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Regulatory information report

Penetration systems tested in accordance with AS 1530.4:2014

Test sponsor: BOSS Fire & Safety P/L

Job number: RIR - FRT180473

Report number: RIR - FRT180473

Test date: 12 March 2019 Revision: R1.0

Amendment schedule

Version	Date	Information relating to report			
R1.0	31/05/2019	Description	Initial issue		
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General conditions of use

Executive summary

This report documents the findings of the fire resistance test of penetration systems undertaken on 12 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 75mm thick Hebel Power Panel penetrated by 13 services. A summary of the penetration systems is provided in Table 1.

Table 1 Test summary

Penetration system	Service	Local fire-stopping protection	Main fire-stopping protection	Aperture size (mm)	FRL
A	Bundle of Power cables	BOSS FireMastic – HPE™	-	Ø90mm	-/120/60
B	Bundle of cables and pipes	BOSS FireMastic – 300™	BOSS Fire Box	300mm × 80mm	-/120/30
C	100mm uPVC (Sandwich core) pipe	BOSS 100mm MaxiCollar™ BOSS FireMastic – 300™	-	Ø121mm	-/120/0
D	Bundle of aluminium cables	BOSS FireMastic – 300™	BOSS Batt BOSS Cable Transit CT120	110mm × 110mm	-/120/30
E	40mm uPVC pipe	BOSS FireMastic - HPE™	-	Ø44mm	-/120/90
F	50mm uPVC pipe	BOSS 50mm MaxiCollar™ BOSS FireMastic – 300™	-	Ø76mm	-/120/120
G	80mm uPVC pipe	BOSS 80mm MaxiCollar™ BOSS FireMastic – 300™	-	Ø102mm	-/120/120
H	Bundle of CAT6 data cable	BOSS Firemastic - HPE™	-	Ø90mm	-/120/60
I	60mm galvanised sprinkler pipe	BOSS FireMastic - 300™	-	Ø80mm	-/120/90
J	80mm copper pipe with lagging	BOSS P40-MAK Wrap BOSS 150mm MaxiCollar™ BOSS FireMastic – 300™	BOSS Batt	Ø180mm	-/120/120
K	40mm uPVC pipe	BOSS 40mm MaxiCollar™ BOSS FireMastic – 300™	-	Ø70mm	-/120/90
L	32mm PEX-A pipe	BOSS FireMastic - HPE™	-	Ø70mm	-/120/0
M	60mm cPVC pipe	BOSS FireMastic - HPE™	-	Ø102mm	-/120/0

Contents

1. Introduction

This report documents the findings of the fire resistance test of penetration systems undertaken on 12 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	75mm thick Hebel Power Panel	
Nominal separating element size	Width (w): Height (h): Thickness (t):	1600mm 1600mm 75mm
Number of penetration systems	13	
Restraint conditions	Restrained on all edges	

Table 4 Test specimen

Penetration system	Service	Local fire-stopping protection	Main fire-stopping protection	Aperture size (mm)
A	Bundle of Power cable	BOSS FireMastic – HPE™	-	Ø90mm
B	Bundle of cables and pipes	BOSS FireMastic – 300™	BOSS Fire Box	300mm × 80mm
C	100mm uPVC (Sandwich core) pipe	BOSS 100mm MaxiCollar™ BOSS FireMastic – 300™	-	Ø121mm
D	Bundle of aluminium cables	BOSS FireMastic – 300™	BOSS Batt BOSS Cable Transit CT120	110mm × 110mm
E	40mm uPVC pipe	BOSS FireMastic - HPE™	-	Ø44mm
F	50mm uPVC pipe	BOSS 50mm MaxiCollar™ BOSS FireMastic – 300™	-	Ø76mm
G	80mm uPVC pipe	BOSS 80mm MaxiCollar™ BOSS FireMastic – 300™	-	Ø102mm
H	Bundle of CAT6 data cable	BOSS Firemastic - HPE™	-	Ø90mm
I	60mm galvanised sprinkler pipe	BOSS FireMastic - 300™	-	Ø80mm
J	80mm copper pipe with lagging	BOSS P40-MAK Wrap BOSS 150mm MaxiCollar™ BOSS FireMastic – 300™	BOSS Batt	Ø180mm
K	40mm uPVC pipe	BOSS 40mm MaxiCollar™ BOSS FireMastic – 300™	-	Ø70mm
L	32mm Pex-a pipe	BOSS FireMastic - HPE™	-	Ø70mm
M	60mm cPVC pipe	BOSS FireMastic - HPE™	-	Ø102mm

Table 5 Installation method and orientation

Item	Detail
Start date of separating element construction	30 January 2019
Start date of penetration systems installation	13 February 2019
Completion date of test specimen construction and installation	8 March 2019
Separating element constructed by	The test sponsor.
Penetration system installed by	The test sponsor.
Orientation	Symmetrical, the fire protections on the exposed and unexposed side were similar

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	75mm Hebel / ACC
	Product name	75mm Hebel Powerpanel
	Density	38.8kg/m^2
	Installation	The 75mm Hebel / ACC were installed in the vertical orientation and supported by the slotted angles around the perimeter on the unexposed side. The panels were joined together with Hebel Adhesive.
2.	Item name	Hebel slotted angle
	Size	50mm × 50mm × 1.2mm (Vertical edges) 75mm × 50mm × 1.2mm (Top and bottom edges
SE	Size	1600mm × 1600mm ×75mm (measured)
	Specification	• The separating element comprised of three 75mm Hebel / ACC with vertical joints at 600 and 1200mm from the east edge of the wall. • The wall system was secured to the test frame with slotted angles on the unexposed side. The slotted angles were fixed to the block work with masonry anchors and connected to the wall system with Hex head type screws. • The perimeter gap on the exposed side was filled with BOSS FireMastic - 300
Fire-stopping protections		
Sealant		
3.	Product name	BOSS FireMastic - 300™
	Density	Nominal 1560kg/m^3 (provide by client)
	Installation	• In the annular gap to 5mm depth between the service and the wall or BOSS Batt. The mastic was then finished flush on both the exposed and the unexposed side. (service C, F, G, J ,K) • In the annular gap to 10mm depth between the service and the wall. The mastic was then finished with 50mm × 50mm fillet on both the exposed and the unexposed side (Service I) • In the interface between BOSS Fire Box and wall system. The mastic was then finished with 25mm × 25mm fillet on both the exposed and the unexposed sides. (Service B) • 2mm mastic was used in the interface between BOSS Batt and the wall system. (Service D, J)
4.	Product name	BOSS FireMastic - HPE™
	Density	Nominal 1300kg/m^3 (provide by client)
		• In the annular gap to 25mm depth between the service and the separating element. The mastic was supported by the backing rod and finished flush on both the exposed and the unexposed sides. (Service A, H, L, M) • In the annular gap, at 10mm depth between the service and the separating element on both the exposed and the unexposed side. The mastic was finished with 25mm × 25mm fillet on both the exposed and unexposed sides. (Service E)

Item	Description		
Fire collar			
5.	Product name	BOSS 40mm MaxiCollar™	
	Collar details	Outer diameter (OD) Inner diameter (ID) Height (h) Outer shell thickness (t)	55mm (measured) 43mm (measured) 31.6mm (measured) 1mm (measured)
	Intumescent details	Number of layers Height Thickness Density	3 30mm (measured) 2.3mm (measured) 1121kg/m^3
	Installation	The collars were installed on both the exposed and the unexposed side of the wall system with three 14-10 × 65 Hex head screws.	
6.	Product name	BOSS 50mm MaxiCollar™	
	Collar details	Outer diameter (OD) Inner diameter (ID) Height (h) Outer shell thickness (t)	70mm (measured) 58mm (measured) 31.6mm (measured) 1mm
	Intumescent details	Number of layers Height Thickness Density	3 30mm (measured) 2.3mm (measured) 1121kg/m^3
	Installation	The collars were installed on both the exposed and the unexposed side of the wall system with three 14-10 × 65 Hex head screws.	
7.	Product name	BOSS 80mm MaxiCollar™	
	Collar details	Outer diameter (OD) Inner diameter (ID) Height (h) Outer shell thickness (t)	103mm (measured) 84mm (measured) 31.3mm (measured) 1mm
	Intumescent details	Number of layers Height Thickness Density	4 30mm (measured) 2.3mm (measured) 1121kg/m^3
	Installation	The collars were installed on both the exposed and the unexposed side of the wall system with three 14-10 × 65 Hex head screws.	
8.	Product name	BOSS 100mm MaxiCollar™	
	Collar details	Outer diameter (OD) Inner diameter (ID) Height (h) Outer shell thickness (t)	135mm (measured) 113mm (measured) 30mm (measured) 1mm
	Intumescent details	Number of layers Height Thickness Density	5 30mm (measured) 2.3mm (measured) 1146kg/m^3
	Installation	The collars were installed on both the exposed and the unexposed side of the wall system with three 14-10 × 65 Hex head screws.	
9.	Product name	BOSS 150mm MaxiCollar™	

Item	Description		
	Collar details	Outer diameter (OD) Inner diameter (ID) Height (h) Outer shell thickness (t)	203mm (provided by sponsor) 163mm (provided by sponsor) 40mm (provided by sponsor) 1mm
	Intumescent details	Number of layers Width (w) Thickness (t) Density	9 40mm (provided by sponsor) 2.3mm (provided by sponsor) 1146kg/m^3
	Installation	The collars were installed on both the exposed and the unexposed side of the BOSS Batt. The collars were secured to the BOSS Batt with three pigtail screws.	
Wrap			
10.	Item name	Insulation wrap	
	Product name	BOSS P40-MAK Wrap	
	Overall size	300mm wide × 40mm thick (measured)	
	Mineral fibre wool density	40kg/m^3 (measured)	
	Installation	The wrap was wrapped around the lagged pipe (service J) on both the exposed and the unexposed side. The wraps were secured with steel wire at approximately 50mm, 150mm and 250mm from the separating element	
Batts/Board			
11.	Item name	BOSS Batt	
	Product name	BOSS Bulkhead Batts	
	Size	300mm × 300mm (measured - service D) 385mm × 385mm (measured - service J)	
	Density	7kg/m^3 (measured)	
	Installation	The BOSS Batts were installed on both the exposed and the unexposed side of the separating element. They were secured by four 14-10 × 100mm Bugle head screw with washer.	
Firebox			
12.	Item name	BOSS Fire Box	
	Product name	BOSS Fire Box Multi-Service Cable & Pipe Transit	
	Size	300mm wide × 80mm high × 131mm deep (measured)	
	No. of intumescent bags in the box	4	
	Density	Nominal: 1330kg/m^3 (measured)	
	Installation	The BOSS Fire Box was inserted into the aperture and secured to the separating element with 20mm × 20mm angles on the exposed side. The annular gap between the BOSS Fire Box and the separating element was filled with BOSS FireMastic – 300 and finished 25mm × 25mm fillet on both exposed and unexposed sides.	
13.	Item name	BOSS Cable Transit	
	Product name	BOSS Cable Transit CT120	
	Size	102mm wide × 102mm high × 254mm deep (measured)	

Item	Description		
	No. of intumescent piece in the box	2	
	Density	Nominal:1255kg/m^3 (measured)	
	Installation	The BOSS Cable Transit was inserted into the aperture of the separating element and the BOSS Batt. The BOSS Cable Transit was secured to the BOSS Batt on both the exposed and unexposed side with BOSS Cable Transit bracket. The annular gap between the BOSS Cable Transit and separating element & BOSS Batt was filled with BOSS FireMastic – 300 to the depth of 5mm.	
Services			
14.	Item name	25mm uPVC pipe	
	Product name	iPlex pipeline Premium BEP PVC S1 PVC-U 25PN12	
	Size	Outer diameter (OD) Inner diameter (ID) Thickness (t)	33.6mm (measured) 29.3mm (measured) 2.2mm (measured)
15.	Item name	40mm uPVC pipe	
	Product name	Vinidex Quality BEP PVC Series 1 40 PVCU PN12 LIc No. 1012 AS/NZS 1477 SL 17 [0]	
	Size	Outer diameter (OD) Inner diameter (ID) Thickness (t)	42.3mm (measured) 37.7mm (measured) 2.3mm (measured)
16.	Item name	40mm uPVC pipe	
	Product name	Pipe King BEP PVC Series 1 40 PVC-U PN 12	
	Size	Outer diameter (OD) Inner diameter (ID) Thickness (t)	48.2mm (measured) 42.2mm (measured) 3mm (measured)
17.	Item name	50mm uPVC pipe	
	Product name	DPSHH50C HOLMAN DWV503 BEP PVC DN50 PVC-U DWV	
	Size	Outer diameter (OD) Inner diameter (ID) Thickness (t)	55.7mm (measured) 50.6mm (measured) 2.6mm (measured)
18.	Item name	80mm uPVC pipe	
	Product name	Pipe King BEP PVC 80 DWV PVCU 18/05/13 SYD AS/NZS 1260 Lic 2157	
	Size	Outer diameter (OD) Inner diameter (ID) Thickness (t)	82.1mm (measured) 75.4mm (measured) 3.4mm (measured)
19.	Item name	100mm uPVC (sandwich type) pipe	
	Product name	Pipe King BEP PVC 100 DWV PVCU SN6 SC	
	Size	Outer diameter (OD) Inner diameter (ID) Thickness (t)	110.6mm(measured) 103mm (measured) 3.8mm (measured)
20.	Item name	50NB CPVC pipe	
	Product name	732-TFP 2”[50mm] BlazeMaster SDR13.5 WP175 PSI(121kPa) 150F (65C) Listed 67CNCPVC SPRINKLER Pipe 4120-06 TFP331804057 F-442 320 PSI @ 180F MEA 185-02-E DADE County Product Control Approved	

Item	Description		
	Size	Outer diameter (OD) Inner diameter (ID) Thickness (t)	60.3mm (measured) 50.3mm (measured) 5mm (measured)
21.	Item name	32mm PEX-A pipe	
	Product name	Tade Pex Water AS 2492 WM 74647// DN32 32 × 4.4mm SDR7.4 PN20 PEX-a	
	Size	Outer diameter (OD) Inner diameter (ID) Thickness (t)	32mm (measured) 21.3mm (measured) 5.4mm (measured)
22.	Item name	32mm lagged copper pipe	
	Product name	32mm copper pipe Type B with 19mm thick Armaflex FRV lagging	
	Size (pipe)	Outer diameter (OD) Inner diameter (ID) Thickness (t)	31.8mm (measured) 29.2mm (measured) 1.3mm (measured)
	Size	Outer diameter (OD) Inner diameter (ID) Thickness (t)	70.2mm (measured) 32.8mm (measured) 18.6mm (measured)
23.	Item name	80mm lagged copper pipe	
	Product name	80mm copper pipe Type B with 50mm thick Thermobreak Tube Thermal Insulation lagging.	
	Size (pipe)	Outer diameter (OD) Inner diameter (ID) Thickness (t)	76.1mm (measured) 72.8mm (measured) 1.7mm (measured)
	Size (Lagging)	Outer diameter (OD) Inner diameter (ID) Thickness (t)	186.1mm (measured) 77.1mm (measured) 54.5mm (measured)
24.	Product name	50NB galvanised MED type steel sprinkler pipe	
	Size	Outer diameter (OD) Inner diameter (ID) Thickness (t)	60.3mm (measured) 53.2mm (measured) 3.6mm (measured)
25.	Product name	Ardent Copper Fire Rated Pair Coil 13mm ¼” × 1/2”	
	Size (Large pipe)	Outer diameter (OD) Inner diameter (ID) Thickness (t)	13.4mm (measured) 10.8mm (measured) 1.3mm (measured)
	Size(Large pipe lagging)	Outer diameter (OD) Inner diameter (ID) Thickness (t)	33mm (measured) 13.4mm (measured) 9.8mm (measured)
	Size (Small pipe)	Outer diameter (OD) Inner diameter (ID) Thickness (t)	6.3mm (measured) 4.6mm (measured) 0.9mm (measured)
	Size (Small pipe lagging)	Outer diameter (OD) Inner diameter (ID) Thickness (t)	26.6mm (measured) 11.4mm (measured) 7.6mm (measured)
26.	Item name	FireSense cable	
	Product name	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	

Item	Description		
	Overall size	Outer diameter	10.3mm (measured)
27.	Item name	Power cable – 3 Core 2.5mm^2	
	Product name	Nexans Olex 2018 V-90 Electric cable 450/780V TUV2 1958EA CNCP07 TrustOlex	
	Overall size	12.5mm × 5.6mm (measured)	
28.	Item name	Power cable – 3 Core 1.5mm^2	
	Product name	Nexans Olex 2018 V-90 Electric cable 450/780V TUV2 1958EA CNCP05 TrustOlex	
29.	Item name	CAT6 Data cables	
	Product name	Serveredge E5960 Category 6 4PR 23 Aug UTP Solid PVC cable ANSI/ TIA-568-C.2 250MHz	
	Overall size	Outer diameter	6.4mm (measured)
30.	Item name	Aluminium cable 70mm^2 conductor	
	Outer diameter	Ø16.4mm (measured)	
31.	Item name	Aluminium cable 120mm^2 conductor	
	Outer diameter	Ø19.3mm (measured)	
32.	Item name	Aluminium cable 185mm^2 conductor	
	Outer diameter	Ø22.9mm (measured)	
33.	Item name	Aluminium cable 240mm^2 conductor	
	Outer diameter	Ø25.5mm (measured)	
Fixings			
34.	Item name	Collar fixing	
	Product name	14 – 10 × 65 Hex Head screws	
	Installation	3 × screws were used to secure each BOSS MaxiCollar™ to the separating element.	
35.	Item name	BOSS Batt fixing	
	Product name	14 – 10 × 100MM Bugle head screws with washer	
	Installation	4 × screws and washers were used to secure each BOSS Batt to the separating element	
Penetration system A			
A	Service	Bundle of 22 × Power cable – 3 Core 2.5mm^2	
	Service detail	Bundle outside diameter: Ø 50mm 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 125mm and 430mm from the separating element.	
	Aperture size	Ø90mm	
	Annular gap	Nominal 20mm	
	Local fire-stopping protection		
	Protection	BOSS FireMastic-HPE™ (item 4)	
	Installation	The annular gap between the service and separating element was filled with BOSS FireMastic – HPE™ to a depth of 25mm with backing rod support and finished flush on both sides.	

Item	Description	
		See Figure 2 and Figure 6 in Appendix A for more details.
Penetration system B		
B	Service	Bundle of cables and pipes in BOSS Fire Box (item 12)
	Service component	• 8 × Power cable – 3 Core 2.5mm^2 • 8 × Power cable – 3 Core 1.5mm^2 • 8 × FireSense Cable – 2 Core 1.5mm^2 • 8 × CAT6 Data Cables • 50NB Galvanised Sprinkler pipe • 32mm lagged copper pipe • Ardent Copper Fire Rated Pair Coil 13mm ¼" × 1/2" • 25mm uPVC pipe • Aluminium cable 70mm^2 conductor • Aluminium cable 185mm^2 conductor
	Service detail	All the metal and plastic pipes were capped on the exposed side. The copper pipe was capped with copper end cap and the galvanised pipe was capped with galvanised end cap. Pair coil copper pipe and the uPVC pipes were sealed with BOSS FireMastic – 300™. (item 3) The metal pipes and cables protruded 500mm from both the exposed and unexposed side of the separating element. The plastic pipe protruded 500mm from the exposed side and 2000mm from the unexposed side.
	Service support	The services were supported by the pipe clamps on the unexposed at 110mm (Metal pipe and cables), 430mm and 1860mm (plastic pipe)
	Aperture size	305mm wide × 85mm high (Provided by sponsor)
	Annular gap	5mm
	Local fire-stopping protection	
	Protection	BOSS Fire Box (item 12) & BOSS FireMastic – 300™ (item 3)
	Installation	The BOSS Fire Box was inserted into the aperture and secured with 20mm × 20mm angle on the exposed side. The gap at interface between the BOSS Fire Box and separating element were filled with BOSS FireMastic-300 and finished with 25mm × 25mm fillet. The cables and pipes were inserted into the BOSS Fire Box and tied together with metal wire. See Figure 2 and Figure 7 in Appendix A for more details
Penetration system C		
C	Service	100mm uPVC (sandwich type) pipe
	Service detail	The service protruded 500mm on the exposed side and 2000mm from 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 435 and 1865mm from the separating element
	Aperture size	Ø121mm (Provided by sponsor)
	Annular gap	Nominal 5.5mm
	Local fire-stopping protection	
	Protection	BOSS 100mm MaxiCollar™ (item 8)& BOSS FireMastic – 300™ (item 3)

Item	Description	
	Installation	The annular gap between the service and the separating element was filled with BOSS FireMastic -300™ to a depth of 5mm and finished flush on both the exposed and the unexposed sides. BOSS 100mm MaxiCollar™ were installed on both exposed and unexposed side and secured to the separating element with Hex head screws. See Figure 2 and Figure 8 in Appendix A for more details
Penetration system D		
D	Service	Bundle of Aluminium conductors in BOSS Cable Transit
	Service component	• 2 × Aluminium cable 70mm^2 conductor (item 30) • 2 × Aluminium cable 120mm^2 conductor (item 31) • 2 × Aluminium cable 185mm^2 conductor (item 32) • 2 × Aluminium cable 240mm^2 conductor (item 33)
	Service detail	The cables protruded 500mm from both the exposed and unexposed side of the separating element.
	Service support	The service was supported by pipe clamps at 130mm and 420mm from the unexposed side of the wall
	Aperture size	110mm × 110mm (Provided by sponsor)
	Annular gap	Nominal 4mm
	Local fire-stopping protection	
	Protection	BOSS Batt (item 11) & BOSS Cable Transit (item 13) & BOSS Firemastic – 300™ (item 3)
	Installation	A 110mm × 110mm aperture was cut at the centre of the BOSS Batt before the BOSS Batts were installed on the exposed and the unexposed side of the separating element. The BOSS Batts were fixed to the separating element with four bugle head screws with washers. The aperture of the BOSS Batts and the separating element were aligned to each other. 2mm thick BOSS FireMastic – 300 was applied on the interface between the BOSS Batt and the separating element. The BOSS Cable Transit was installed into the aperture of the separating element and the BOSS Batt. The cables were inserted into the BOSS Cable Transit at the centre and supported by pre-cut foam located at the front and the back of the BOSS Cable Transit. The annular gap between the BOSS Cable Transit and BOSS Batt & separating element was filled with BOSS FireMastic – 300™ to a depth of 25mm on both the exposed and unexposed side. See Figure 2 and Figure 9 in Appendix A for more details
Penetration system E		
E	Service	40mm uPVC pipe (item 15)
	Service detail	The service protruded 500mm on the exposed and 2000mm on the unexposed side. The pipe was capped with BOSS FireMastic – 300.
	Service support	The service was supported by pipe clamps at 130mm and 420mm from the separating element.
	Aperture size	Ø44mm (Provided by sponsor)
	Annular gap	Nominal 0.5mm
	Local fire-stopping protection	
	Protection	BOSS FireMastic – HPE™ (item 4)

Item	Description	
	Installation	The annular gap between the service and the separating element was filled with BOSS FireMastic – HPE™ to a depth of 10mm and finished with 25mm × 25mm fillet on both the exposed and unexposed side. See Figure 2 and Figure 10 in Appendix A for more details
Penetration system F		
F	Service	50mm uPVC pipe (item 17)
	Service detail	The service protruded 500mm on the exposed side and 2000mm from 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 420 and 1865mm from the separating element
	Aperture size	Ø76mm (Provided by sponsor)
	Annular gap	Nominal 8mm
	Local fire-stopping protection	
	Protection	BOSS 50mm MaxiCollar™ (item 6)& BOSS FireMastic – 300™ (item 3)
	Installation	The annular gap between the service and the separating element was filled with BOSS FireMastic -300™ to a depth of 5mm and finished flush on both the exposed and the unexposed side. BOSS 50mm MaxiCollar™ were installed on both exposed and unexposed side and secured to the separating element with Hex head screws. See Figure 2 and Figure 11 in Appendix A for more details
Penetration system G		
G	Service	80mm uPVC pipe (item 18)
	Service detail	The service protruded 500mm on the exposed side and 2500mm from 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 420 and 1865mm from the separating element
	Aperture size	Ø102mm (Provided by sponsor)
	Annular gap	Nominal 10mm
	Local fire-stopping protection	
	Protection	BOSS 80mm MaxiCollar™ (item 7) & BOSS FireMastic – 300™ (item 3)
	Installation	The annular gap between the service and the separating element was filled with BOSS FireMastic – 300 to a depth of 5mm and finished flush on both the exposed and the unexposed side. BOSS 80mm MaxiCollar™ collar were installed on both exposed and unexposed side and secured to the separating element with Hex head screws. See Figure 2 and Figure 12 in Appendix A for more details
Penetration system H		
H	Service	Bundle of 38 × CAT6 Data cables (Ø50mm bundle) (item 29)
	Service detail	The service protruded 500mm from the exposed side and 500mm from the unexposed side.
	Service support	The service was supported by pipe clamps at 110mm and 415mm from the separating element

Item	Description	
	Aperture size	Ø90mm (Provided by sponsor)
	Annular gap	Nominal 20mm
	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™ to a depth of 25mm supported by backing rod. The mastic was finished flushed on both exposed and unexposed side. See Figure 2 and Figure 13 in Appendix A for more details
Penetration system I		
I	Service	50NB galvanised MED type steel sprinkler pipe (item 24)
	Service detail	The service protruded 500mm on the exposed side and 500mm on the unexposed side. The pipe was capped with galvanised end cap on the exposed side
	Service support	The service was supported by pipe clamps at 115mm and 415mm from the separating element
	Aperture size	Ø80mm (Provided by sponsor)
	Annular gap	Nominal 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 to a depth of 10mm. The mastic was finished with 50mm × 50mm fillet on both exposed and unexposed side. See Figure 2 and Figure 14 in Appendix A for more details
Penetration system J		
J	Service	80mm lagged Copper pipe (item 23)
	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	Ø180mm (Provided by sponsor)
	Annular gap	0mm
	Local fire-stopping protection	
	Protection	BOSS Batt (item 11)& BOSS FireMastic – 300™ (item 3)& BOSS 150mm MaxiCollar™ (item 9)& BOSS P40-MAK Wrap (item 10)
	Installation	A Ø180mm aperture was cut at the centre of the BOSS Batt before the BOSS Batts were installed on the exposed and the unexposed side of the separating element. The BOSS Batts were fixed to the separating element with four bugle head screws with washers. The aperture of the BOSS Batts and the separating element were aligned to each other. 2mm thick BOSS FireMastic – 300™ was applied on the interface between the BOSS Batt and the separating element.

Item	Description	
		The annular gap between the service and the BOSS Batt was filled with BOSS FireMastic – 300™ to the depth of 5mm and finished flush on both sides. The BOSS 150mm MaxiCollar™ collars were installed on both sides and fixed to the BOSS Batt with pig tail screws. The BOSS 150mm MaxiCollar™ Collar had compressed the Thermobreak lagging for total of 20mm. 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 2 and Figure 15 in Appendix A for more details
Penetration system K		
K	Service	40mm uPVC pipe (item 16)
	Service detail	The service protruded 500mm on the exposed side and 2000mm from 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 700 and 1880mm from the separating element
	Aperture size	Ø70mm (Provided by sponsor)
	Annular gap	Nominal 11mm
	Local fire-stopping protection	
	Protection	BOSS 40mm MaxiCollar™ (item 5)& BOSS FireMastic – 300™ (item 3)
	Installation	The annular gap between the service and the separating element was filled with BOSS FireMastic – 300™ to a depth of 5mm and finished flush on both the exposed and the unexposed side. BOSS 40mm MaxiCollar™ collar were installed on both exposed and unexposed side and secured to the separating element with Hex head screws. See Figure 2 and Figure 16 in Appendix A for more details
Penetration system L		
L	Service	32mm Pex-a pipe (item 21)
	Service detail	The service protruded 500mm on the exposed side and 2000mm from the unexposed side. The pipe was capped with BOSS FireMastic - 300™ on the exposed side
	Service support	The service was supported by the pipe clamps on the unexposed side at 450 and 1850mm from the separating element
	Aperture size	Ø70mm (Provided by sponsor)
	Annular gap	Nominal 19mm
	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™ to a depth of 25mm with backing rod support and finished flush on both the exposed and the unexposed side. See Figure 2 and Figure 17 in Appendix A for more details
Penetration system M		
M	Service	50NB CPVC pipe (item 20)
	Service detail	The service protruded 500mm on the exposed side and 2000mm from the unexposed side. The pipe was capped with uPVC pipe cap with ceramic wool and fire rated sealant on the exposed side

Item	Description	
	Service support	The service was supported by the pipe clamps on the unexposed side at 700 and 1840mm from the separating element
	Aperture size	Ø102mm (Provided by sponsor)
	Annular gap	Nominal 20.1mm
	Local fire-stopping protection	
	Protection	BOSS FireMastic – HPE™ (item 4)
	Installation	The annular gap between the service and the separating element was filled with BOSS FireMastic – HPE™ to a depth of 25mm with backing rod support and finished flush on both the exposed and the unexposed sides. See Figure 2 and Figure 18 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 and control joints.	
Variations	• None	
Pre-test conditioning	The construction and installation of the test specimen was completed on 8 March 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	20°C 20°C 24°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 585mm above 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.

Table 8 Test results

Penetration system	Criteria	Results	Fire resistance level (FRL)
A	Structural adequacy	Not applicable	**-/120/60**
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 68 minutes	
B	Structural adequacy	Not applicable	**-/120/30**
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 33 minutes	
C	Structural adequacy	Not applicable	**-/120/0**
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 7 minutes	
D	Structural adequacy	Not applicable	**-/120/30**
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 58 minutes	
E	Structural adequacy	Not applicable	**-/120/90**
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 113 minutes	
F	Structural adequacy	Not applicable	**-/120/120**
	Integrity	No failure at 121 minutes	
	Insulation	No failure at 121 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	**-/120/60**
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 69 minutes	
I	Structural adequacy	Not applicable	**-/120/90**
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 106 minutes	
J	Structural adequacy	Not applicable	**-/120/120**
	Integrity	No failure at 121 minutes	
	Insulation	No failure at 121 minutes	
K	Structural adequacy	Not applicable	**-/120/90**
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 106 minutes	

Penetration system	Criteria	Results	Fire resistance level (FRL)
L	Structural adequacy	Not applicable	**-/120/0**
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 13 minutes	
M	Structural adequacy	Not applicable	**-/120/0**
	Integrity	No failure at 121 minutes	
	Insulation	Failure at 13minutes	

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

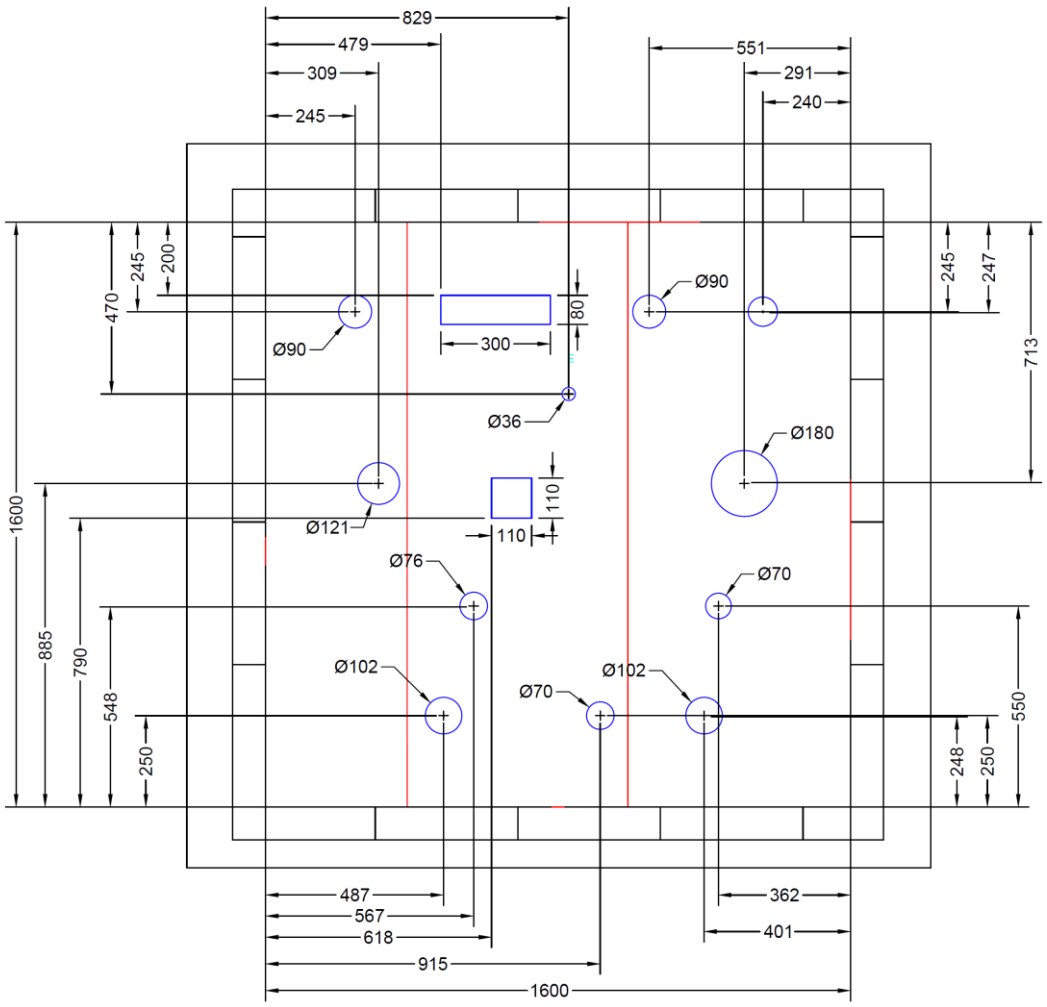


Figure 1 Elevation view of test specimen (Core hole)

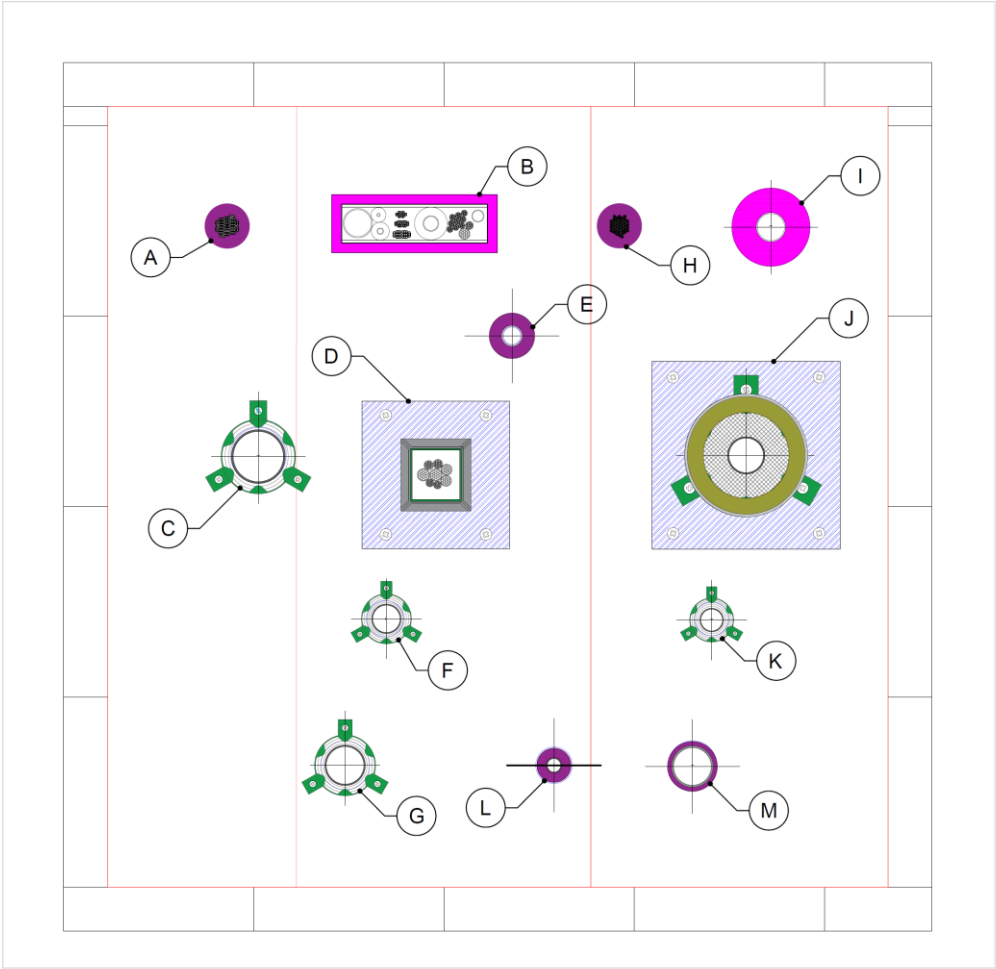


Figure 2 **Elevation view of test specimen (unexposed side)**

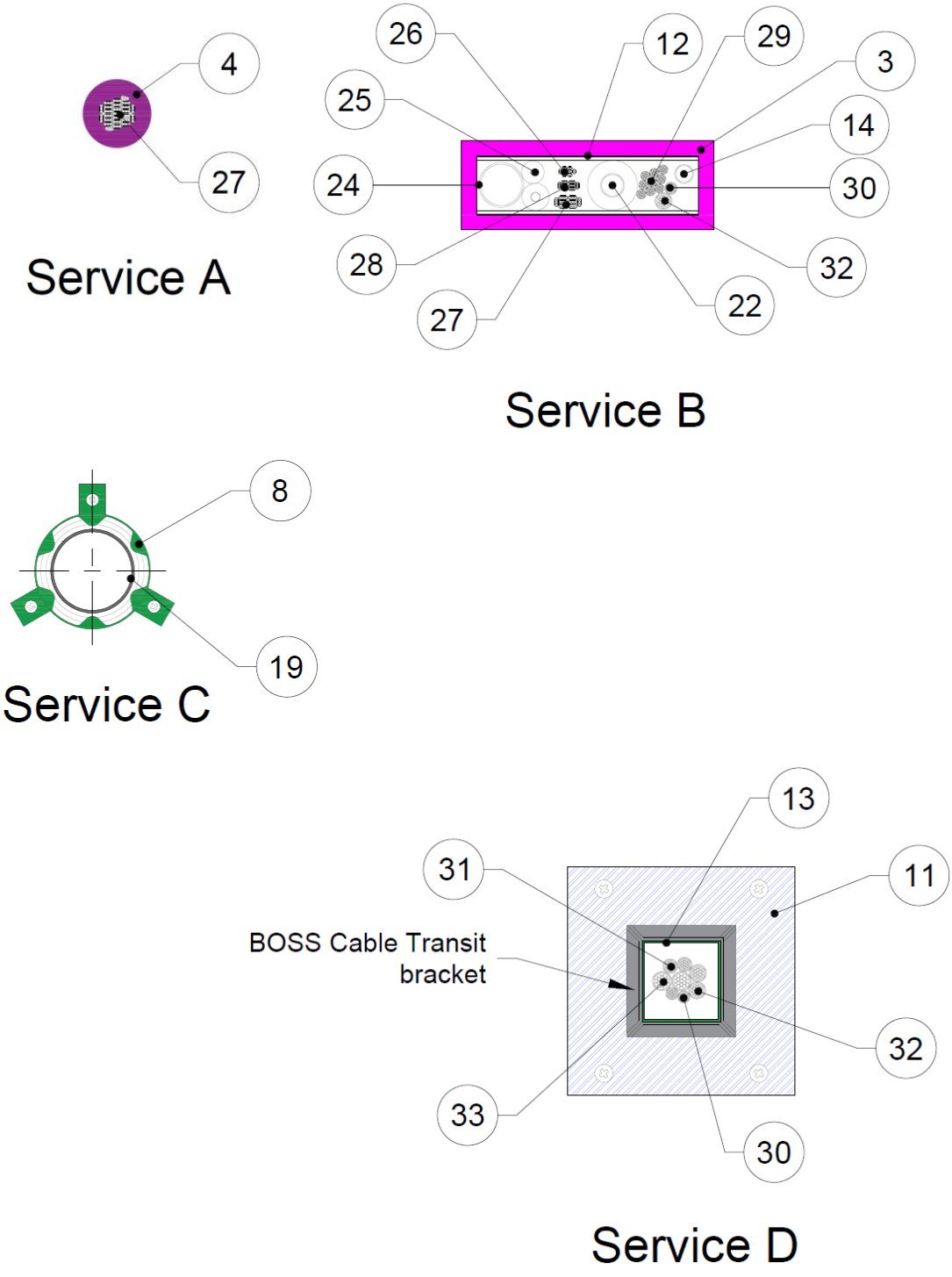


Figure 3 Elevation view of test specimen (Individual specimen)

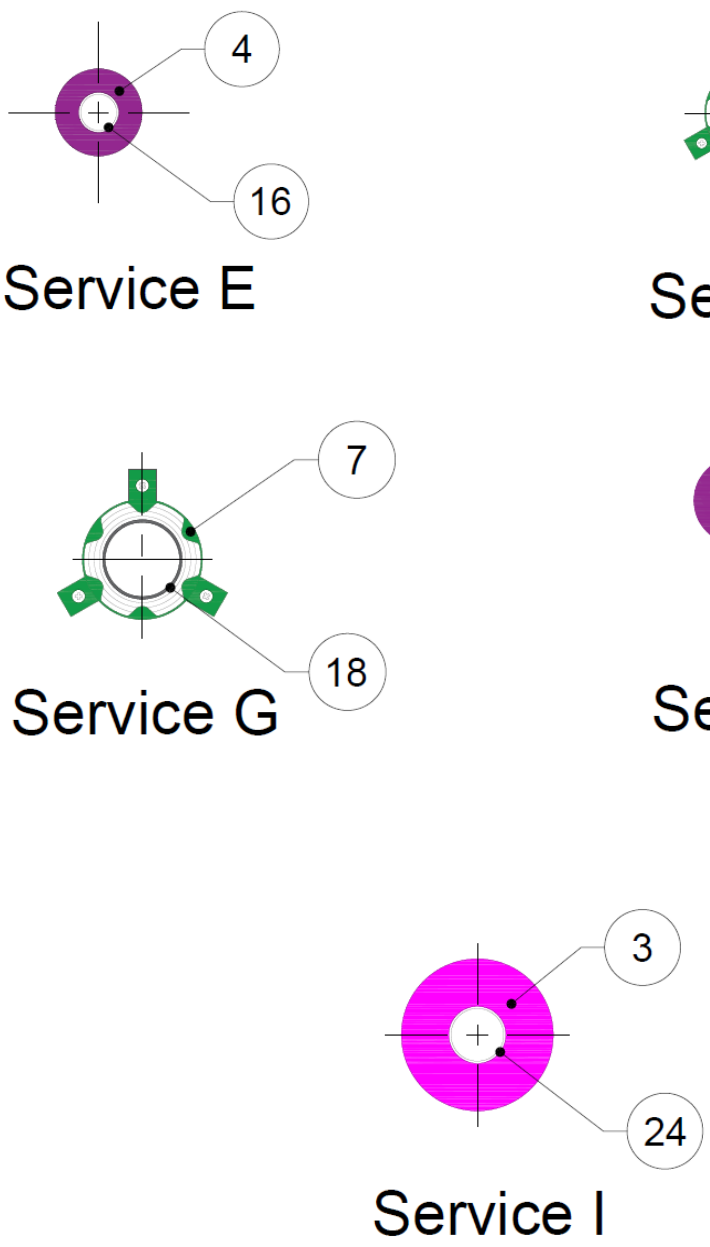


Figure 4 **Elevation view of test specimen (Individual specimen)**

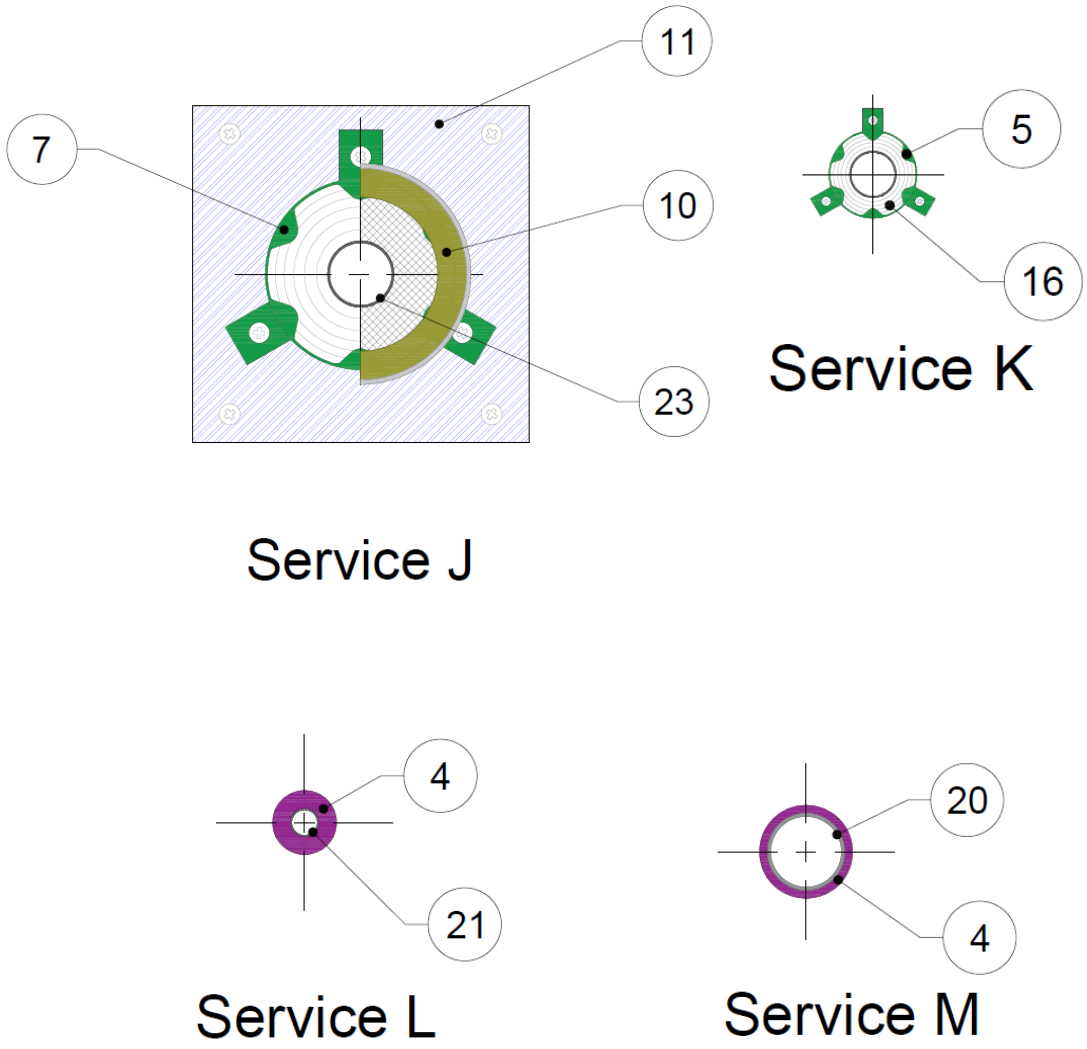


Figure 5 **Elevation view of test specimen (Individual specimen)**

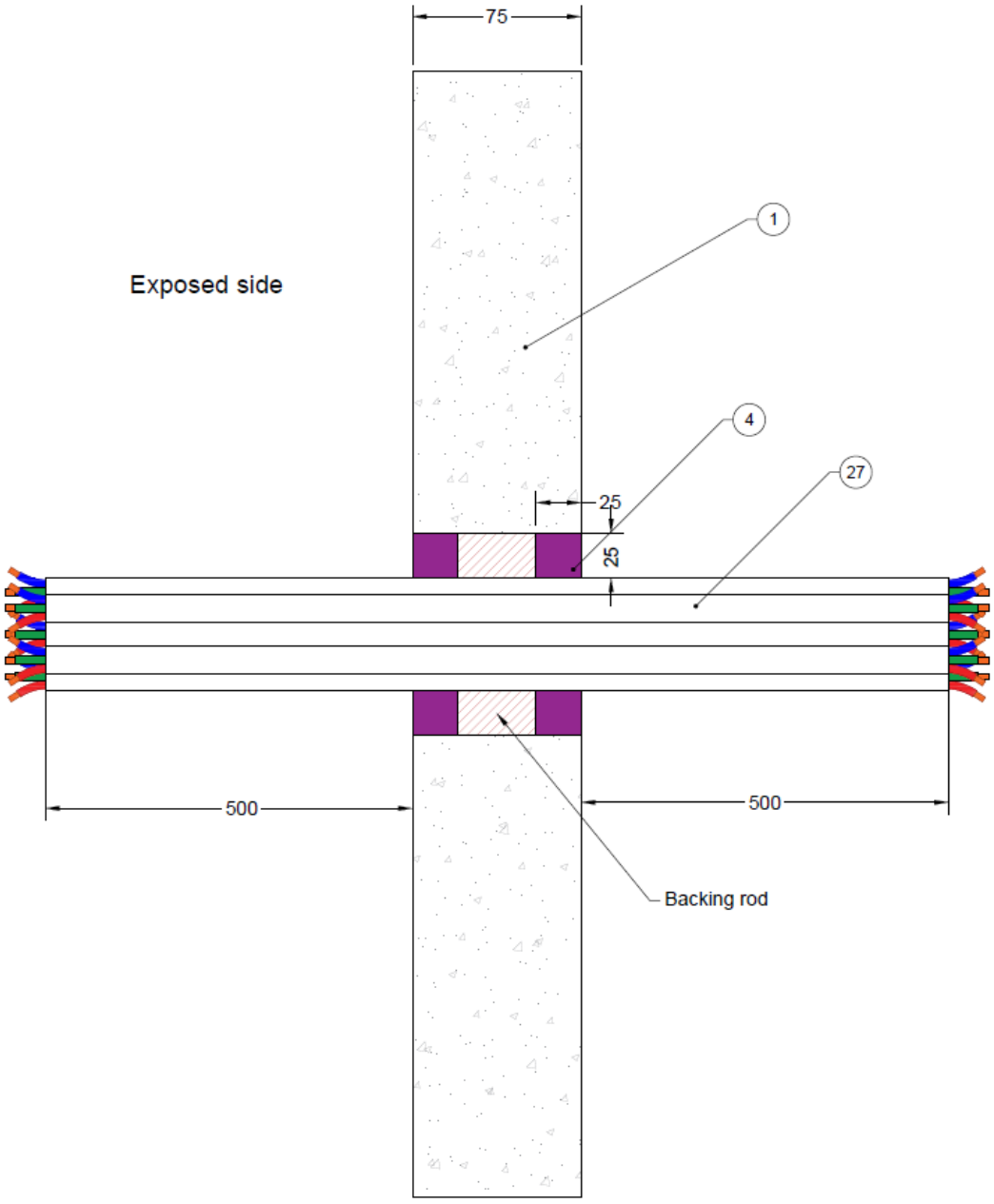


Figure 6 Cross-section of specimen A

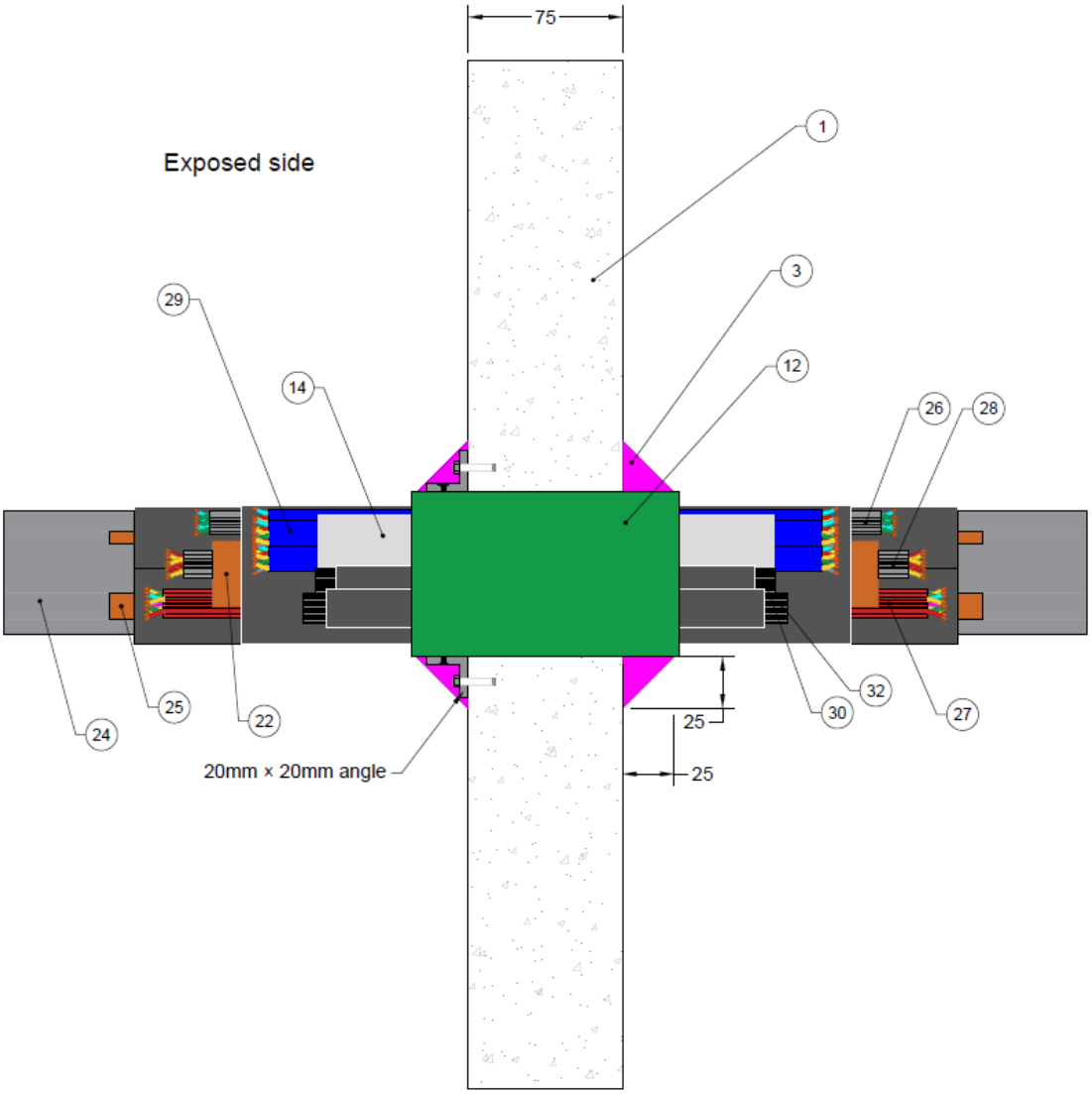


Figure 7 Cross-section of specimen B

Note: Scale of the services in the drawing is not representative of the actual installation. See section 2 for actual length.

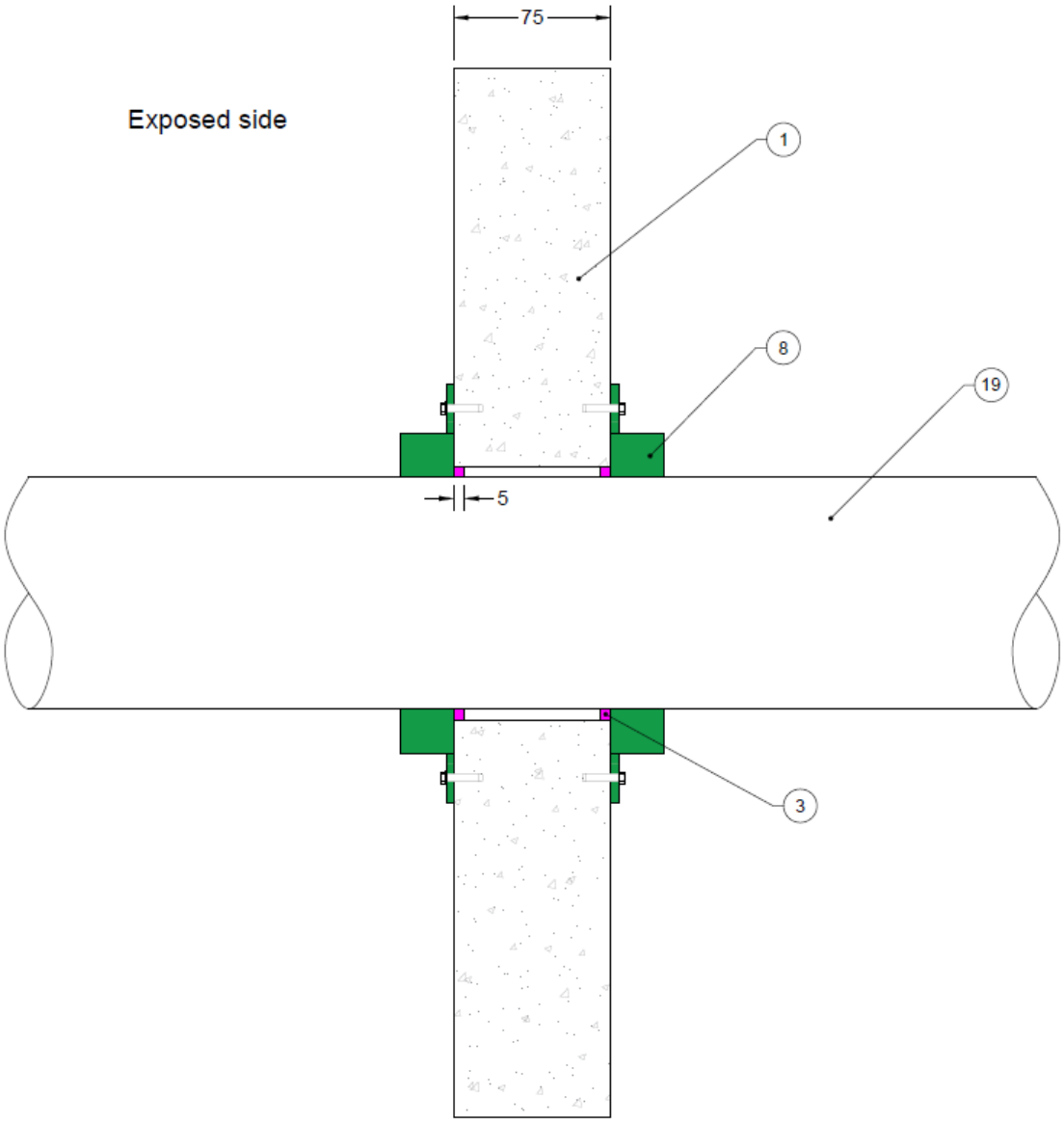


Figure 8 Cross-section of specimen C

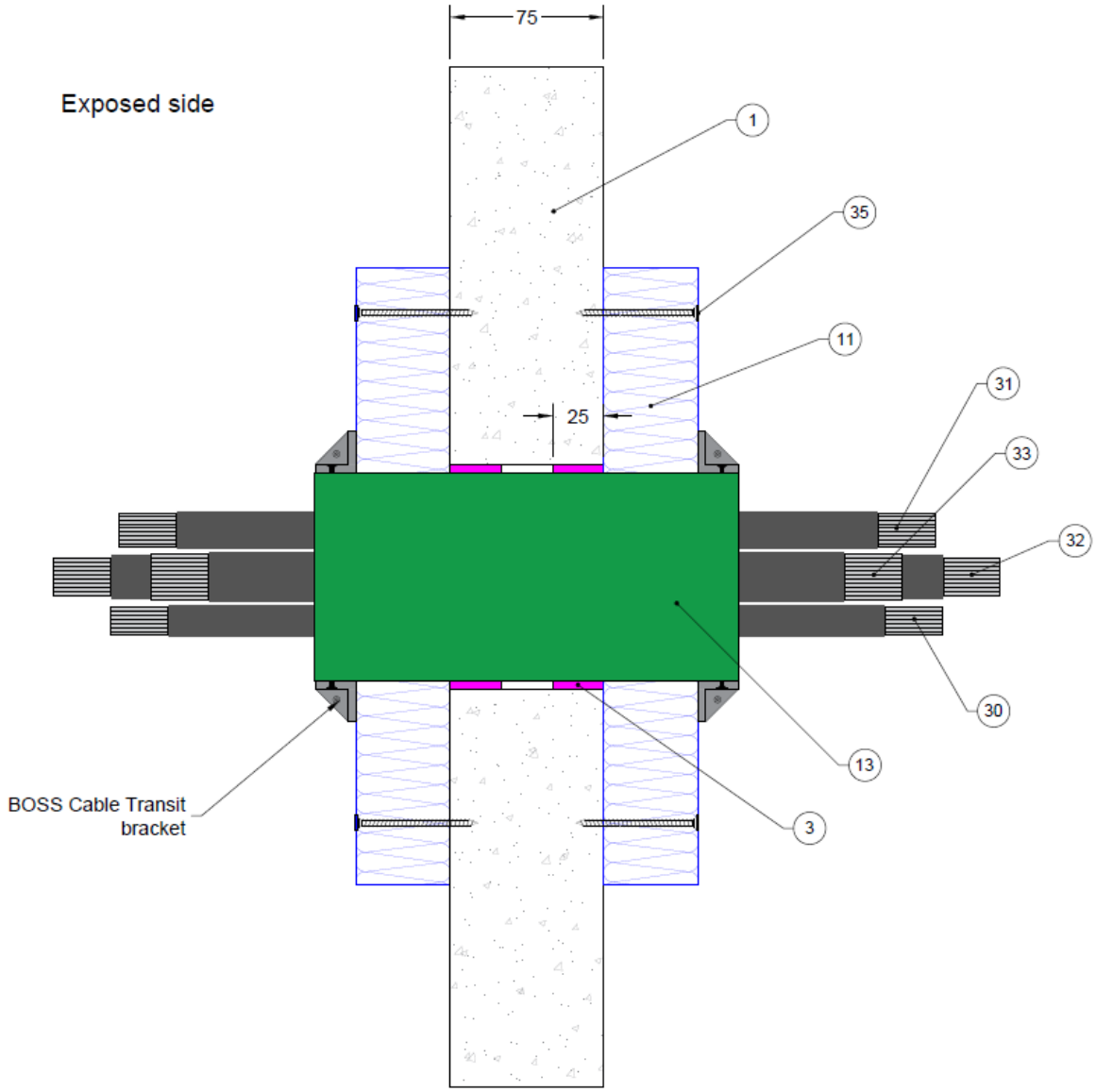


Figure 9 Cross-section of specimen D

Note: Scale of the services in the drawing is not representative of the actual installation. See section 2 for actual length.

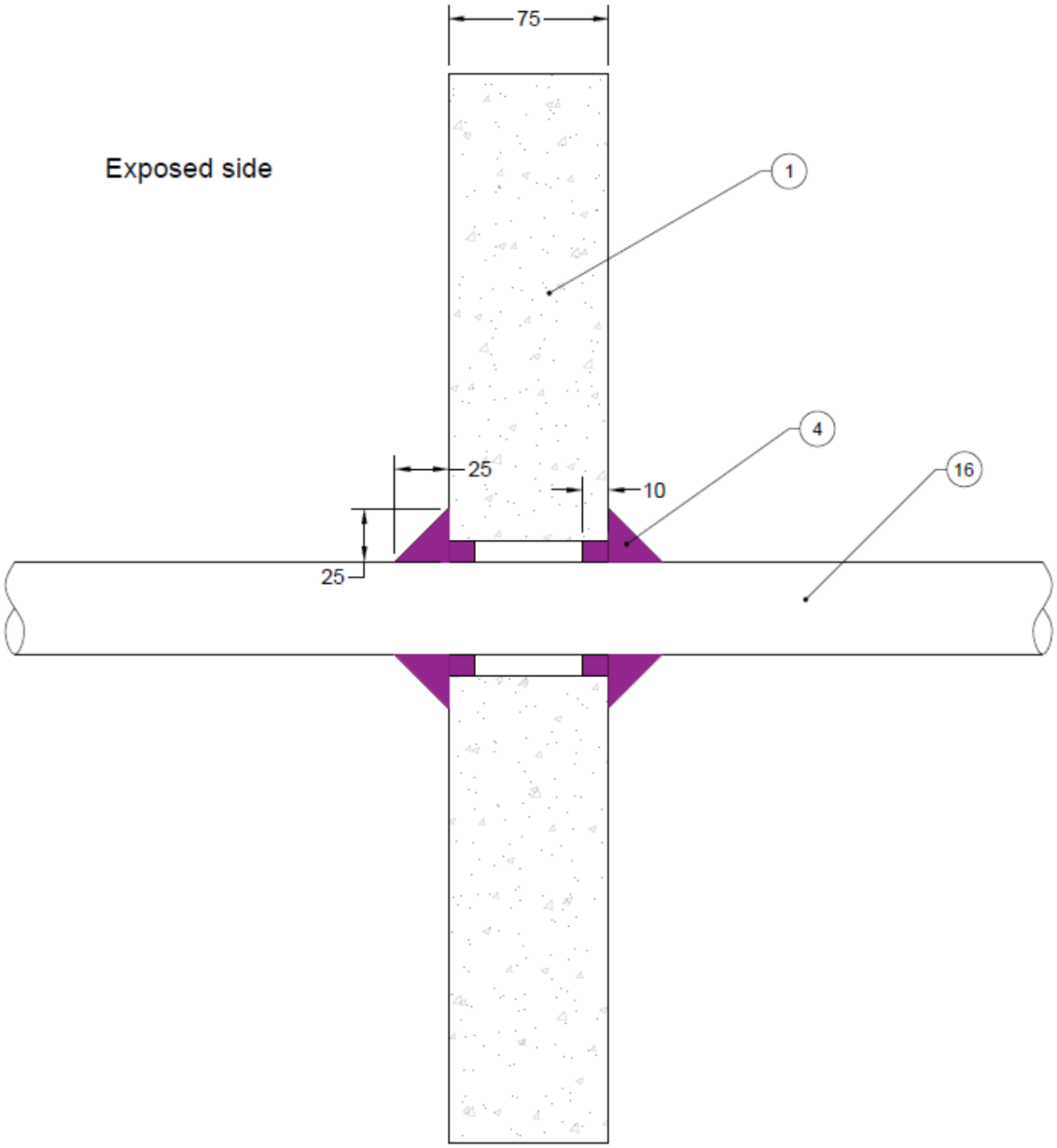


Figure 10 Cross-section of specimen E

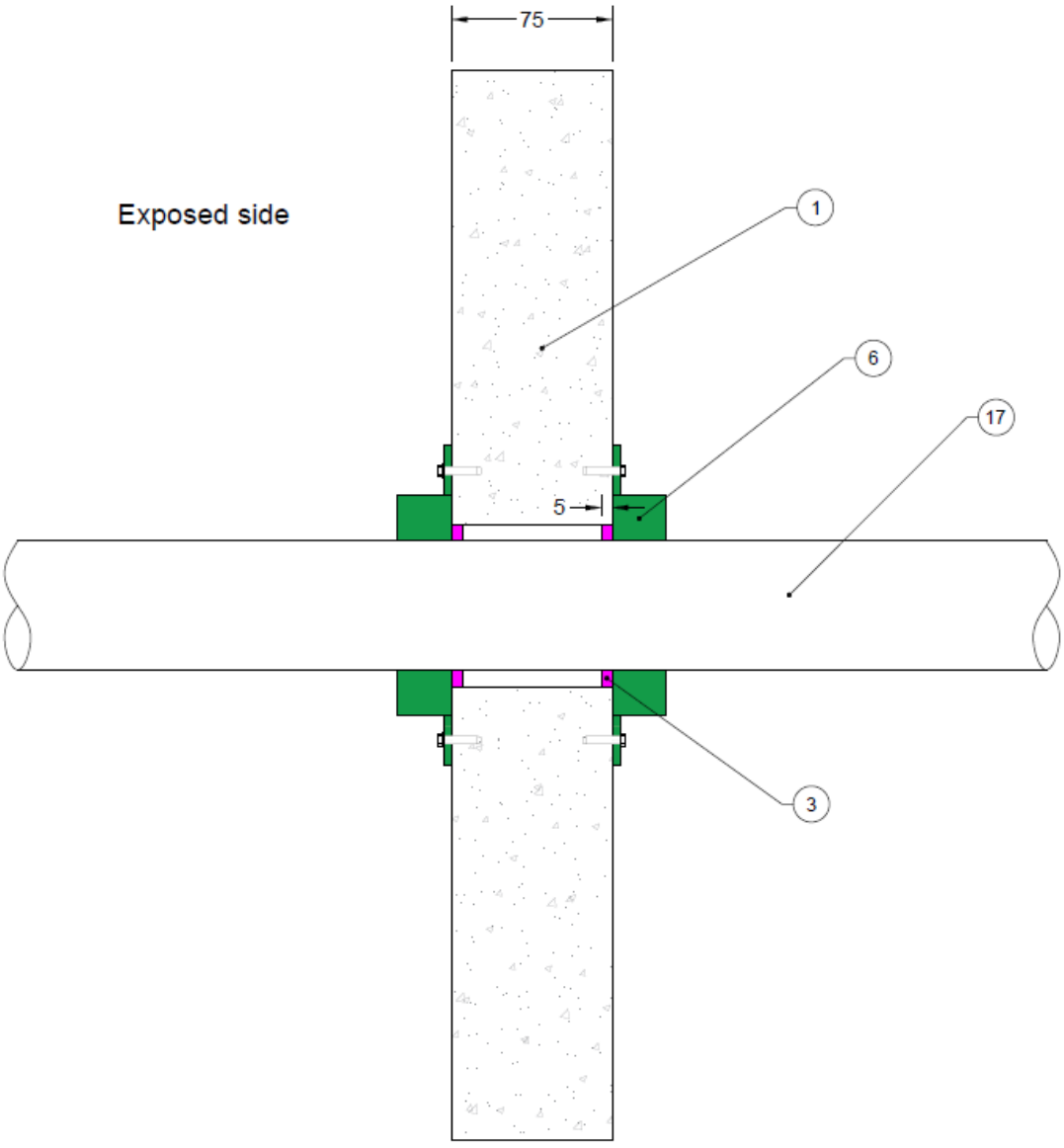


Figure 11 Cross-section of specimen F

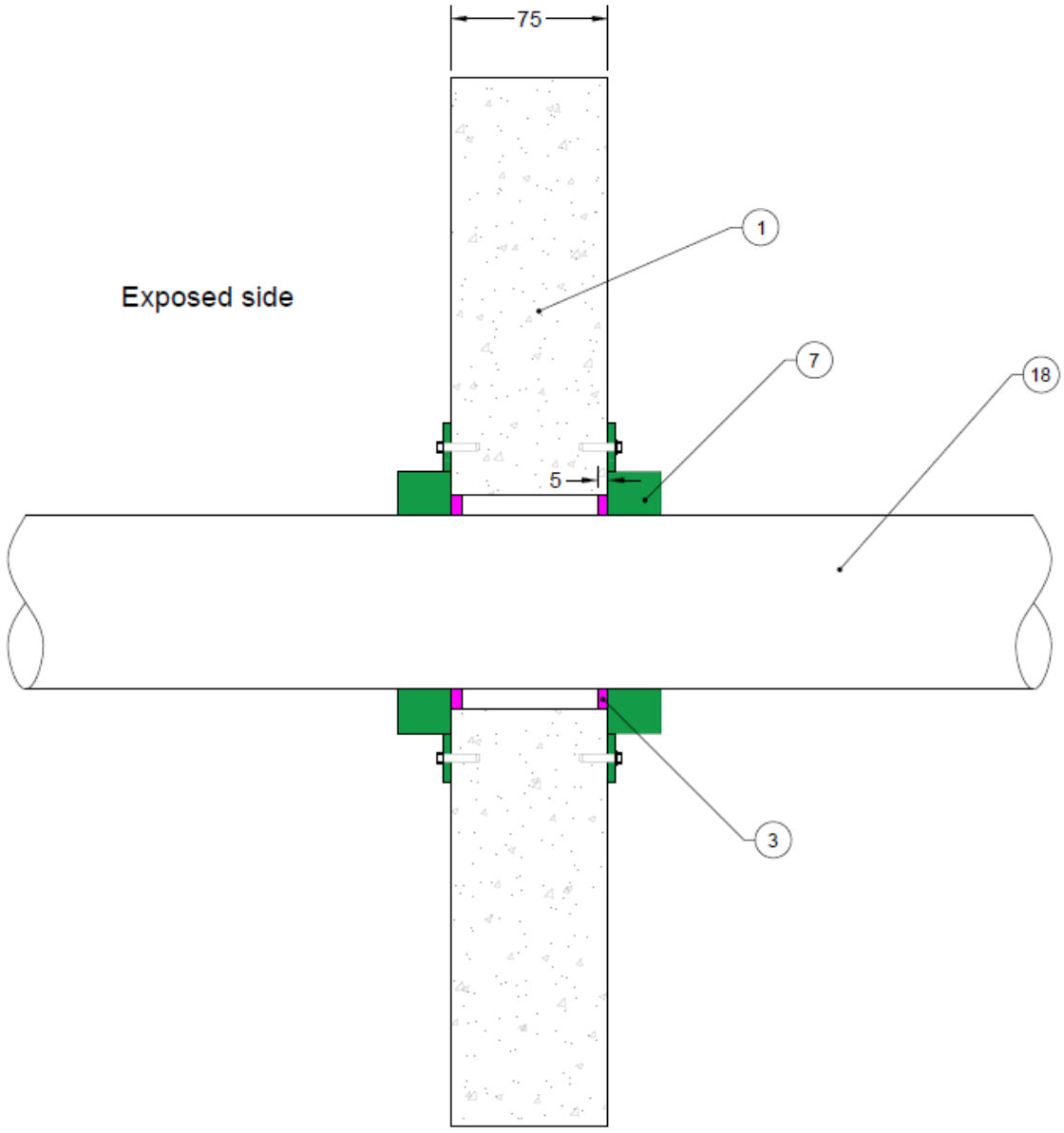


Figure 12 Cross-section of specimen G

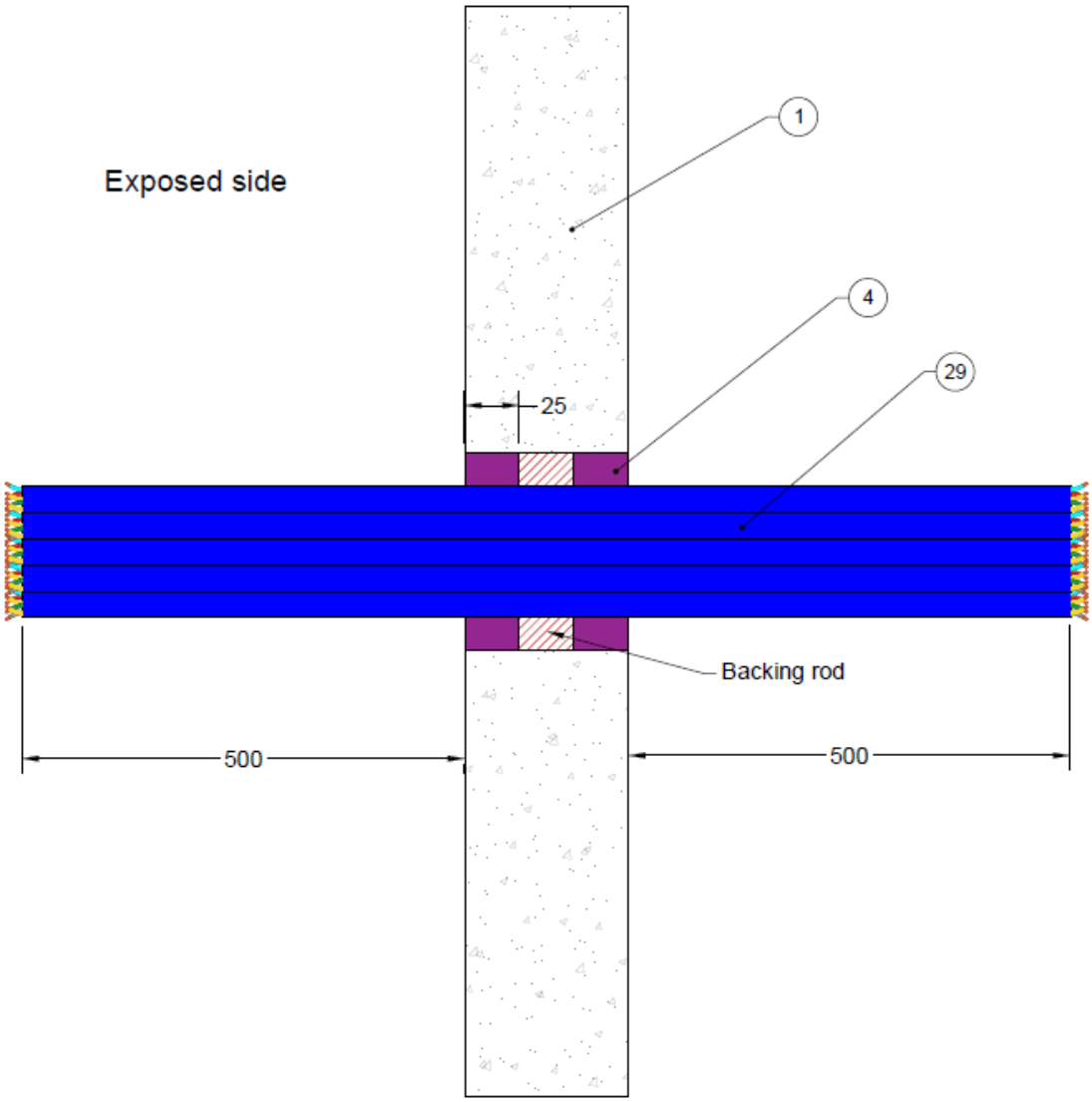


Figure 13 Cross-section of specimen H

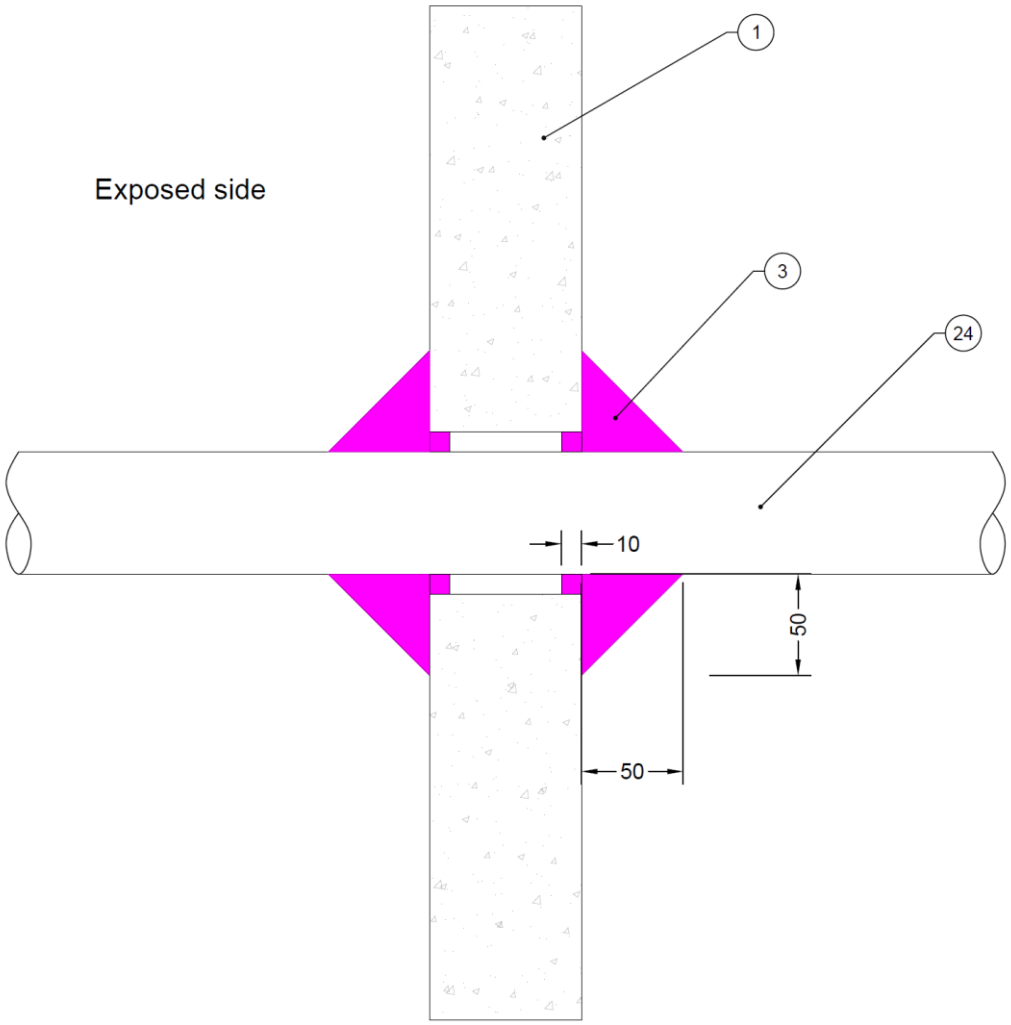


Figure 14 Cross-section of specimen I

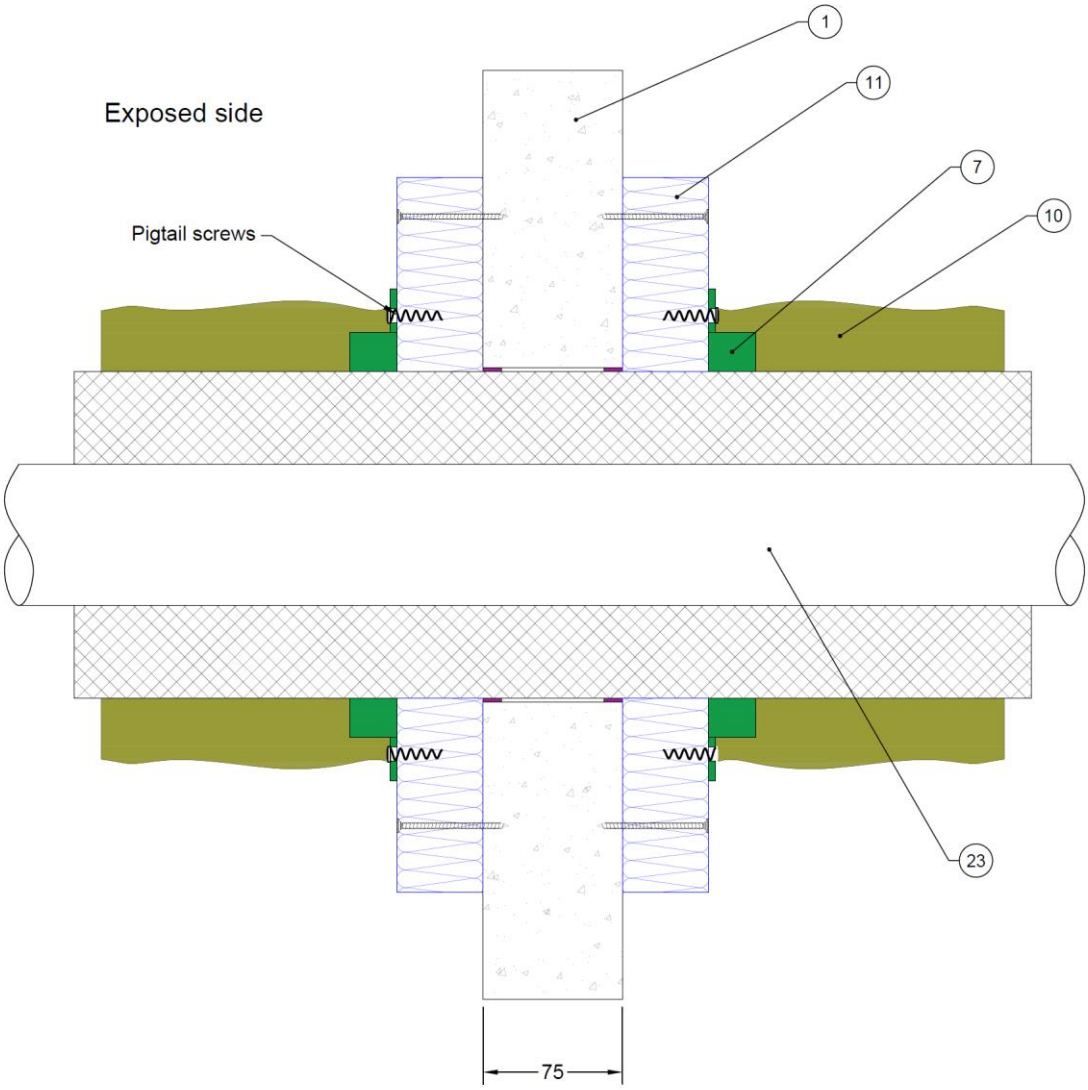


Figure 15 Cross-section of specimen J

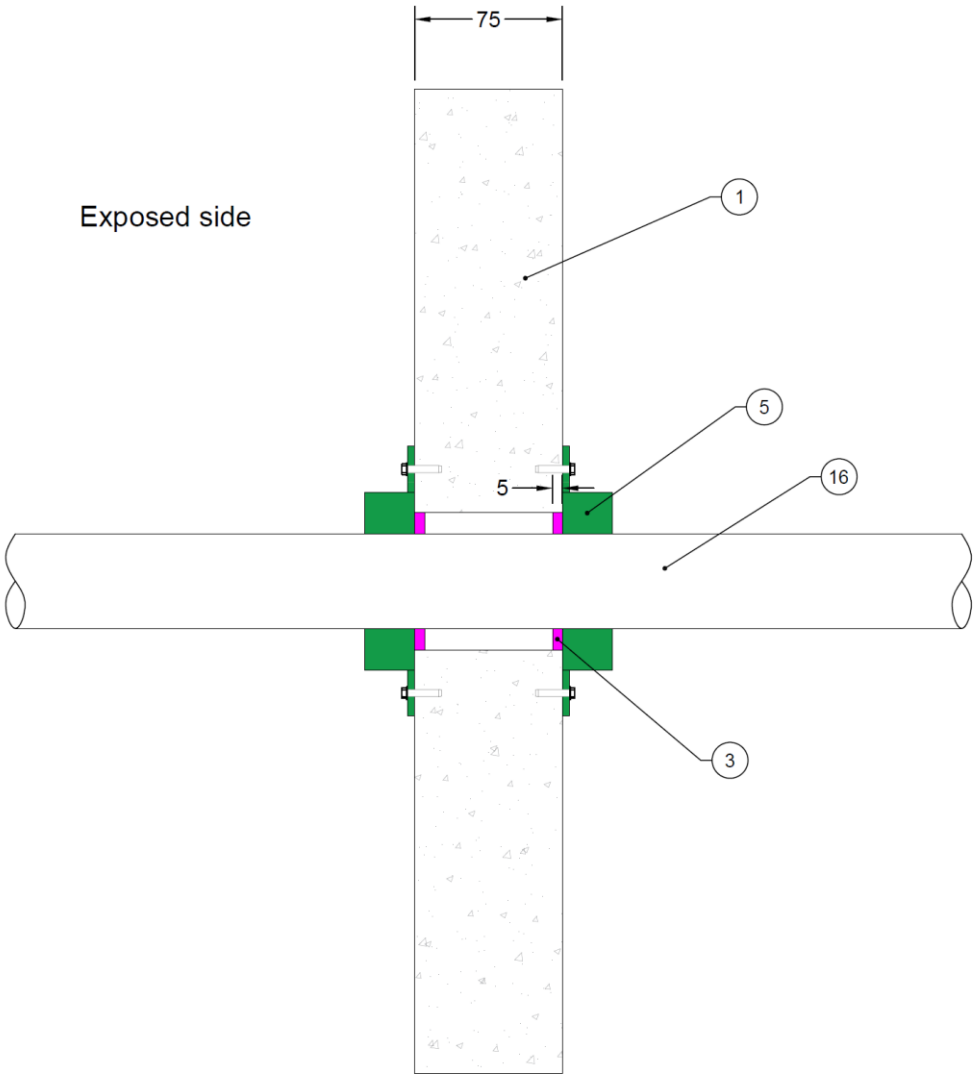


Figure 16 Cross-section of specimen K

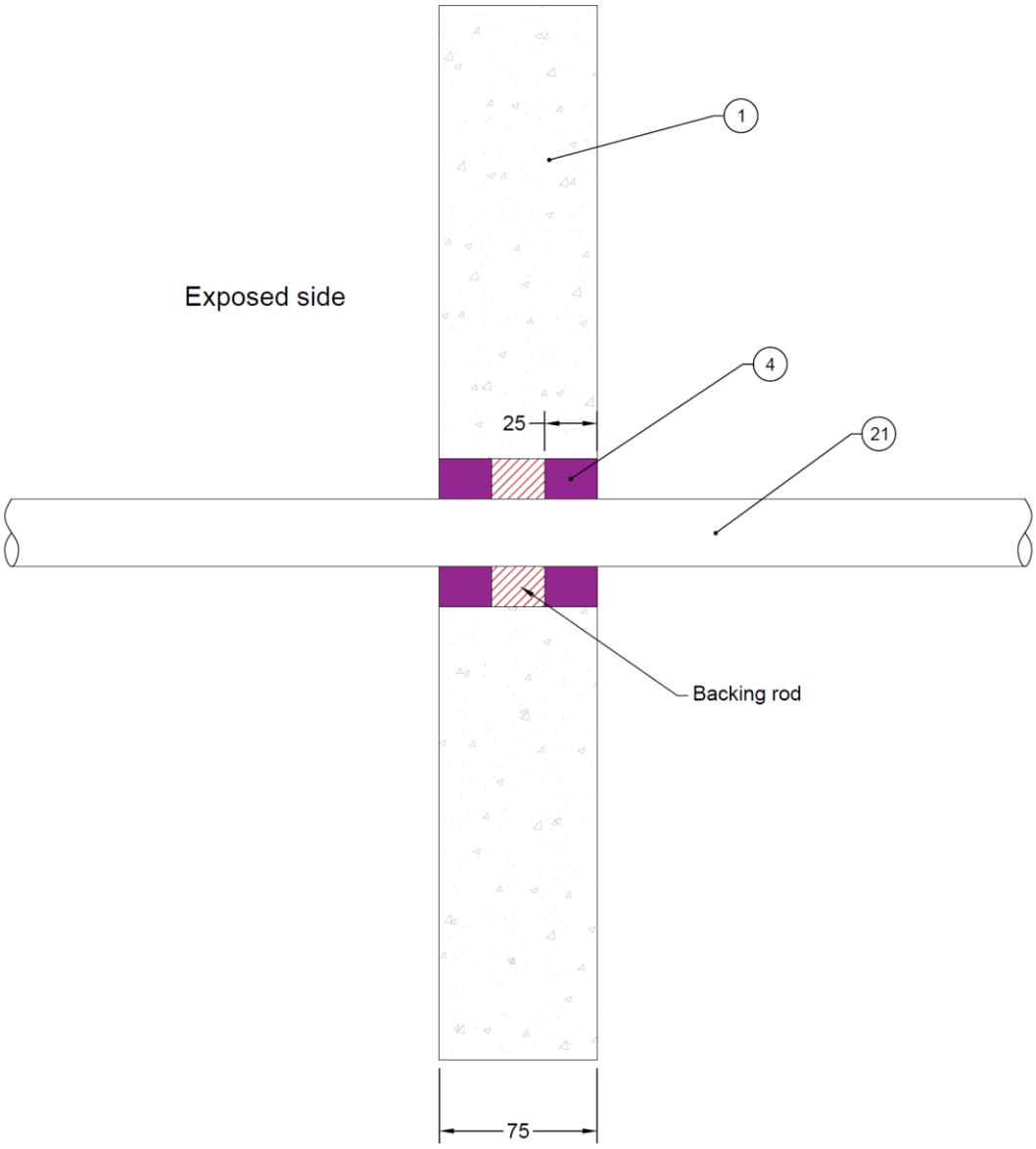


Figure 17 Cross-section of specimen L

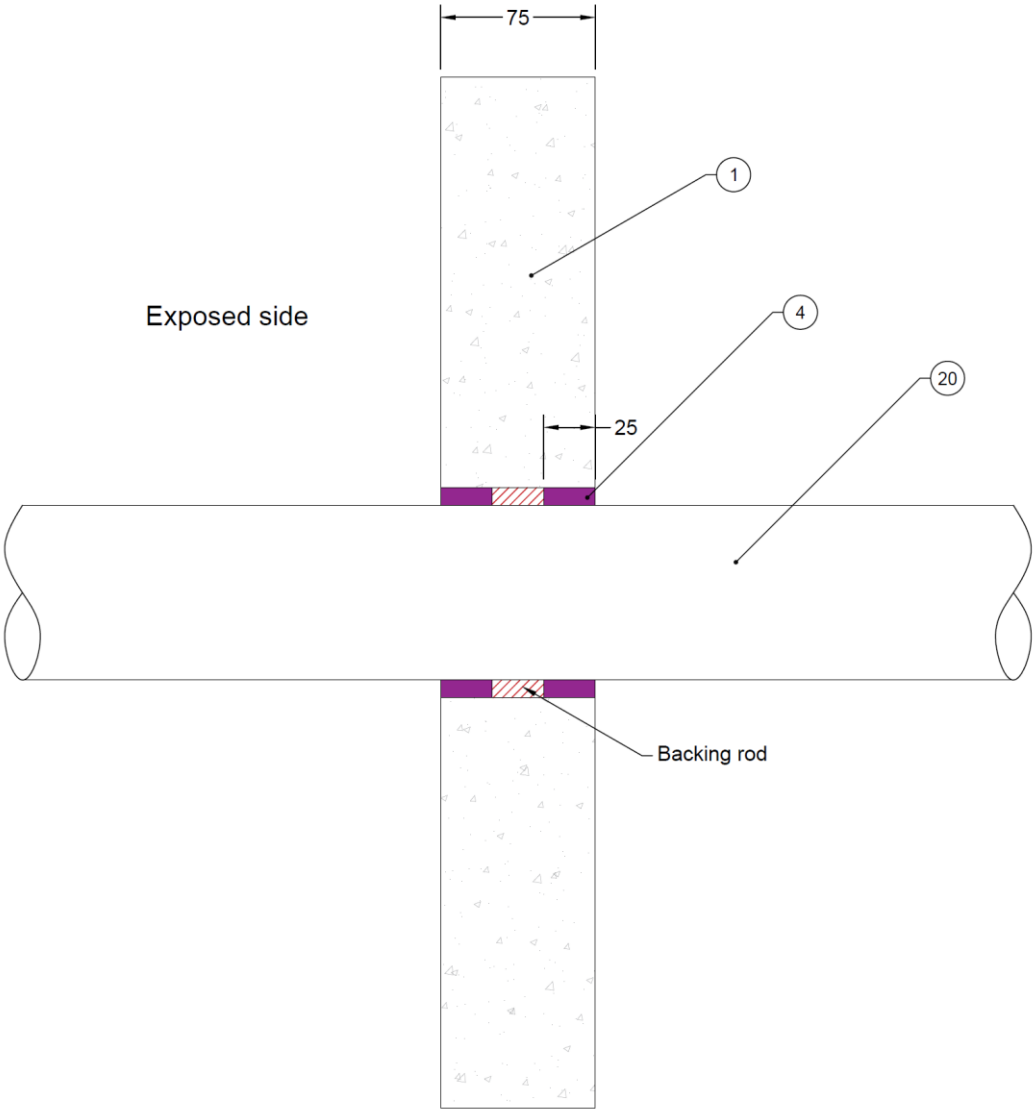


Figure 18 Cross-section of specimen M

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 commenced and the initial temperature of the specimen was approximately 20°C.
02	46	Smoke emission appeared between the cables.
08	20	Smoke venting at the end of the pipe.
30	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
42	40	The mastic seal had expanded, and the bundle of cables had been pushed out by the mastic.
44	03	The expanded mastic was falling out from the wall system. The mastic seal expansion had advanced.
60	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
68	**10**	**TC 011 on the wall recorded a temperature of 200°C. Failure of insulation in accordance with AS 1530.4:2014 clause 2.13.3(b), where the maximum temperature of Thermocouple TC 011 had exceeded the initial temperature by more than 180°C.**
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 B		
00	00	Fire resistance test commenced and the initial temperature of the specimen was approximately 19°C.
00	32	Smoke emission appeared between the pipes.
20	52	Discolouration appeared on the wall around the service.
21	48	Smoke emission appeared between the separating element and service.
30	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
33	**00**	**TC 021 on the bundle of cables recorded a temperature of 200°C. Failure of insulation in accordance with AS 1530.4:2014 clause 2.13.3(b), where the maximum temperature of Thermocouple TC 021 had exceeded the initial temperature by more than 180°C.**
34	12	Smoke continuously emitting from the gap between the service and the protection.
46	45	The intumescent inside the box had expanded and some of the expanded intumescent appeared outside the box.
60	60	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.
108	18	Smoke venting appeared from the end of the pipe.
120	00	The specimen had continued to maintain integrity in accordance with AS 1530.4:2014.

Time		Observation
Min	Sec	
121	00	Test stopped at the request of the sponsor.
Penetration system C		
00	00	Fire resistance test commenced and the initial temperature of the specimen was approximately 20°C.
00	35	Smoke emission appeared between the cables.
03	09	Smoke venting appeared from the end of the pipe.
03	28	Intermittent venting appeared from the end of the pipe.
04	49	The pipe had deformed.
06	10	Smoke emission appeared around the collar.
07	**15**	**TC 037 on the top of the pipe recorded a temperature of 200°C. Failure of insulation in accordance with AS 1530.4:2014 clause 2.13.3(b), where the maximum temperature of Thermocouple TC 037 had exceeded the initial temperature by more than 180°C.**
08	20	Smoke venting at the end of the pipe.
10	11	Crack and holes appeared on the pipe near the collar.
11	40	The pipe had deformed.
20	52	Discolouration appeared on the wall around the service.
21	48	Smoke emission appeared between the separating element and service.
30	00	The specimen had continued to maintain integrity in accordance with AS 1530.4:2014.
34	12	Smoke continuous emitting from the wall opening.
41	13	The expanded intumescent was pushing the pipe toward the unexposed side.
60	60	The specimen had continued to maintain integrity in accordance with AS 1530.4:2014.
83	14	Crack appeared on the wall system between specimen C ,D & J.
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 D		
00	00	Fire resistance test commenced and the initial temperature of the specimen was approximately 19°C.
01	19	Smoke emission appeared between the cables.
05	52	Large volume of smoke emission appeared between the cables.
08	20	Smoke venting at the end of the pipe.
09	11	Fluid was dripping from the end of the cables.
20	52	Discolouration appeared on the war around the service.
21	48	Smoke emission appeared between the separating element and service.
30	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
34	12	Smoke continuous emitting from the gap between the service and the protection.

Time		Observation
Min	Sec	
58	**55**	**TC 048 on the bundle of cables recorded a temperature of 200°C. Failure of insulation in accordance with AS 1530.4:2014 clause 2.13.3(b), where the maximum temperature of Thermocouple TC 048 exceeded the initial temperature by more than 180°C.**
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 commenced and the initial temperature of the specimen was approximately 20°C.
05	51	Smoke venting appeared from the end of the pipe.
08	20	Smoke venting at the end of the pipe.
19	57	Yellow colour smoke venting from the pipe.
22	11	Slightly deformation appeared on the pipe near the wall.
22	11	Smoke emission appeared around the pipe.
25	13	Small hole formed near the TC 101.
30	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
34	12	Smoke continuous venting from the end of the pipe.
35	32	Fluid was dripping from the end of the pipes.
48	01	The expanded mastic was detaching from the top side of the wall and the gap visible between the wall and the mastic seal.
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.
113	**00**	**TC 057 on the wall recorded a temperature of 200°C. Failure of insulation in accordance with AS 1530.4:2014 clause 2.13.3(b), where the maximum temperature of Thermocouple TC 057 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 F		
00	00	Fire resistance test commenced and the initial temperature of the specimen was approximately 20°C.
03	09	Smoke venting appeared from the end of the pipe.
03	28	Intermittent venting appeared from the end of the pipe.
04	49	The pipe had deformed.
08	20	Smoke venting at the end of the pipe.
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.

Time		Observation
Min	Sec	
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 G		
00	00	Fire resistance test commenced and the initial temperature of the specimen was approximately 20°C.
03	09	Smoke venting appeared from the end of the pipe.
08	20	Smoke venting at the end of the pipe.
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 commenced and the initial temperature of the specimen was approximately 20°C.
08	20	Smoke venting at the end of the pipe.
30	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
38	56	Intumescent was pushed out from the opening of the collar.
60	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014.
69	**30**	**TC 118 on the wall recorded a temperature of 200°C. Failure of insulation in accordance with AS 1530.4:2014 clause 2.13.3(b), where the maximum temperature of Thermocouple TC 118 had exceeded the initial temperature by more than 180°C.**
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 commenced and the initial temperature of the specimen was approximately 19°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.

Time		Observation
Min	Sec	
106	**45**	**TC 127 on the pipe recorded a temperature of 199°C. Failure of insulation in accordance with AS 1530.4:2014 clause 2.13.3(b), where the maximum temperature of Thermocouple TC 127 had exceeded the initial temperature by more than 180°C.**
108	18	Smoke venting appeared from the end of the pipe.
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 J		
00	00	Fire resistance test commenced and the initial temperature of the specimen was approximately 20°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.
91	04	Smoke emission appeared from the opening between the top side of the pipe and the lagging.
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 K		
00	00	Fire resistance test commenced and the initial temperature of the specimen was approximately 20°C.
04	07	Smoke venting appeared from the end of the pipe.
08	20	Smoke venting at the end of the pipe.
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.
106	**50**	**TC 143 on the wall recorded a temperature of 200°C. Failure of insulation in accordance with AS 1530.4:2014 clause 2.13.3(b), where the maximum temperature of Thermocouple TC 143 had 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 L		
00	00	Fire resistance test commenced and the initial temperature of the specimen was approximately 20°C.
06	28	Smoke venting from the end of the pipe.
08	20	Smoke venting at the end of the pipe.
13	**25**	**TC 152 on the pipe recorded a temperature of 201°C. Failure of insulation in accordance with AS 1530.4:2014 clause 2.13.3(b), where the maximum temperature of Thermocouple TC 152 had exceeded the initial temperature by more than 180°C.**

Time		Observation
Min	Sec	
30	00	The specimen had continued to maintain integrity in accordance with AS 1530.4:2014.
34	12	Smoke continuous venting from the end of the pipe.
50	00	The expanded mastic appeared from the opening.
60	60	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 M		
00	00	Fire resistance test commenced and the initial temperature of the specimen was approximately 20°C.
04	58	Intermittent venting appeared from the end of the pipe.
08	20	Smoke venting at the end of the pipe.
13	**45**	**TC 158 on the pipe recorded a temperature of 201°C. Failure of insulation in accordance with AS 1530.4:2014 clause 2.13.3(b), where the maximum temperature of Thermocouple TC 158 had exceeded the initial temperature by more than 180°C.**
13	50	Holes appeared on the pipe near the wall.
14	10	A 30 second cotton pad test was carried out in accordance with AS 1530.4:2014. No glowing or flaming had become evident.
16	00	A 30 second cotton pad test was carried out in accordance with AS 1530.4:2014. No glowing or flaming had become evident.
20	52	Discolouration appeared on the wall around the service.
21	48	Smoke emission appeared between the separating element and service.
30	00	The specimen had continued to maintain integrity in accordance with AS 1530.4:2014.
60	60	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.

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.

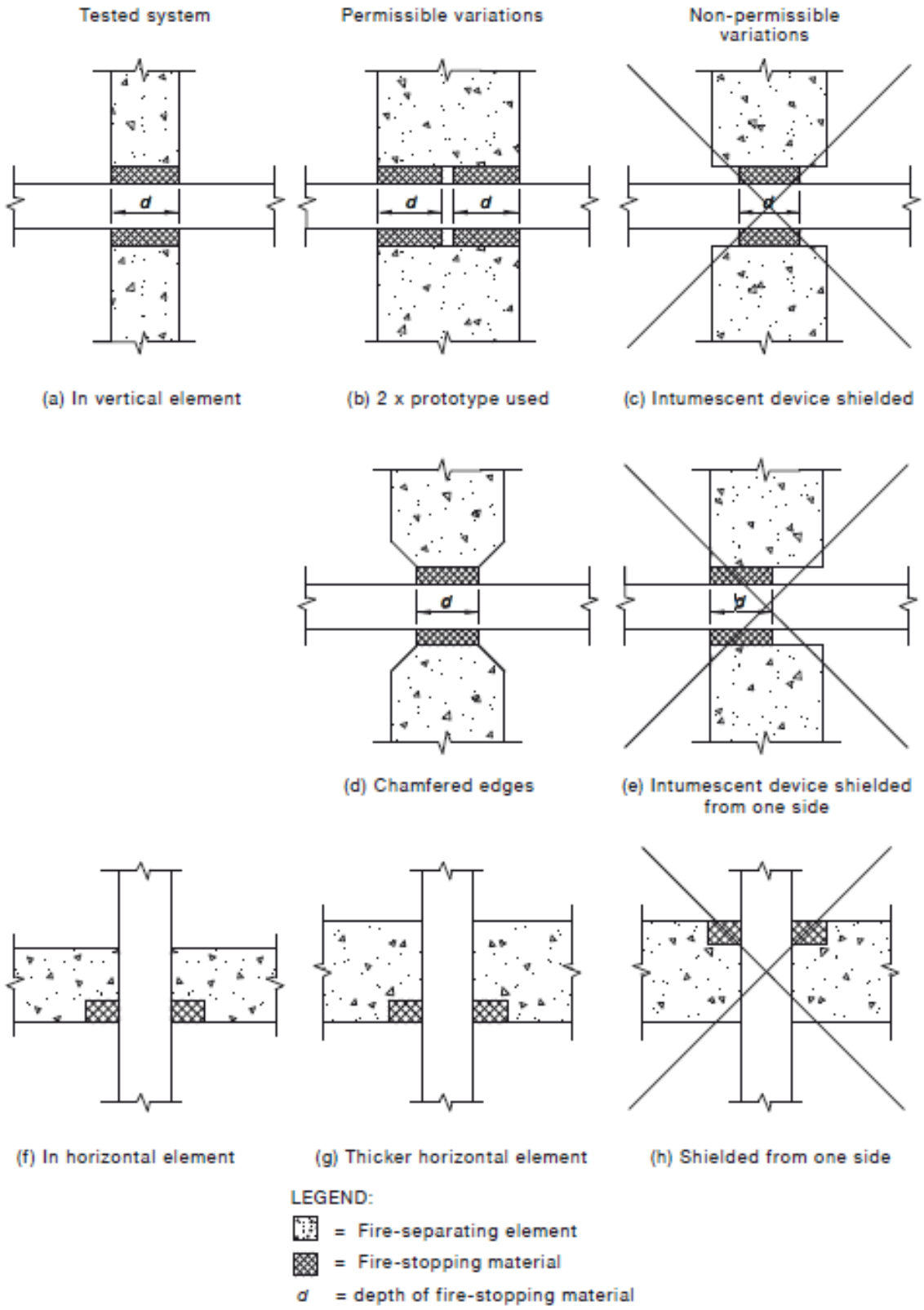
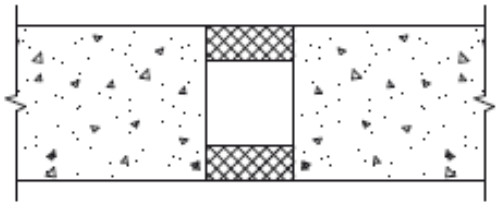
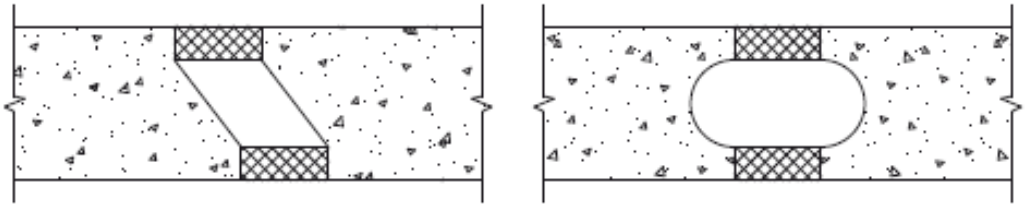


FIGURE 10.12.5.1 EQUIVALENT EXPOSURE OF UPVC PIPE FIRE-STOPPING SYSTEMS



(a) Butt joint



(b) Contoured joints

LEGEND:

= Fire-separating element

= Fire-stopping material

FIGURE 10.12.6 CONTOURED CONTROL JOINTS