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Regulatory information report

Various pipes and cables services protected by BOSS protection systems in a plasterboard wall system

Test sponsor: BOSS Products (Australia) Pty Ltd

Address: Unit 8/ 15-23 Kumulla Road
Caringbah, NSW, 2229
Australia

Job number: RIR FRT190033 Author: Patrick Chan

Test Date: 6 August 2018 Revision: R1.0

Amendment schedule

Version	Date	Information relating to report			
R1.0	27/02/2019	Description	Initial issue		
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General conditions of use

Executive summary

Objective

To evaluate the fire resistance of various pipes and cables services subjected to a test in accordance with AS 1530.4:2014 Section 2 & 10.

Sponsor

BOSS Products (Australia) Pty Ltd , Unit 8/ 15-23 Kumulla Road, Caringbah, NSW, 2229, Australia

Summary of tested specimen

The test specimen comprised a 92mm thick steel frame system clad with two layers of 13mm USG Boral Firestop plasterboard on both exposed and unexposed side. The wall cavity was filled with Fletcher Insulation Pink Partition 14 R2.2 insulation.

There was 20mm gap between the test frame and the top edge of the plasterboard, 15mm gap between the test frame and the vertical edge of the plasterboard and 10mm gap between the test frame and the bottom edge of the plasterboard. The gaps were protected by BOSS FM300 sealant.

The wall system was penetrated by 12-off various pipe services and 1-off cable services. The pipe and cable services were protected by various fire protection systems. The test assembly is summarised in the table blow.

System	Service	Local fire-stopping protection	Secondary Fire protection	No. of Service	Service Size (mm)	Aperture size (mm)
A	PEX/AL/PEX	FireMastic-HPE	None	1	Ø25	65
B	PEX pipe	FireMastic-HPE	None	1	Ø 25	65
C	PEX pipe	BOSS 32mm MaxiCollar™	FireMastic-HPE	1	Ø 25	32
D	CPVC pipe	FireMastic-HPE	None	1	Ø 50	90
E	PEX pipe	FireMastic-HPE	None	1	Ø 32	72
F	uPVC pipe	FireMastic-HPE	None	1	Ø 40	80
G	uPVC pipe	FireMastic-HPE	None	1	Ø 50	90
H	Galvanised pipe	BOSS FM300	None	1	Ø34	42
I	TPS cables	BOSS FM300	None	7	12 × 5.6	30
J	uPVC pipe	FireMastic-HPE	None	1	Ø80	120
K	uPVC pipe	BOSS 100mm MaxiCollar™	None	1	Ø100	110
L	PP-R pipe	FireMastic-HPE	None	1	Ø63	103
M	PP-R pipe	FireMastic-HPE	None	1	Ø50	90

The specimen was tested against the performance criteria for service penetrations and control joint specified in AS 1530.4:2014 Section 2 & 10.

Test results

The penetration systems/ control joints satisfied the performance requirements specified in AS 1530.4:2014 for the periods stated below:

- Penetration system A
  - FRL (Fire Resistance Level): -/120/30
- Penetration system B
  - FRL (Fire Resistance Level): -/120/120
- Penetration system C
  - FRL (Fire Resistance Level): -/120/60
- Penetration system D
  - FRL (Fire Resistance Level): -/120/60
- Penetration system E
  - FRL (Fire Resistance Level): -/120/0
- Penetration system F
  - FRL (Fire Resistance Level): -/120/120
- Penetration system G
  - FRL (Fire Resistance Level): -/120/120
- Penetration system H
  - FRL (Fire Resistance Level): -/120/120
- Penetration system I
  - FRL (Fire Resistance Level): -/120/120
- Penetration system J
  - FRL (Fire Resistance Level): -/90/90
- Penetration system K
  - FRL (Fire Resistance Level): -/120/120
- Penetration system L
  - FRL (Fire Resistance Level): -/120/0
- Penetration system M
  - FRL (Fire Resistance Level): -/120/0

Date of test

6 August 2018

Contents

1. Construction details

1.1 Test assembly

The test assembly comprised a nominal 1600mm wide × 1600mm high × 144mm thick USG Boral Firestop wall system with Fletcher Insulation Pink Partition 14 R2.2 insulation in the wall cavity.

The wall was restrained along both vertical and horizontal edges.

1.2 Test specimen

The test specimen comprised a 92mm thick steel frame system clad with two layers of 13mm USG Boral Firestop plasterboard on both exposed and unexposed side. The wall cavity was filled with Fletcher Insulation Pink Partition 14 R2.2 insulation.

There was 20mm gap between the test frame and the top edge of the plasterboard, 15mm gap between the test frame and the vertical edge of the plasterboard and 10mm gap between the test frame and the bottom edge of the plasterboard. The gaps were protected by BOSS FM300 sealant.

The wall system was penetrated by 12-off various pipe services and 1-off cable services. The pipe and cable services were protected by various fire protection systems. The test assembly is summarised in the table blow.

The test assembly is summarised in Table 1 below.

A full description of the specimen is provided in Section 2.

System	Service	Local fire-stopping protection	Secondary Fire protection	No. of Service	Service Size (mm)	Aperture size (mm)
A	PEX/AL/PEX	FireMastic-HPE	None	1	Ø25	65
B	PEX pipe	FireMastic-HPE	None	1	Ø 25	65
C	PEX pipe	BOSS 32mm MaxiCollar™	FireMastic-HPE	1	Ø 25	32
D	CPVC pipe	FireMastic-HPE	None	1	Ø 50	90
E	PEX pipe	FireMastic-HPE	None	1	Ø 32	72
F	uPVC pipe	FireMastic-HPE	None	1	Ø 40	80
G	uPVC pipe	FireMastic-HPE	None	1	Ø 50	90
H	Galvanised pipe	BOSS FM300	None	1	Ø34	42
I	TPS cables	BOSS FM300	None	7	12 × 5.6	30
J	uPVC pipe	FireMastic-HPE	None	1	Ø80	120
K	uPVC pipe	BOSS 100mm MaxiCollar™	None	1	Ø100	110
L	PP-R pipe	FireMastic-HPE	None	1	Ø63	103
M	PP-R pipe	FireMastic-HPE	None	1	Ø50	90

Table 1 Test assembly

1.3 Assembly and installation methods

The services and fire-stopping protections were installed on 28 May 2018 and completed on 30 July 2019 by representatives of the test sponsor.

1.4 Orientation

The wall system was asymmetrical, due to the services supports were installed on the unexposed side only.

2. Schedule of components

Item		Description
Separating element		
1.	Item name	13mm fire rated plasterboard
	Product name	USG Boral Firestop plasterboard
	Density	923kg/m^3 (measured)
	Installation	2 layers of 13mm fire rated plasterboard on both the exposed and unexposed side using 6g× 45mm long self-drilling, bugle head, plasterboard screws at 200mm centres.
2.	Item name	92mm steel frame
	Size	1600mm wide × 1600mm high
	Installation	The steel frame was secured to the concrete brickwork and lintel with 6.5mm masonry anchors. The masonry anchors were installed at middle of the tracks and 30mm in from either end of the tracks.
3.	Item name	Insulation wool
	Product name	Fletcher Insulation Pink Partition 14 R2.2 insulation
	Density	44.4kg/m^3 (measured)
	Installation	The cavity in the wall steel frame system was filled with Fletcher Insulation Pink Partition 14 R2.2 Glasswool Batt insulation.
SE	Size	1600mm wide × 1600mm high × 144mm thick
	Installation	The wall system comprised of 92mm thick steel framing. The wall system was clad with two layers of 13mm fire rated plasterboard (USG Boral Firestop) on both the exposed and unexposed side There was a 20mm gap between the top edge of the plasterboard and the concrete lintel. There were a 15mm gap on both vertical edge between the plasterboard and the concrete blockwork. There was a 10mm gap between the bottom edge of the plasterboard and the concrete sill. The gaps between the perimeter of the wall system and the block lintel/blockwork/sill were filled with BOSS FireMastic 300.
Fire-stopping protections		
Sealant		
4.	Product name	BOSS FireMastic-HPE
	Installation	BOSS FireMastic-HPE was inserted into the annular gap at 26mm depth (thickness of the plasterboards) between the service and the wall on both exposed and unexposed side. BOSS FireMastic-HPE was installed into the aperture between the service and collar on both the exposed and the unexposed sides.
5.	Product name	BOSS FireMastic-300
	Installation	BOSS FireMastic-300 was inserted into the annular gap at 26mm depth (thickness of the plasterboards) and finish off with a 50mm fillet on both exposed and unexposed side of the galvanised pipe penetration service. BOSS FireMastic-300 was inserted into the annular gap at 26mm depth (thickness of the plasterboards) and finish off with a 30mm fillet on both exposed and unexposed side of the Bundle of TPS cable penetration service. BOSS FireMastic-300 was installed at the wall edges between blockwork and plasterboard.

Item		Description
Fire-collar		
6.	Product name	BOSS 32mm MaxiCollar™ Collar
	Collar details	Outer diameter (OD): Ø47mm Inner diameter (ID): Ø35mm Height (h): 31.6mm Outer shell thickness (t): 1mm Mounting bracket: 24mm × 15mm × 1mm No. of mounting brackets: 3
	Intumescent details	Number of layers: 2 Density: 1121kg/m^3 (measured)
	Installation	The collars were installed on both the exposed and the unexposed side of the wall system with three-off 6g self-drilling, bugle head, 45mm plasterboard screws.
7.	Product name	BOSS 100mm MaxiCollar™ Collar
	Collar details	Outer diameter (OD): Ø136mm Inner diameter (ID): Ø114.8mm Height (h): 31.6mm Outer shell thickness (t): 1mm Mounting bracket: 24mm × 15mm × 1mm No. of mounting brackets: 3
	Intumescent details	Number of layers:5 Density: 1121kg/m^3 (measured)
	Installation	The collars were installed on both the exposed and the unexposed side of the wall system with three-off 6g self-drilling, bugle head, 45mm plasterboard screws.
Services		
8.	Item name	25mm PEX-AL-PEX pipe
	Product name	VelPEX: Gas AS 4176:8 LIC # Watermark AM174520 DN25×2.5 Class 500 PEX-Al-PEX
	Size	Outer diameter (OD): Ø24.6mm Inner diameter (ID): Ø19.3mm Thickness (t): 2.7mm
9.	Item name	25mm PEX pipe
	Product name	AusPEX. DN25 PN16 SDR9 PE-xb 80 AS/NZS 2492 RWC DSIA. LN 2058
	Size	Outer diameter (OD): Ø25.2mm Inner diameter (ID): Ø19.0mm Thickness (t): 3.1mm
10.	Item name	32mm PEX pipe
	Product name	Water Pex Australia. Rifeng Watermark WMKAO21344 DN20 32 × 3.0 PN 12.5 SDR 11 PE-xb 80
	Size	Outer diameter (OD): Ø32.5mm Inner diameter (ID): Ø26.0mm Thickness (t): 3.3mm
11.	**Item Name**	50mm PP-R pipe
	Product	Aquatherm green pipe SDR11 s 50×4.6 mm PP-R

Item		Description
	Size	Outer diameter (OD): Ø50.6mm Inner diameter (ID): Ø39.9mm Thickness (t): 5.4mm
12.	**Item Name**	63mm PP-R pipe
	Product	Aquatherm green pipe SDR11 s 63×5.8 PP-R
	Size	Outer diameter (OD): Ø63.5mm Inner diameter (ID): Ø50.5mm Thickness (t): 6.5mm
13.	**Item Name**	50mm CPVC pipe
	Product	753-TFP 2” (50mm) SDR 13.5 WP 175 PSI 150F(65°C) Listed 67CN CPVC SPRINKLER PIPE 4120-06 TFP 331711132112 F-442 320PSI @ 73F 100PSI @ 180F. MEA 185-02-E
	Size	Outer diameter (OD): Ø60.2mm Inner diameter (ID): Ø50.1mm Thickness (t): 5.1mm
14.	**Item Name**	40mm uPVC pipe
	Product	Pipe King BEP PVC 40 DWV PVCU AS/NZS 1260
	Size	Outer diameter (OD): Ø42.4mm Inner diameter (ID): Ø37.4mm Thickness (t): 2.5mm
15.	**Item Name**	50mm uPVC pipe
	Product	Vinidex Quality BEP PVC DWV 50 PVCU LIC No 1010 AS/NZS 1260 SL15
	Size	Outer diameter (OD): Ø55.8mm Inner diameter (ID): Ø50.5mm Thickness (t): 2.7mm
16.	**Item Name**	80mm uPVC pipe
	Product	Vinidex Quality BEP PVC DWV 80 PVCU LIC No 1010 AS/NZS 1260 SL15
	Size	Outer diameter (OD): Ø82.0mm Inner diameter (ID): Ø75.6mm Thickness (t): 3.2mm
17.	**Item Name**	100mm uPVC pipe (Sandwich type)
	Product	Vinidex BEP PVC DWV 100 PVC-U SC SN6 Lic No. 1079 AS/NZS 1260 UL01
	Size	Outer diameter (OD): Ø110.8mm Inner diameter (ID): Ø104.5mm Thickness (t): 3.2mm
18.	**Item Name**	TPS cable
	Product	Advance cable 2.5mm2 Cu 2×Core + Earth 450/750V V90/3V90
	Size	12mm × 5.6mm
19.	**Item name**	Galvanised pipe
	Product	Sprinkler pipe
	Size	Outer diameter (OD): Ø33.9mm Inner diameter (ID): Ø26.9mm

Item		Description
		Thickness (t): 3.5mm NB: 25
Penetration system A		
A	Service	Pipe
	Service detail	25mm PEX-AL-PEX pipe
	Service support	The pipe protruded 500mm from the exposed side and 2000mm from the unexposed side of the wall system. The pipe was supported at 500mm and 1500mm away from the unexposed side of the wall system.
	Aperture size	Ø65mm
	Annular gap	20mm
	Installation	The pipe was sealed on the exposed side only
	Local fire-stopping protection	
	Product Name	BOSS FireMastic-HPE
	Mastic depth	26mm (full depth of the plasterboard)
	Installation	The annular gap between the wall and the pipe was filled up with BOSS FireMastic-HPE to depth of the plasterboard on both the exposed and the unexposed side. The mastic was flush finished to the surface of the wall.
Penetration system B		
B	Service	Pipe
	Service detail	25mm PEX pipe
	Service support	The pipe protruded 500mm from the exposed side and 2000mm from the unexposed side of the wall system. The pipe was supported at 500mm and 1500mm away from the unexposed side of the wall system
	Aperture size	Ø65mm
	Annular gap	20mm
	Installation	The pipe was sealed on the exposed side only.
	Local fire-stopping protection	
	Protection	BOSS FireMastic-HPE
	Mastic depth	26mm (full depth of the plasterboard)
	Installation	The annular gap between the wall and the pipe was filled up with BOSS FireMastic-HPE to depth of the plasterboard on both the exposed and the unexposed side. The mastic was flush finished to the surface of the wall.
Penetration system C		
C	Service	Pipe
	Service detail	25mm PEX pipe
	Service support	The pipe protruded 500mm from the exposed side and 2000mm from the unexposed side of the wall system. The pipe was supported at 500mm and 1500mm away from the unexposed side of the wall system
	Aperture size	Ø32mm
	Annular gap	3.5mm
	Installation	The pipe was sealed on the exposed side only
	Local fire-stopping protection	
	Protection	BOSS 32mm MaxiCollar™ BOSS FireMastic-HPE

Item		Description
	Mastic depth	25mm (full depth of the collar)
	Installation	The Maxi collar was installed on both the exposed side and the unexposed side of the wall system. The MaxiCollar™ was fixed to the wall with 3-off 6g × 45mm long bugle head needle point screws. The gap between the collar and the pipe was filled up with BOSS FireMastic-HPE on both the exposed and the unexposed side.
Penetration system D		
D	Service	Pipe
	Service detail	50mm CPVC pipe
	Service support	The pipe protruded 500mm from the exposed side and 2000mm from the unexposed side of the wall system. The pipe was supported at 500mm and 1500mm away from the unexposed side of the wall system.
	Aperture size	Ø90mm
	Annular gap	15mm
	Installation	The pipe was sealed on the exposed side only.
	Local fire-stopping protection	
	Protection	BOSS FireMastic-HPE
	Mastic depth	26mm (full depth of the plasterboard)
	Installation	The annular gap between the wall and the pipe was filled up with BOSS FireMastic-HPE on both the exposed and the unexposed side. The mastic was flushed to the surface of the wall and down to 26mm depth.
Penetration system E		
E	Service	Pipe
	Service detail	32mm PEX pipe
	Service support	The pipe protruded 500mm from the exposed side and 2000mm from the unexposed side of the wall system. The pipe was supported at 500mm and 1500mm away from the unexposed side of the wall system.
	Aperture size	Ø72mm
	Annular gap	20mm
	Installation	The pipe was sealed on the exposed side only.
	Local fire-stopping protection	
	Protection	BOSS FireMastic-HPE
	Mastic depth	26mm (full depth of the plasterboard)
	Installation	The annular gap between the wall and the pipe was filled up with BOSS FireMastic-HPE to depth of the plasterboard on both the exposed and the unexposed side. The mastic was flush finished to the surface of the wall.
Penetration system F		
F	Service	Pipe
	Service detail	40mm uPVC pipe
	Service support	The pipe protruded 500mm from the exposed side and 2000mm from the unexposed side of the wall system. The pipe was supported at 500mm and 1500mm away from the unexposed side of the wall system.
	Aperture size	Ø80mm
	Annular gap	19mm
	Installation	The pipe was sealed on the exposed side only.

Item	Description	
	Local fire-stopping protection	
	Protection	BOSS FireMastic-HPE
	Mastic depth	26mm (full depth of the plasterboard)
	Installation	The annular gap between the wall and the pipe was filled up with BOSS FireMastic-HPE to depth of the plasterboard on both the exposed and the unexposed side. The mastic was flush finished to the surface of the wall.
Penetration system G		
G	Service	Pipe
	Service detail	50mm uPVC pipe
	Service support	The pipe protruded 500mm from the exposed side and 2000mm from the unexposed side of the wall system. The pipe was supported at 500mm and 1500mm away from the unexposed side of the wall system.
	Aperture size	Ø90mm
	Annular gap	17mm
	Installation	The pipe was sealed on the exposed side only.
	Local fire-stopping protection	
	Protection	BOSS FireMastic-HPE
	Mastic depth	26mm (full depth of the plasterboard)
	Installation	The annular gap between the wall and the pipe was filled up with BOSS FireMastic-HPE to depth of the plasterboard on both the exposed and the unexposed side. The mastic was flush finished to the surface of the wall.
Penetration system H		
H	Service	Pipe
	Service detail	Galvanised steel pipe
	Service support	The pipe protruded 500mm from the exposed side and 500mm from the unexposed side of the wall system. The pipe was supported at 500mm away from the unexposed side of the wall system.
	Aperture size	Ø42mm
	Annular gap	4mm
	Installation	The pipe was sealed on the exposed side only.
	Local fire-stopping protection	
	Protection	BOSS FireMastic 300
	Mastic depth	26mm (full depth of the plasterboard)
	Mastic fillet	50mm × 50mm cone
	Installation	The annular gap between the wall and the pipe was filled up with BOSS FireMastic 300 to 26mm depth and finished off with 50mm × 50mm fillet cone on both the exposed and the unexposed side.
Penetration system I		
I	Service	Cables
	Service detail	Bundle of TPS cable
	Service support	The bundle of cable protruded 500mm from the exposed side and 500mm from the unexposed side of the wall system. The bundle of cables was supported at 500mm away from the unexposed side of the wall system.
	Core hole size	Ø30mm
	Annular gap	~3.5mm

Item	Description	
	Local fire-stopping protection	
	Protection	BOSS FireMastic 300
	Mastic depth	26mm (full depth of the plasterboard)
	Mastic fillet	30mm × 30mm cone
	Installation	The annular gap between the wall and the bundle of cables was filled up with BOSS FireMastic 300 at 26mm depth and finished off with 30mm × 30mm fillet cone on both the exposed and the unexposed side.
Penetration system J		
J	Service	Pipe
	Service detail	80mm uPVC pipe
	Service support	The pipe protruded 500mm from the exposed side and 2000mm from the unexposed side of the wall system. The pipe was supported at 500mm and 1500mm away from the unexposed side of the wall system.
	Core hole size	Ø120mm
	Annular gap	19mm
	Local fire-stopping protection	
	Product Name	BOSS FireMastic-HPE
	Mastic depth	26mm (full depth of the plasterboard)
	Installation	The annular gap between the wall and the pipe was filled up with BOSS FireMastic-HPE to depth of the plasterboard on both the exposed and the unexposed side. The mastic was flush finished to the surface of the wall.
Penetration system K		
K	Service	Pipe
	Service detail	100mm uPVC pipe
	Service support	The pipe protruded 500mm from the exposed side and 2000mm from the unexposed side of the wall system. The pipe was supported at 500mm and 1500mm away from the unexposed side of the wall system.
	Core hole size	Ø110mm
	Installation	The pipe was capped on the exposed side only
	Local fire-stopping protection	
	Product Name	BOSS 100mm MaxiCollar™
	Installation	The Maxi collar was installed on both the exposed side and the unexposed side of the wall system. The MaxiCollar™ was fixed to the wall with 4-off 6g×45mm long bugle head need point screws.
Penetration system L		
L	Service	Pipe
	Service detail	63mm PP-R pipe
	Service support	The pipe protruded 500mm from the exposed side and 2000mm from the unexposed side of the wall system. The pipe was supported at 500mm and 1500mm away from the unexposed side of the wall system.
	Core hole size	Ø103mm
	Annular gap	20mm
	Installation	The pipe was capped on the exposed side only.
	Local fire-stopping protection	
	Product Name	BOSS FireMastic-HPE

Item		Description
	Mastic depth	26mm (full depth of the plasterboard)
	Installation	The annular gap between the wall and the pipe was filled up with BOSS FireMastic-HPE on both the exposed and the unexposed side. The mastic was flushed to the surface of the wall and down to 26mm depth.
Penetration system M		
M	Service	Pipe
	Service detail	50mm PP-R pipe
	Service support	The pipe protruded 500mm from the exposed side and 2000mm from the unexposed side of the wall system. The pipe was supported at 500mm and 1500mm away from the unexposed side of the wall system.
	Core hole size	Ø90mm
	Annular gap	20mm
	Installation	The pipe was capped on the exposed side only.
	Penetration Protection	
	Product Name	BOSS FireMastic-HPE
	Mastic depth	26mm (full depth of the plasterboard)
	Installation	The annular gap between the wall and the pipe was filled up with BOSS FireMastic-HPE to depth of the plasterboard on both the exposed and the unexposed side. The mastic was flush finished to the surface of the wall.

Table 2 Schedule of components

3. Test procedure

3.1 Statement of compliance

The test was performed in accordance with the requirements of AS 1530.4:2014 Sections 2 & 10 appropriate for service penetrations and control joints

3.2 Variations to test method

None

3.3 Pre-test conditioning

The construction of the test specimen was completed on 30 July 2018. The test specimen was subjected to normal laboratory temperatures and conditions during this period.

3.4 Sampling/specimen selection

The laboratory was not involved in sampling or selecting the test specimen for the fire resistance test.

3.5 Ambient temperature

The ambient temperature of the laboratory at the start of the test was 14°C and varied between 14°C and 18°C during the test.

3.6 Test duration

The test duration was 121 minutes.

3.7 Instrumentation and equipment

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

- 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 × 2.0 mm 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 291mm above mid-height of the lowest penetration
- Cotton pads were available during the test to assess the performance under the criteria for integrity.

4. Test measurements

4.1 Furnace temperature and pressure measurements

The furnace temperature and pressure data is provided in test report EWFA 5569300.1.

4.2 Specimen temperatures

The specimen temperature data is provided in test report EWFA 5569300.1.

4.3 Observations

Table 4 in Appendix A 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.

5. Performance criteria and test results

Table 3 shows the results the specimen achieved against the performance criteria listed in AS 1530.4:2014 Sections 2 & 10.

System	Criteria	Results
A	Structural adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	Failure at 47 minutes
	FRL	-/120/30
B	Structural adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	No failure at 121 minutes
	FRL	-/120/120
C	Structural adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	Failure at 78 minutes
	FRL	-/120/60
D	Structural adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	Failure at 65 minutes
	FRL	**-/**120/60
E	Structural adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	Failure at 9 minutes
	FRL	-/120/0
F	Structural adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	No failure at 121 minutes
	FRL	-/120/120
G	Structural adequacy	Not applicable
	Integrity	No failure at 121 minutes

System	Criteria	Results
	Insulation	No failure at 121 minutes
	FRL	-/120/120
H	Structural adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	No failure at 121 minutes
	FRL	-/120/120
I	Structural adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	No failure at 121 minutes
	FRL	-/120/120
J	Structural adequacy	Not applicable
	Integrity	Failure at 113 minutes
	Insulation	Failure at 113 minutes
	FRL	-/90/90
K	Structural adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	No failure at 121 minutes
	FRL	-/120/120
L	Structural adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	Failure at 15 minutes
	FRL	-/120/0
M	Structural adequacy	Not applicable
	Integrity	No failure at 121 minutes
	Insulation	Failure at 10 minutes
	FRL	-/120/0

Table 3 Test results

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 B – 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

Because of the nature of fire resistance testing and the consequent difficulty in quantifying the uncertainty of measurement of fire resistance, it is not possible to provide a stated degree of accuracy of the result.

7. Conclusions

Twelve-off various pipe services and 1-off cable services protected by BOSS protection systems protruded from a 144mm thick USG Boral Firestop wall system has been subjected to a fire resistance test in accordance with AS 1530.4:2014 Section 2 & 10.

The specimen satisfied the performance requirements specified in AS 1530.4:2014 for the periods stated below:

- Penetration system A
  - FRL (Fire Resistance Level): -/120/30
- Penetration system B
  - FRL (Fire Resistance Level): -/120/120
- Penetration system C
  - FRL (Fire Resistance Level): -/120/60
- Penetration system D
  - FRL (Fire Resistance Level): -/120/60
- Penetration system E
  - FRL (Fire Resistance Level): -/120/0
- Penetration system F
  - FRL (Fire Resistance Level): -/120/120
- Penetration system G
  - FRL (Fire Resistance Level): -/120/120
- Penetration system H
  - FRL (Fire Resistance Level): -/120/120
- Penetration system I
  - FRL (Fire Resistance Level): -/120/120
- Penetration system J
  - FRL (Fire Resistance Level): -/90/90
- Penetration system K
  - FRL (Fire Resistance Level): -/120/120
- Penetration system L
  - FRL (Fire Resistance Level): -/120/0
- Penetration system M
  - FRL (Fire Resistance Level): -/120/0

Appendix A Test observations

Table 4 shows observations of any significant behaviour of the specimen during the test.

Time		Observation
Min	Sec	
Penetration system A		
00	00	Fire resistance test commenced and the average initial temperature was approximately 13°C.
06	01	Deformation appeared on the base of the pipe near the separating element
19	00	Smoke venting appeared from the end of the pipe
30	00	The specimen had continued to maintain integrity and insulation in accordance with the AS 1530.4:2014
36	00	The volume of smoke venting from the end of the pipe had increased
41	13	The volume of smoke venting from the end of the pipe had increased
47	**05**	**TC 052 on the pipe, 25mm away from the mastic recorded a temperature of 194°C. Failure of insulation in accordance with AS 1530.4:2014 clause 2.13.3(b), where the maximum temperature of Thermocouple TC 052 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
94	50	Deformation and discolouration appeared on the pipe near the separating element
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 client
Penetration system B		
00	00	Fire resistance test commenced and the average initial temperature was approximately 13°C.
14	20	Smoke venting appeared from the end of the pipe
23	20	The volume of smoke venting from the end of the pipe had increased
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
81	28	Discoloration appeared on the plasterboard around the penetration service
90	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 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 client
Penetration system C		
00	00	Fire resistance test commenced and the average initial temperature was approximately 13°C.
30	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
58	33	Smoke venting appeared from the end of the pipe
60	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
78	**40**	**TC 041 on the pipe, 25mm away from the mastic recorded a temperature of 194°C. Failure of insulation in accordance with AS 1530.4:2014 clause 2.13.3(b), where the maximum temperature of Thermocouple TC 041 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 client

Penetration system D		
00	00	Fire resistance test commenced and the average initial temperature was approximately 13°C.
14	20	Smoke venting appeared from the end of the pipe
23	20	The volume of smoke venting from the end of the pipe had increased
30	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
36	00	The volume of smoke venting from the end of the pipe had increased
41	13	The volume of smoke venting from the end of the pipe had increased
60	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
65	**40**	**TC 011 on the pipe, 25mm away from the mastic recorded a temperature of 194°C. Failure of insulation in accordance with AS 1530.4:2014 clause 2.13.3(b), where the maximum temperature of Thermocouple TC 011 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
100	40	The intumescent had pushed out from the core hole
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 client
Penetration system E		
00	00	Fire resistance test commenced and the average initial temperature was approximately 13°C.
04	09	Smoke venting appeared from the end of the pipe
09	**30**	**TC 021 on the pipe, 25mm away from the mastic recorded a temperature of 194°C. Failure of insulation in accordance with AS 1530.4:2014 clause 2.13.3(b), where the maximum temperature of Thermocouple TC 021 exceeded the initial temperature by more than 180°C.**
10	20	Deformation appeared on the base of the pipe near the separating element
14	20	Smoke venting appeared from the end of the pipe
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 and insulation 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 client
Penetration system F		
00	00	Fire resistance test commenced and the average initial temperature was approximately 13°C.
02	00	Smoke venting appeared from the end of the pipe
10	48	The pipe had detached from the separating element
12	00	A 30 second cotton pad test was carried out in accordance with AS 1530.4:2014. No glowing or flaming had become evident
27	49	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 and insulation in accordance with AS 1530.4:2014
42	33	Small amount of smoke emission appeared from the core hole.
60	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
79	58	The intumescent had pushed out from the core hole
90	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
105	16	A 30 second cotton pad test was carried out in accordance with AS 1530.4:2014. No glowing or flaming had become evident

111	35	Furnace gas can be observed thought he expanded intumescent. A 30 second cotton pad test was carried out in accordance with AS 1530.4:2014. No glowing or flaming had become evident
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 client
Penetration system G		
00	00	Fire resistance test commenced and the average initial temperature was approximately 13°C.
06	01	Deformation appeared on the base of the pipe near the separating element
19	00	Smoke venting appeared from the end of the pipe
23	20	The volume of smoke venting from the end of the pipe had increased
30	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
36	00	The volume of smoke venting from the end of the pipe had increased
53	46	The expanded intumescent had pushed out from the core hole and the pipe detached from the separating element.
81	28	Discoloration appeared on the plasterboard around the penetration service
90	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
101	33	Smoke emission appeared from the core hole
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 client
Penetration system H		
00	00	Fire resistance test commenced and the average initial temperature was approximately 13°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 client
Penetration system I		
00	00	Fire resistance test commenced and the average initial temperature was approximately 13°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 client
Penetration system J		
00	00	Fire resistance test commenced and the average initial temperature was approximately 13°C.
02	00	Smoke venting appeared from the end of the pipe
02	40	The volume of smoke venting from the end of the pipe had increased
05	40	Deformation appeared on the base of the pipe near the separating element
07	15	The pipe had detached from the separating element
08	14	A 30 second cotton pad test was carried out in accordance with AS 1530.4:2014. No glowing or flaming had become evident

10	00	A 30 second cotton pad test was carried out in accordance with AS 1530.4:2014. No glowing or flaming had become evident
19	00	Smoke venting appeared from the end of the pipe
30	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
36	00	The volume of smoke venting from the end of the pipe had increased
41	13	The volume of smoke venting from the end of the pipe had increased
50	36	A 30 second cotton pad test was carried out in accordance with AS 1530.4:2014. No glowing or flaming had become evident
60	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
81	28	Discoloration appeared on the plasterboard around the penetration service
87	10	A 30 second cotton pad test was carried out in accordance with AS 1530.4:2014. No glowing or flaming had become evident
90	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
113	**50**	**Furnace gas was coming out from the core hole. A 30 second cotton pad test was carried out on top of the core hole and resulting in flaming of the cotton pad. Failure of integrity of the specimen in accordance with AS 1530.4:2014, clause 2.13.2.2, where ignition of the cotton had occurred.**
Penetration system K		
00	00	Fire resistance test commenced and the average initial temperature was approximately 13°C.
03	31	Smoke venting appeared from the end of the pipe
05	24	Deformation appeared on the base of the pipe near the separating element
19	20	The volume of smoke venting from the end of the pipe had reduced significantly
30	00	The specimen had continued to maintain integrity and insulation in accordance with AS 1530.4:2014
36	00	The volume of smoke venting from the end of the pipe had increased
41	13	The volume of smoke venting from the end of the pipe had increased
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 client
Penetration system L		
00	00	Fire resistance test commenced and the average initial temperature was approximately 13°C.
14	20	Smoke venting appeared from the end of the pipe
15	**15**	**TC 016 on the pipe, 25mm away from the mastic recorded a temperature of 194°C. Failure of insulation in accordance with AS 1530.4:2014 clause 2.13.3(b), where the maximum temperature of Thermocouple TC 016 exceeded the initial temperature by more than 180°C.**
16	50	The pipe had detached from the separating element
18	05	A 30 second cotton pad test was carried out in accordance with AS 1530.4:2014. No glowing or flaming had become evident
25	40	The pipe had detached from the separating element.
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
81	28	Smoke emission appeared from the core hole and discoloration appeared on the surrounding plasterboard
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 client

Penetration system M		
00	00	Fire resistance test commenced and the average initial temperature was approximately 13°C.
10	**20**	**TC 037 on the pipe, 25mm away from the mastic recorded a temperature of 194°C. Failure of insulation in accordance with AS 1530.4:2014 clause 2.13.3(b), where the maximum temperature of Thermocouple TC 037 exceeded the initial temperature by more than 180°C.**
11	12	The pipe had almost detached from the separating element and smoke venting from the pipe opening near the separating element.
30	00	The specimen had continued to maintain integrity in accordance with AS 1530.4:2014
53	46	The expanded intumescent had pushed out from the core hole and the pipe detached from the separating element.
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 client

Table 4 Test observations

Appendix B Direct field of application

B.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 have been made.

B.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.

B.3 Metal Pipes

B.3.1 Sealing Systems Tested Using Standard Configurations

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

NOTE: For information on standard configurations, see Appendix F of AS1530.4-2014.

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

B.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 AS1530.4-2014.

B.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.

B.3.4 Insulated (Lagged) Metal Pipes

Where fire test data on the insulation system are not available, penetration sealing systems that have been subjected to the standard test with uninsulated metal pipes may be used, provided the appropriate requirements of Clause 10.12.3.2 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.

B.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; or
- 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; and
  - thermal conductivity is equal to or less than the tested specimen diffusivity of the material.

B.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.

B.5 Plastic Pipes

B.5.1 General

In addition to the requirements of Clause 10.12.2, 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.

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 plastics 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.

B.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.

B.6 Control Joints

The following variations are permitted:

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

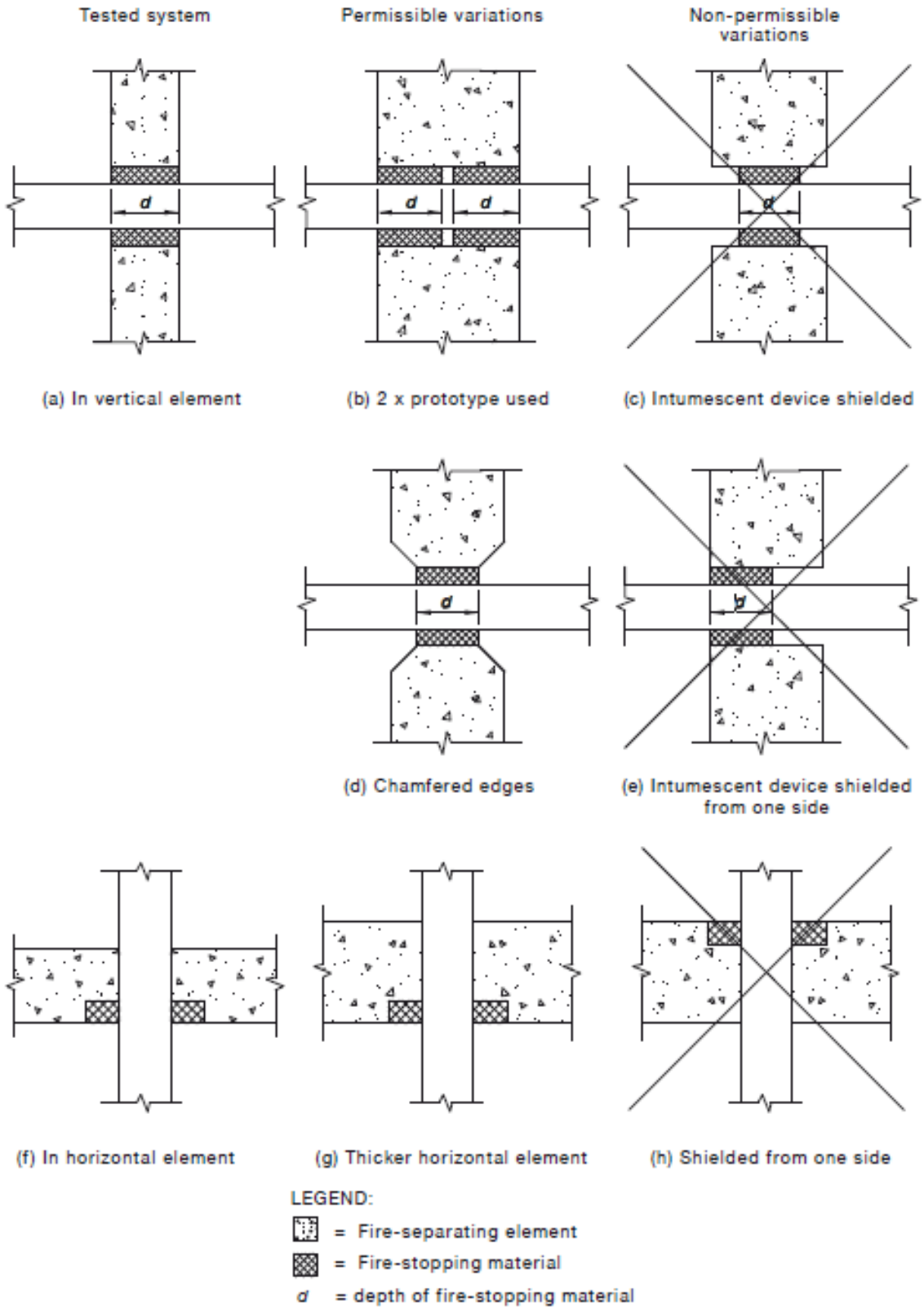
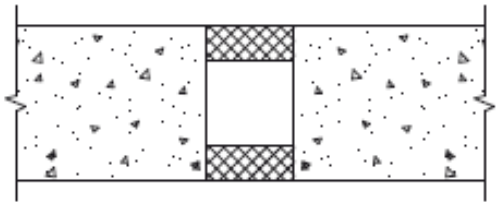
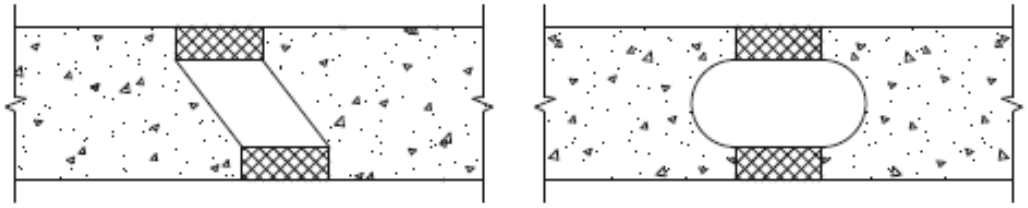


FIGURE 10.12.5.1 EQUIVALENT EXPOSURE OF UPVC PIPE FIRE-STOPPING SYSTEMS



(a) Butt joint



(b) Contoured joints

LEGEND:

= Fire-separating element

= Fire-stopping material

FIGURE 10.12.6 CONTOURED CONTROL JOINTS