ASSESSMENT REPORT

The fire resistance performance of a 77mm, 64mm and 51mm thick Speedpanel wall system penetrated by uPVC and metal pipes if tested in accordance with AS1530.4-2005 and assessed in accordance with AS4072.1- 2005

EWFA Report No:

25472-07

Report Sponsor:

Speedpanel Victoria Pty Ltd
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Testing. Advising. Assuring.

DOCUMENT REVISION STATUS

Date Issued	Issue No	Description	Prepared By	Reviewed By
07/12/2010	25472-00	Initial Issue	S. Townsend	K. Nicholls
27/04/2012	25472-01	Inclusion variation of Rockwool insulation to metal pipes	S. Hu	K. Nicholls
22/05/2014	25472-02	Revised to include an Ø317mm HDPE pipe	S. Hu	K. Nicholls
04/07/2014	25472-03	Revised to include Promat FCW collars for uPVC pipes	S. Hu	K. Nicholls
09/07/2014	25472-04	Revised to include alternative Promat FCW collar installation option for 78mm thick Speedpanel wall.	S. Hu	D. Nicholson
16/01/2015	25472-05	Revised to include clearance around metal pipes up to 20mm wide.	S. Hu	K. Nicholls
23/09/2016	25472-06	Revised to include confirmation of service spacing	D. Nicholson	C. McLean
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CONTENTS

1 INTRODUCTION

This report supersedes assessment report EWFA 25472-06.

This report presents an assessment of the fire resistance performance of a 77mm thick Speedpanel wall system penetrated by uPVC and metal pipes if tested in accordance with AS1530.4-2005 and assessed in accordance with AS4072.1- 2005.

Also assessed, shall be Speedpanel 51mm, 64mm and 78mm thick vertically orientated walls as tested in BWA 2257600, EWFA 2848300.2 and EWFA 2736002.1 with consideration given to 110mm and 150mm uPVC pipes penetrating through the walls and protected with FC100 and FC150 Promat pipe collars, respectively. Furthermore, each face of the Speedpanel wall will be faced with 13mm fire rated plasterboard or alternatively one face fixed with 2 layers of 13mm fire rated plasterboard.

The tested prototypes described in Section 2 of this report, when subject to the proposed variations described in Section 3, are to perform satisfactorily if tested in accordance with the referenced test method described in Section 4. The conclusions of the report are summarised in Section 5.

The validity of this assessment is conditional on compliance with Sections 6, 7, 8 and 9 of this report.

Summaries of the test data on which this assessment is based are provided in Appendix A together with a summary of the critical issues leading to the assessment conclusions including the main points of argument.

2 TESTED PROTOTYPES

This assessment is based on reference test EWFA 2517300.2 being a test on service penetrations in a Speedpanel wall. The report was sponsored by Speedpanel (VIC) Pty. Ltd.

Reference is also made to test reports EWFA 2683500, FSP 1470 and FSRG A-08-526.

Test EWFA 2683500 comprised a steel framed plasterboard wall lined with three layers of 13mm fire grade plasterboard on the exposed side and two layers of 13mm fire grade plasterboard on the unexposed side consisting two service penetrations wrapped with Rockwool insulation. The report was sponsored by Exova Warringtonfire Aus Pty Ltd.

Test FSP 1470 comprised a steel framed Powerscape wall lined with two layers of 16mm Powerscape board on each side consisting of a large diameter metal pipe service. The report was sponsored by Lend Lease Project Management & Construction (Aus) Pty Ltd.

Test FSRG A-08-526 comprised a steel framed plasterboard wall lined with two layers of 16mm thick Fyrchek plasterboard on each side including a Ø317mm (OD) HDPE pipe. The report was sponsored by Promat Australia Pty Ltd and was conducted by Fire Science Research Group.

Permissions have been provided by the test sponsors for the test data to be referenced.

The assessment references to test reports EWFA 2798800.1_AS, WFRA F91622 and WFRA F91633, being tests on plastic pipe penetrations in various framed and panel wall.

The assessment also references to test report FSRG A-14-903, being test on control joint in concrete floor protected with PROMASEAL® Supa Mastic sealant.

Permission has been granted by Promat Australia Pty Ltd for the reference report F91622 and F91633 and FSRG A-14-903 to be used by the sponsor of the assessment report.

FSV 0562 comprised a test of a vertically orientated 77mm thick Speedpanel wall system 3m × 3m in size. The wall was clad on both sides with one half 10mm standard plasterboard (side A) and the other half 13mm fire rated plasterboard (side B). For both plasterboard systems the board was directly screw fixed to the Speedpanel wall. The test was conducted by CSIRO and sponsored by Speedpanel Vic Pty Ltd.

This assessment is also based on reference test reports:

FR 3754 which was sponsored by Speedwell New Zealand Ltd and conducted by BRANZ Limited (New Zealand).

Permission has been granted by Speedwall New Zealand for this assessment for the referenced report FAR 3754 to be used for the purpose of this assessment.

The assessment also makes reference to assessment report EWFA 29592300.3 comprising an assessment of multiple pipe penetrations including uPVC pipe penetrations in Speedpanel walls up to 250mm diameter.

Permission has been granted by Promat Australia Pty Ltd to this assessment author for the referenced report EWFA 29592300.3 to be used for the purpose of this assessment

Refer to Appendix A for a full summary of the test data.

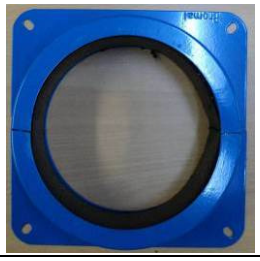
3 VARIATION TO TESTED PROTOTYPES

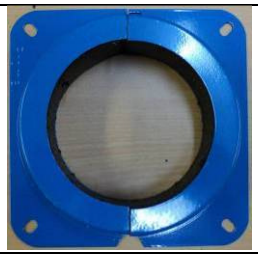
The proposed construction is to be as tested in EWFA 2517300.2, subject to the following variations:

- Copper and ferrous pipes up to 150mm diameter sealed to wall wrapped with 38mm Fibretex 450 for 600mm each side only or 50mm Fibretex 820 for 600mm each side and continuous through the wall. The annular gap between wall and pip shall be as shown in figure 6.
- O.D. 325mm steel pipe with a minimum pipe wall thickness of 2mm lagged with 50mm thick Fibretex 820 for 600mm each side and continuous through the wall and sealed to wall with Promat Supamastic. The wall system incorporates a 77mm Speedpanel wall and a 51mm or 64mm steel stud wall frame lined with two layers of 16mm fire grade plasterboard adjacent to the Speedpanel wall to make a minimum thickness of 156mm. The annular gap between wall and pip shall be as shown in figure 6.
- Inclusion of a 200mm copper pipe with a minimum pipe wall thickness of 2mm without insulation. The annular gap between wall and pip shall be as shown in figure 6.
- Inclusion of a Ø317mm (OD) HDPE pipe with a minimum pipe wall thickness of 13.5mm and sealed to wall with PROMASEAL® AN Acrylic sealant. The wall system incorporates a 77mm Speedpanel wall and a 51mm or 64mm steel stud wall frame lined with two layers of 16mm fire grade plasterboard adjacent to the Speedpanel wall to make a minimum thickness of 126mm. The annular gap between wall and pip shall be as shown in figure 6.
- Inclusion of 40mm, 50mm, 65mm, 80mm and 100mm uPVC pipes that are protected by PROMASEAL® FCW 40, 50, 65, 80 and 100 collars fitted centrally in 51mm, 64mm and 78mm Speedpanel panels based on reference to EWFA 2798800.1. A fillet of sealant around the full circumference of the collar fully covering the exposed casing (not the mesh) on each side as shown in figure 13.
- Inclusion of 40mm, 50mm, 65mm, 80mm and 100mm uPVC pipes that are protected by PROMASEAL® FCW 40, 50, 65, 80 and 100 collars fitted flush to Speedpanel panel surface in 78mm Speedpanel panels. A fillet of sealant around the full circumference of the collar fully covering the exposed casing (not the mesh) on one side as shown in figure 14.
- Inclusion installation options of pipe penetrations in Speedpanel wall as shown in figures 1, 2, 3 and 4. The retained Speedpanel panel cut shall be fully filled with PROMASEAL® Supa Mastic sealant. Additional minimum 256mm wide x 0.42mm BMT metal flashing shall be applied over the butt joints at one side with minimum 100mm wide overlap. The metal flashing is held in place with 10 gauge and 16mm along self-drilling screws with PROMAESEAL® Supa Mastic or Hilti CP 606 applied around the perimeter of flashing.
- Speedpanel 51mm, 64mm and 78mm thick vertically orientated walls as tested in BWA 2257600, EWFA 2848300.2 and EWFA 2736002.1 with consideration given to 110mm and 150mm uPVC pipes penetrating through the walls and protected with FC100 and FC150 Promat pipe collars, respectively. Furthermore, each face of the Speedpanel wall will be faced with 13mm fire rated plasterboard or alternatively one face fixed with 2 layers of 13mm fire rated plasterboard.
- Service penetrations shall be spaced at a minimum of 40mm apart

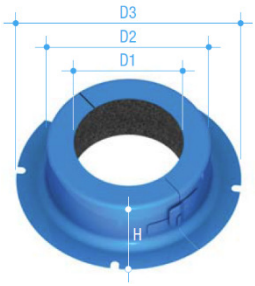
Detailed schedule of proposed construction is shown in Table 1 below:

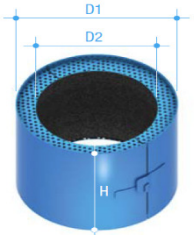
Table 1 – Schedule of Components

Item	Description	
1	**Name**	**Speedpanel Panels**
	Panel size	283mm wide × 78mm thick
	Installation	The panels are vertically oriented and are stitched together at the joins on one side of the wall system only with 10 gauge × 16mm long self-drilling steel screws at 1500mm centres.
2	**Name**	**150mm to 158mm uPVC Pipe**
	Size	150mm to 158mm outer diameter with a wall thickness of 4.0mm to 6.5mm, respectively.
	Pipe Support	Pipe supported at approximately 500 and 1500mm from the support construction.
	Location	The pipe is to be located into the wall system through a nominally 165mm diameter hole.
	Collar	Promat FC150  
	Collar size	Nominal OD of the collar is 192mm × 75mm high with an internal diameter to the intumescent material nominally of 158mm. The outer shell of the collar is made from pressed steel
	Intumescent	The intumescent is 70mm wide × 17.9mm thick, with an approximate density of 986kg/m^3.
	Fixing	Collar fixed to both sides of the wall using 4 off 6g x 40mm coarse thread bugle head screws with 18.6mm diameter washers to both sides, and 4 off 12g x 55mm hex head self-drilling screws to one side only.
	Sealant	The annular gap around the pipe is sealed to a nominal 5mm depth with Promat PROMASEAL® Supa Mastic Sealant or PROMASEAL® AN Acrylic Sealant or where item 18 is incorporated to create a build-up the annular gap should be filled with at least to the depth of the fire rated plasterboard.
3	**Name**	**110mm uPVC Pipe**
	Size	110mm outer diameter uPVC pipe with a wall thickness of 3.4mm to 4.3mm.
	Pipe Support	Pipe supported at approximately 500 and 1500mm from the support construction.
	Location	Pipe located into the wall system through a nominally 115mm diameter hole.
	Collar	Promat FC100

Item	Description	
		 
	Collar size	Nominal OD of the collar is 150mm × 51mm high with an internal diameter to the intumescent material nominally of 114mm. The outer shell of the collar is made from pressed steel
	Intumescent	The intumescent is 49mm wide × 17.6mm thick, with an approximate density of 1014kg/m^3.
	Fixing	Collar fixed to both sides of the wall using 4 off 6g x 40mm coarse thread bugle head screws with 18.6mm diameter washers to both sides.
	Sealant	The annular gap around the pipe is sealed to a nominal 5mm depth with Promat PROMASEAL® Supa Mastic Sealant or PROMASEAL® AN Acrylic Sealant or where item 18 is incorporated to create a build-up the annular gap should be filled with at least to the depth of the fire rated plasterboard.
4	**Name**	**43mm uPVC Pipe**
	Size	42.8mm outer diameter uPVC pipe with a wall thickness of 2.2mm.
	Pipe Support	Pipe supported at approximately 500 and 1500mm from the support construction.
	Location	Pipe located into the wall system through a nominally 45mm diameter hole.
	Collar	Promat FC40  
	Collar size	Nominal OD of the collar is 76mm × 44mm high with an internal diameter to the intumescent material nominally of 46mm. The outer shell of the collar is made from pressed steel
	Intumescent	The intumescent is 41mm wide × 9.8mm thick, with an approximate density of 945kg/m^3.
	Fixing	Collar fixed to both sides of the wall using 4 off 6g x 40mm coarse thread bugle head screws with 18.6mm diameter washers.
	Sealant	The annular gap around the pipe is sealed to a nominal 5mm depth with Promat PROMASEAL® Supa Mastic Sealant or PROMASEAL® AN Acrylic Sealant or where item 18 is incorporated to create a build-up the annular gap should be filled with at least to the depth of the fire rated plasterboard.

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td rowspan="4">5</td><td>Name</td><td>Metal Pipes</td></tr>
<tr><td>Material</td><td>Copper or Ferrous pipes</td></tr>
<tr><td>Size</td><td>
<table>
<tr><th>Pipe Material</th><th>Max Diameter</th><th>Min Wall Thickness</th></tr>
<tr><td rowspan="3">Copper, or Ferrous</td><td>150mm</td><td>2mm</td></tr>
<tr><td>102mm</td><td>1.2mm</td></tr>
<tr><td>32mm</td><td>0.91mm</td></tr>
<tr><td>Copper</td><td>200mm</td><td>2mm</td></tr>
</table>
</td></tr>
<tr><td>Insulated Pipe Installation</td><td>Option 1: Installed into the wall system through a hole with diameter approx. 23mm larger than pipe OD. The annular gap between wall and pipe shall be maximum 20mm wide and sealed with PROMASEAL® Supa Mastic with a minimum depth of 10mm each side. A 30mm fillet of PROMASEAL® Supa Mastic Sealant on each side.
Pipes shall be wrapped with 38mm Fibretex 450 Rockwool (Item 8) for a length of 600mm each side of the wall and then sealed with a 6mm fillet of Supa Mastic Sealant on each side;
OR
Option 2: Installed with 50mm Fibretex 820 Rockwool (Item 9) into the wall system through a hole with diameter 23mm larger than pipe O.D. The annular gap between wall and pipe shall be maximum 20mm wide and sealed with PROMASEAL® Supa Mastic with a minimum depth of 10mm each side. A 50mm fillet of PROMASEAL® Supa Mastic Sealant on the both sides of the wall.</td></tr>
<tr><td>Un-insulated Pipe Installation</td><td>Installed into the wall system through a hole with diameter approx. 23mm larger than pipe OD. The annular gap between wall and pipe shall be maximum 20mm wide and sealed with PROMASEAL® Supa Mastic with a minimum depth of 10mm each side. A 30mm fillet of Supa Mastic Sealant on each side.</td></tr>
<tr><td rowspan="4">6</td><td>Name</td><td>Large Ferrous Pipe</td></tr>
<tr><td>Material</td><td>Ferrous pipe</td></tr>
<tr><td>Size</td><td>Maximum O.D.325mm × Minimum 2mm pipe wall thickness</td></tr>
<tr><td>Installation</td><td>Installed with 50mm Fibretex 820 Rockwool (Item 9) into the wall system through a hole with diameter 23mm larger than pipe O.D. The annular gap between wall and pipe shall be maximum 20mm wide and sealed with PROMASEAL® Supa Mastic with a minimum depth of 10mm. A 50mm fillet of PROMASEAL® Supa Mastic Sealant on the both sides of the wall.</td></tr>
<tr><td rowspan="3">7</td><td>Name</td><td>Plasterboard Line Partition</td></tr>
<tr><td>Material</td><td>Two layers of 16mm fire grade plasterboard installed for a steel-studded partition
51mm steel stud (or 55mm box track) or 64mm steel stud</td></tr>
<tr><td>Size</td><td>Maximum 100mm coverage around pipe penetration and the total length including the pipe penetration shall be maximum 600mm.</td></tr>
</table>

Item	Description	
	Installation	**Option 1:** 2 × 16mm layers of fire rated plasterboard lined surround pipe penetration and 55mm C-track fitted into C track surrounding pipe penetration to form 55mm frame from face of Speedpanel. Gap between Speedpanel and fire grade plasterboard is filled with Promat PROMASEAL® Supamastic; **OR** **Option 2:** 2 × 16mm layers of fire rated plasterboard lined surround pipe penetration and 51mm or 64mm steel stud fixed to 1.2 BMT equal angle surrounding pipe penetration to form 51mm or 64mm frame from face of Speedpanel. Gap between Speedpanel and fire grade plasterboard is filled with Promat PROMASEAL® Supamastic.
8	**Name**	**Pipe Insulation 1**
	Material	38mm Fibretex 450 Rockwool
	Size	38mm thick Bradford Fibretex 450 Rockwool
	Installation	38mm Fibretex 450 Rockwool shall be wrapped along metal pipes with a length of 600mm each side only.
9	**Name**	**Pipe Insulation 2**
	Material	50mm Fibretex 820 Rockwool
	Size	50mm thick Bradford Fibretex 820 Rockwool
	Installation	50mm Fibretex 820 Rockwool shall be wrapped along metal pipes with a length of 600mm each side and continuous through the wall.
10	**Name**	**317mm HDPE Pipe**
	Size	Ø317mm (OD) HDPE pipe with a wall thickness of 13.5mm.
	Pipe Support	Pipe supported at approximately 500, 1250mm and 2270mm from the support construction.
	Location	The pipe is to be located into the wall system through a nominally 325mm diameter hole.
	Collar	PROMSEAL® FC 300 (circular base)  
	Collar size	Nominal OD of the collar is Ø466mm (D3) × 160mm high with an internal diameter to the intumescent material nominally of 318mm. The outer shell of the collar is made from pressed steel
	Intumescent	The intumescent is nominal 145mm wide × 37mm thick, with an approximate density of 1036kg/m^3 to 1055kg/m^3.
	Fixing	Collar fixed to both sides of the wall using eight 8mm threaded rod and nut assemblies (through bolt) on both

<table>
<tr><th>Item</th><th colspan="2">Description</th></tr>
<tr><td></td><td></td><td>sides.</td></tr>
<tr><td></td><td>Sealant</td><td>The annular gap between Speedpanel wall and pipe is filled with 32mm deep PROMASEAL® AN Acrylic sealant backed with backing rod.
The annular gap between plasterboard lined partition (item 7) and pipe is filled with PROMASEAL® AN Acrylic sealant to depth of boards.</td></tr>
<tr><td rowspan="3">11</td><td>Name</td><td>uPVC Pipe</td></tr>
<tr><td>Size</td><td>
<table>
<tr><th>Nominal Pipe Size (mm)</th><th>Outside Diameter OD (mm)</th><th>Pipe Wall Thickness (mm)</th></tr>
<tr><td>40</td><td>43</td><td>2.2</td></tr>
<tr><td>50</td><td>56</td><td>3</td></tr>
<tr><td>65</td><td>69</td><td>2.9</td></tr>
<tr><td>80</td><td>83</td><td>3.4</td></tr>
<tr><td>100</td><td>111</td><td>3.7</td></tr>
</table>
</td></tr>
<tr><td>Installation</td><td>Pipes to be supported at 500mm and 1500mm from the support element.</td></tr>
<tr><td rowspan="3">12</td><td>Name</td><td>PROMASEAL® FC Fire Collar</td></tr>
<tr><td>Size
 

</td><td>
<table>
<tr><th rowspan="2">Code No.</th><th rowspan="2">Pipe Nom. Size (mm)</th><th colspan="3">Body (mm)</th></tr>
<tr><th>H</th><th>D1</th><th>D2</th></tr>
<tr><td>FCW 40</td><td>40</td><td>120</td><td>80*</td><td>47</td></tr>
<tr><td>FCW 50</td><td>50</td><td>120</td><td>93*</td><td>60</td></tr>
<tr><td>FCW 65</td><td>65</td><td>120</td><td>107*</td><td>75</td></tr>
<tr><td>FCW 80</td><td>80</td><td>120</td><td>126*</td><td>89</td></tr>
<tr><td>FCW 100</td><td>100</td><td>120</td><td>153*</td><td>116</td></tr>
</table>
*Additional allowance of 3mm for clip
</td></tr>
<tr><td>Installation</td><td>Option 1:
Installed centrally in the wall with gap sealed with Hilti CP 606 mastic (item 13).
The collar is retained in its location with 2 metal clips on one side only.
Option 2:
Installed in the wall and are flush to the surface of Speedpanel wall at one side.
The annular gap is sealed with Hilti CP 606 mastic (item 13). The collar is retained in its location with 2 metal clips on one side only.</td></tr>
<tr><td rowspan="3">13</td><td>Name</td><td>Sealant</td></tr>
<tr><td>Product</td><td>Hilti CP 606 mastic</td></tr>
<tr><td>Installation</td><td>Applied at the annular gaps between supporting walls and PROMASEAL® FCW collars.
For PROMASEAL® FCW collars installed centrally in walls, sealant is finished off with a fillet on each side of the penetration and the fillet shall fully cover the FCW collars</td></tr>
</table>

Item	Description	
		each side. For PROMASEAL® FCW collars fitted flush to the surface of wall panel at one side, sealant is finished off with a fillet on the other side of the penetration and the fillet shall fully cover the extension of FCW collars.
14	**Name**	**Speedpanel Panels**
	Panel size	289mm wide × 64mm thick
	Installation	The panels are vertically oriented and are stitched together at the joins on one side of the wall system only with 10 gauge 16mm long self-drilling screws at 1000mm centres.
15	**Name**	**Speedpanel Panels**
	Panel size	292mm wide × 51mm thick
	Installation	The panels are vertically oriented and are stitched together at the joins on one side of the wall system only with 10 gauge 16mm long self-drilling screws at 1000mm centres.
16	**Name**	**Metal Flashing (Over Butt Join in Speedpanel)**
	Material	Minimum 256mm wide × 0.42mm thick steel flashing (length to suite the butt joint length), made of shell of the 78mm Speedpanel panel.
	Installation,	Applied over the butt joint with min. 100mm wide overlap at one side of the wall held in place with 10 gauge × 16mm screws and sealed around perimeter with Promaseal Supa Mastic or Hilti CP606
17	**Name**	**Sealant**
	Material	PROMASEAL® Supa Mastic or PROMASEAL® AN Acrylic
	Installation	• Fully applied within the butt joints between Speedpanel panels. • Buttered on all edges of retained Speedpanel panel cut with full depth with minimum 3mm thick. • For figures 15 to 18, the sealant is applied around the perimeter of the plasterboard within the Speedpanel profile approximately 10mm deep and in the pipe/Speedpanel annular gap to the same depth at the built up board thickness. • For figure 16, where the board is split into two parts the butt join should be sealed with sealant and additional screw fixing applied
18	**Name**	13mm fire rated plasterboard board (minimum thickness)
	Installation	The board is fixed directly to the Speedpanel wall using item 6 (below) with maximum screw spacings not exceeding 100mm and not exceeding 25mm from the edge and corners of the board.

Item	Description	
		The build-up board can be located in the following configurations: • A single layer on both sides of the wall • Two layers on one side of the wall See figure 15 to 18 for indication
19	**Name**	**10g x 40mm bugle head plasterboard screws**
	Installation	<u>Fixed at:</u> • Promat collar flange (corners) • Fixed 25mm in from the edges of the plasterboard build up and spaced at distances not exceeding 100mm centre to centre.

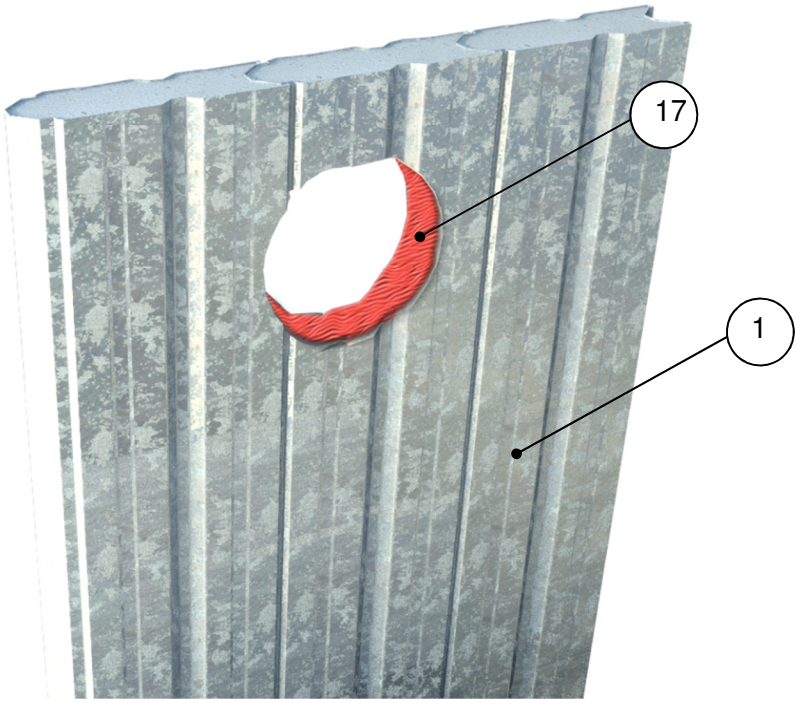


Figure 1 – Installation Option of Pipes in Speedpanel Wall

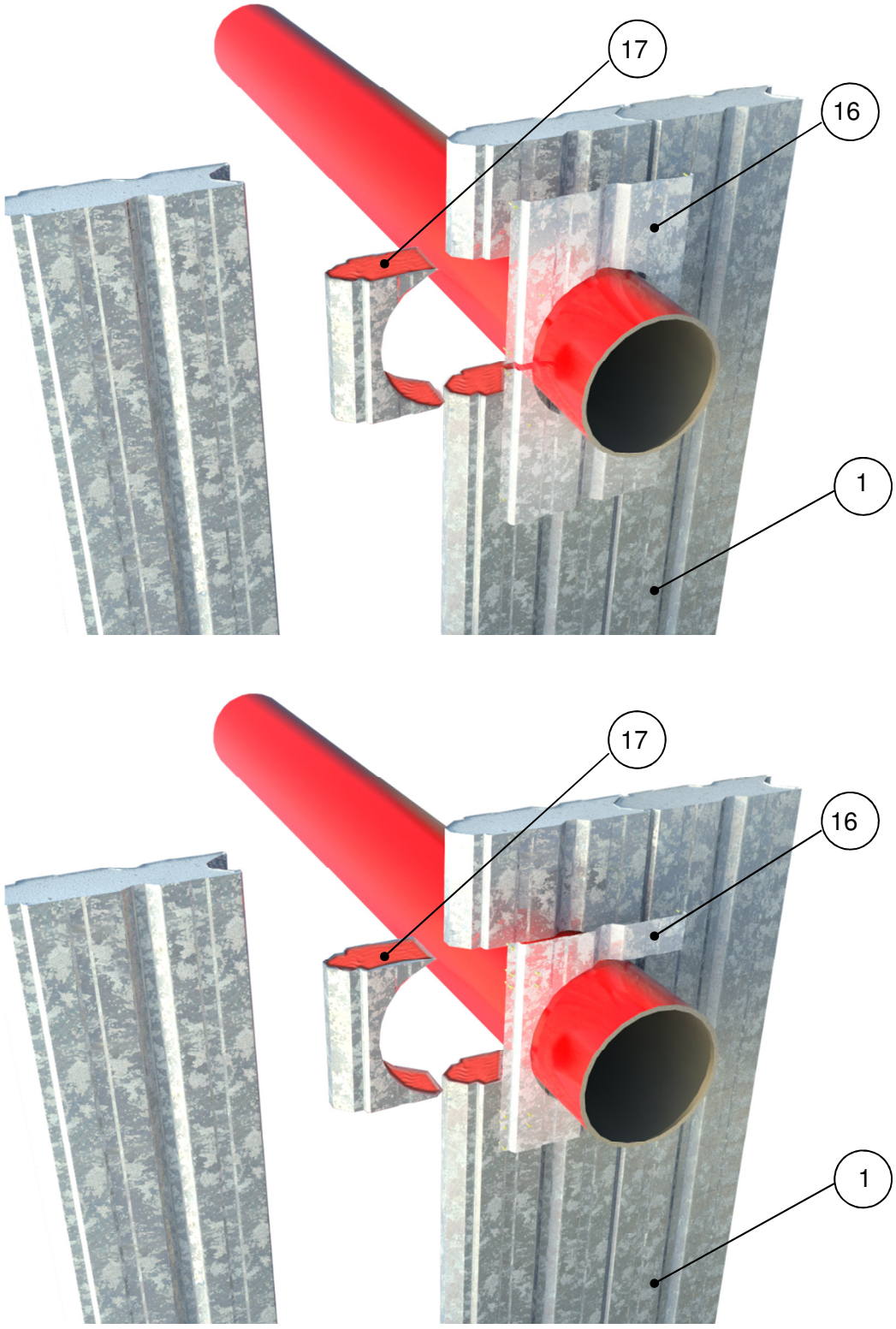


Figure 2 – Installation Option of Pipes in Speedpanel Wall

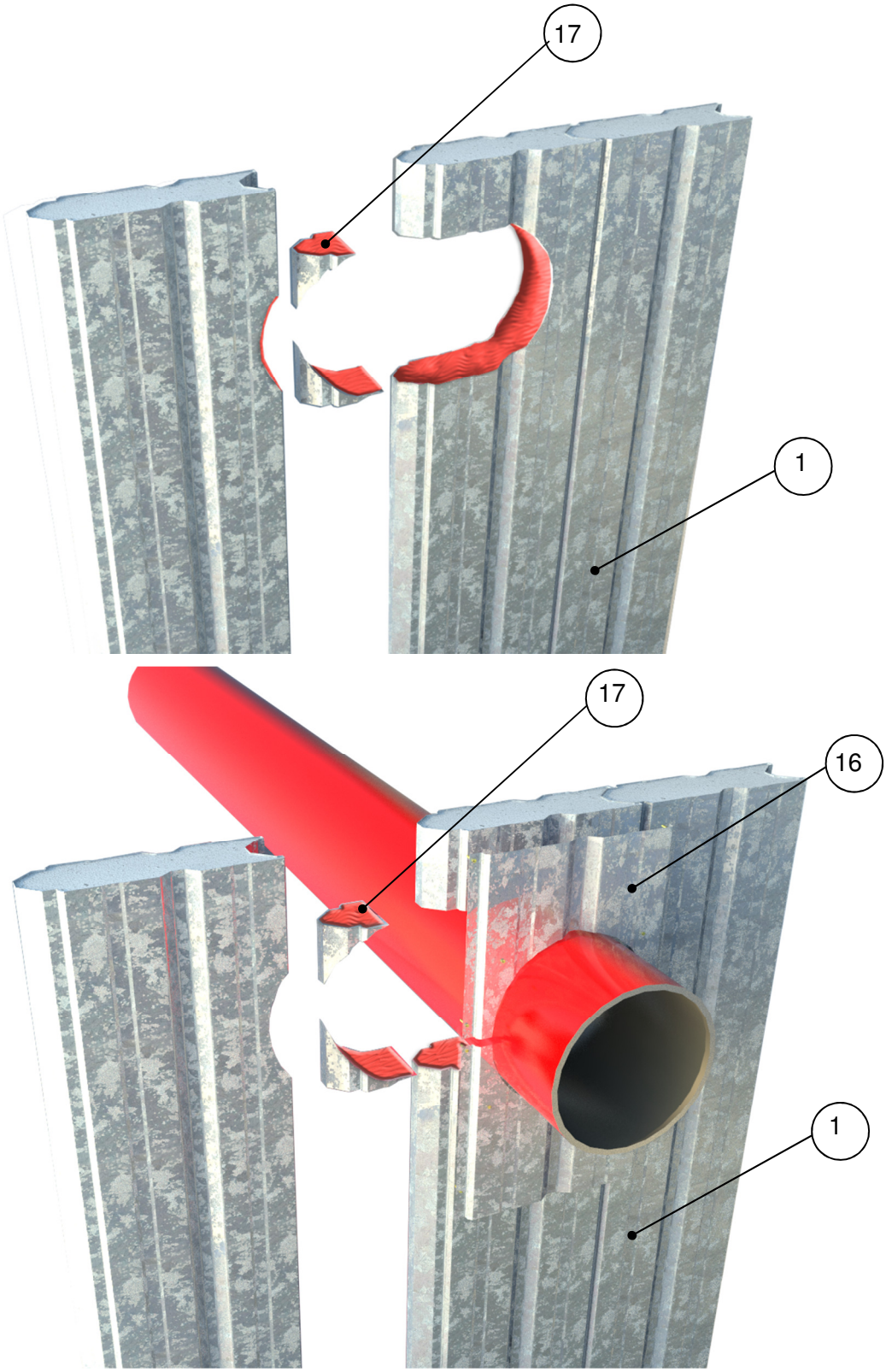


Figure 3 – Installation Option of Pipes in Speedpanel Wall

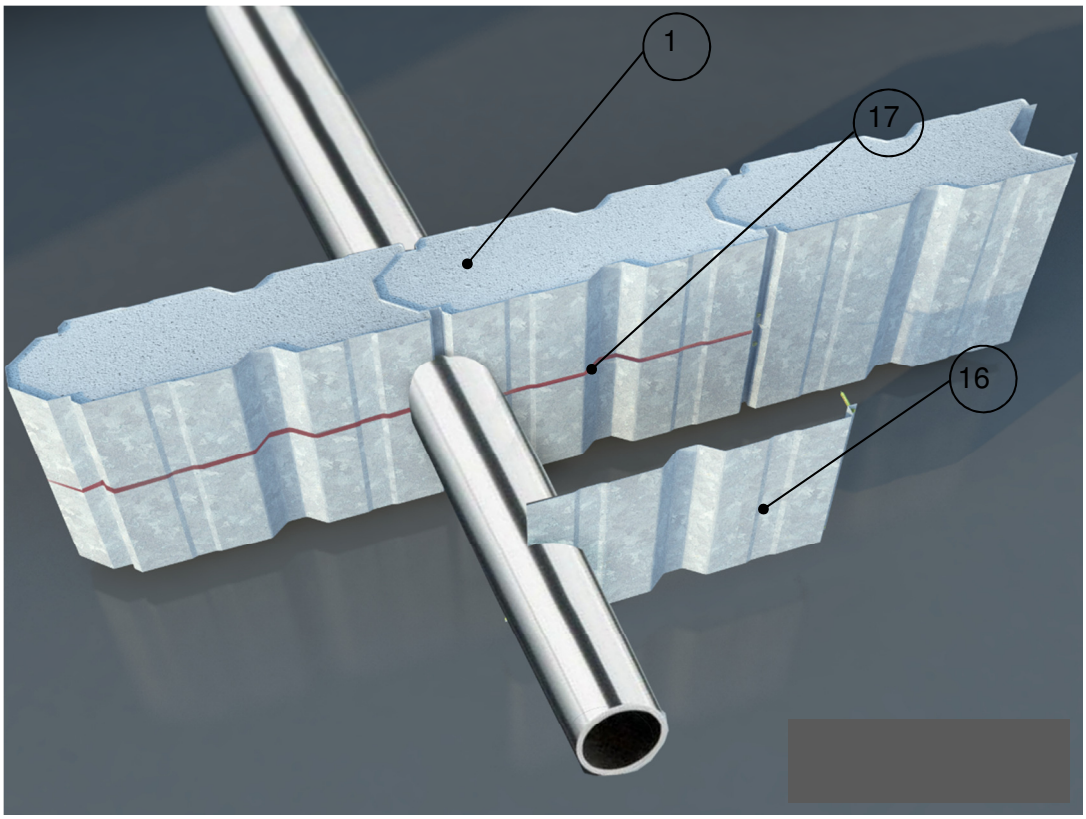


Figure 4 – Installation Option of Pipes in Speedpanel Wall interrupting more than One Panel

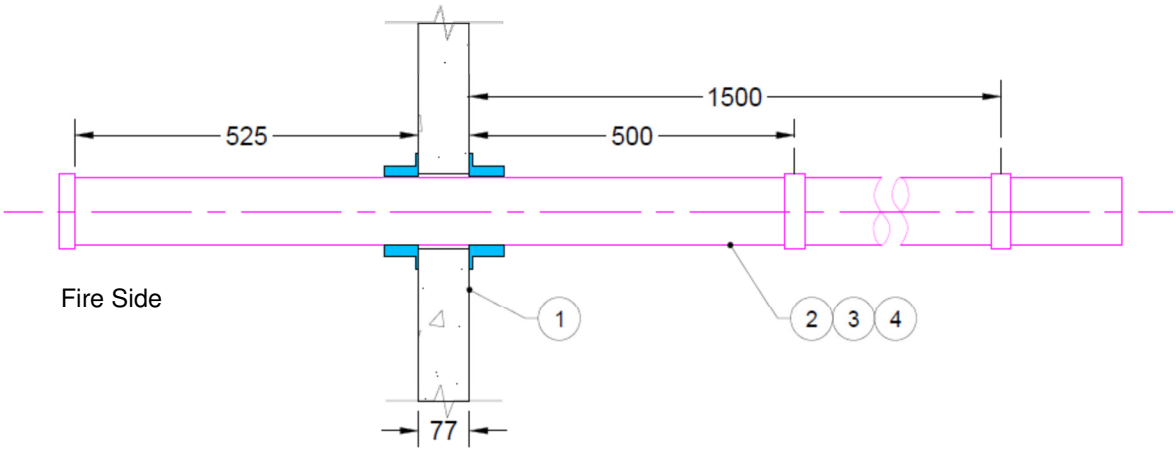


Figure 5 – Configuration for uPVC Pipes

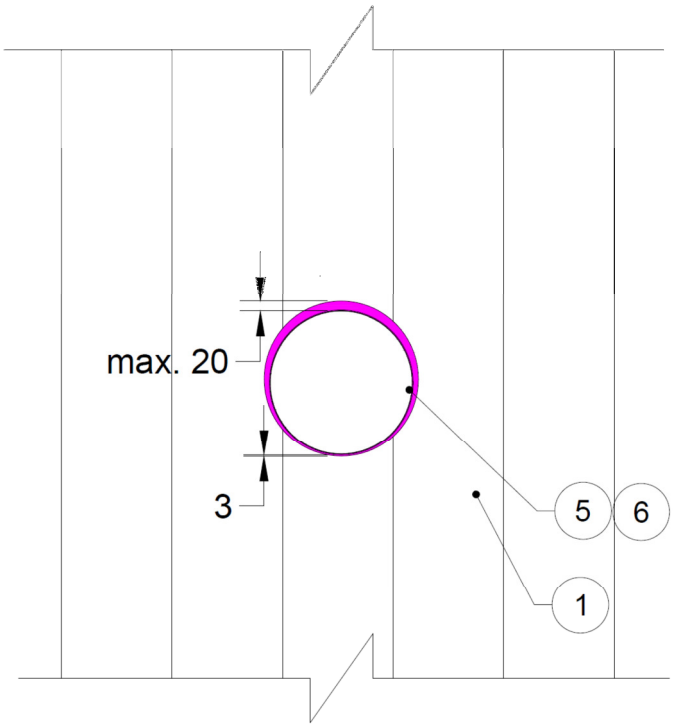


Figure 6 – Cross Section of Metal Pipes in Speedpanel Wall

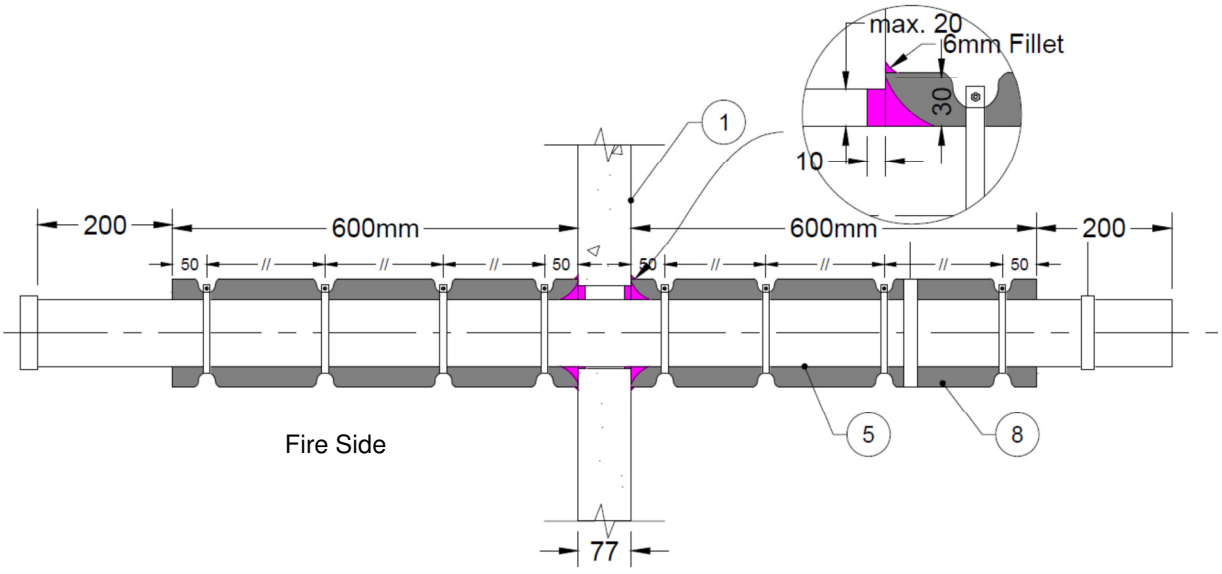


Figure 7 – Copper and Ferrous Pipes up to 150mm with Insulation option 1

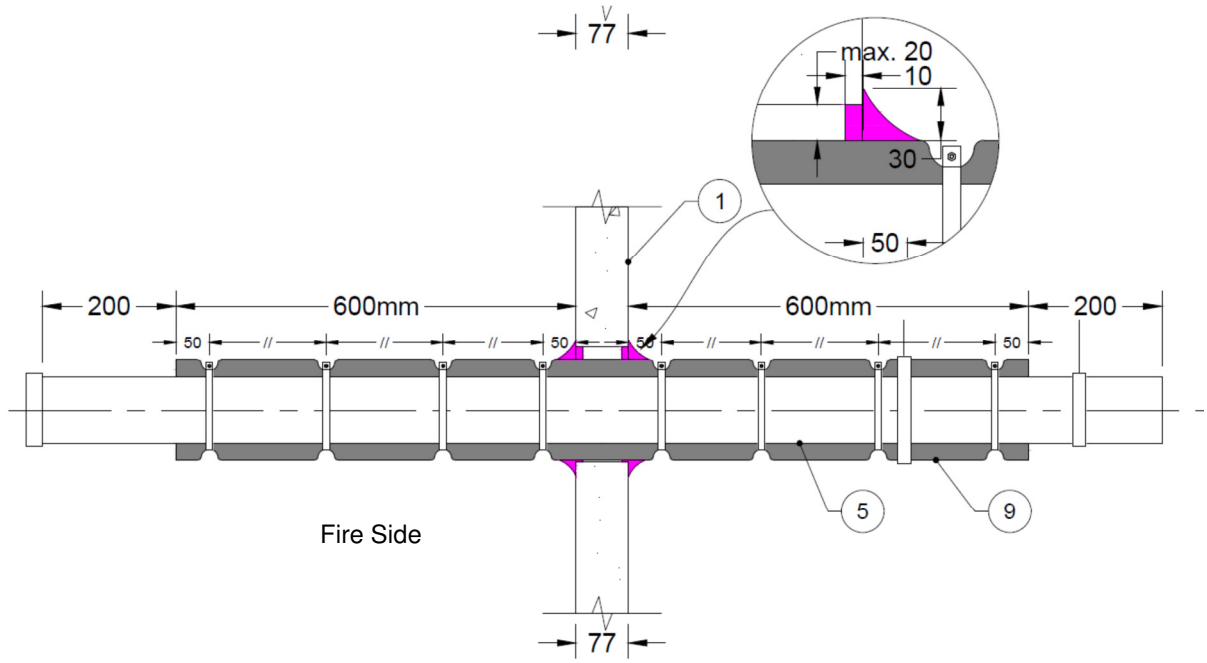


Figure 8 – Copper and Ferrous Pipes up to 150mm with Insulation option 2

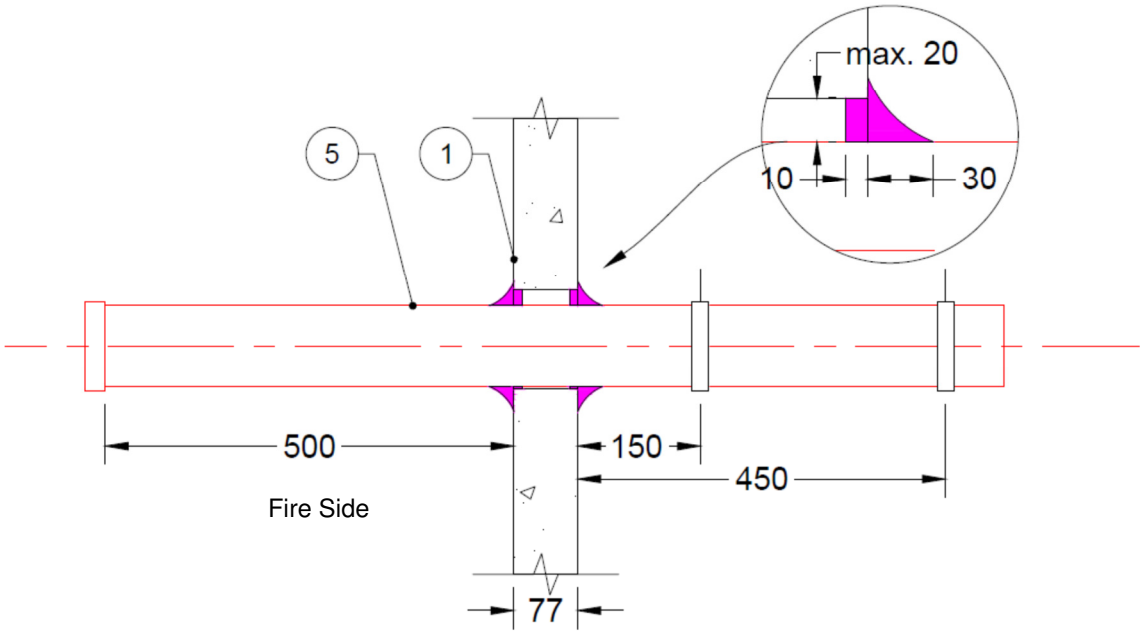


Figure 9 – Configuration for Copper and Ferrous Pipes without insulation

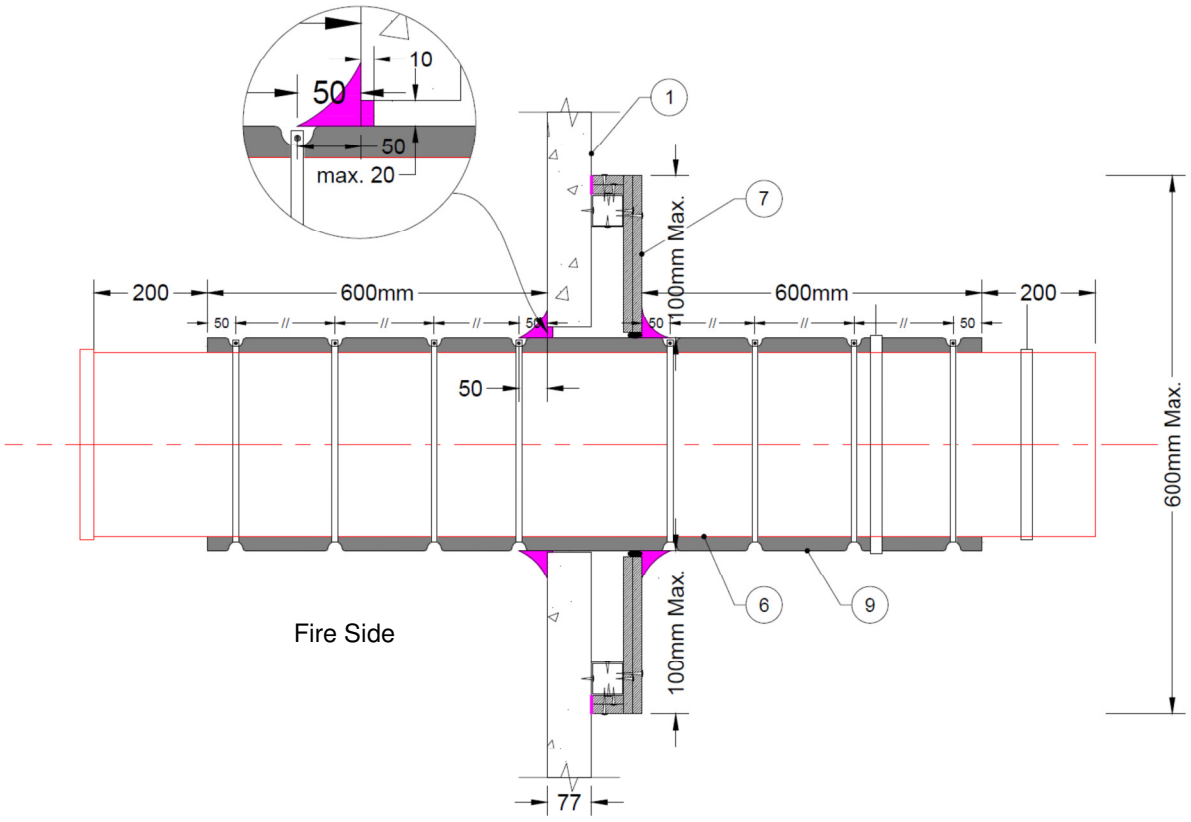


Figure 10 – Configuration for Steel Pipe in Wall Conjunction Option 1

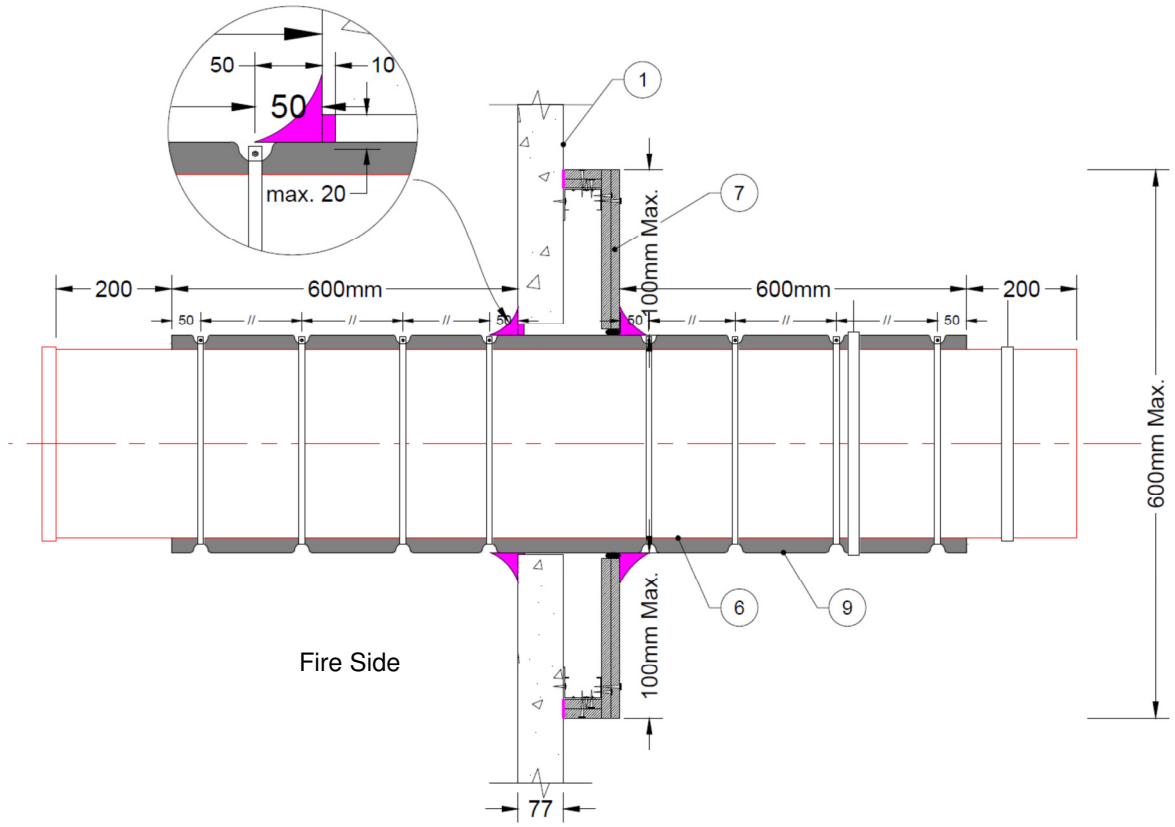


Figure 11 – Configuration for Steel Pipe in Wall Conjunction Option 2

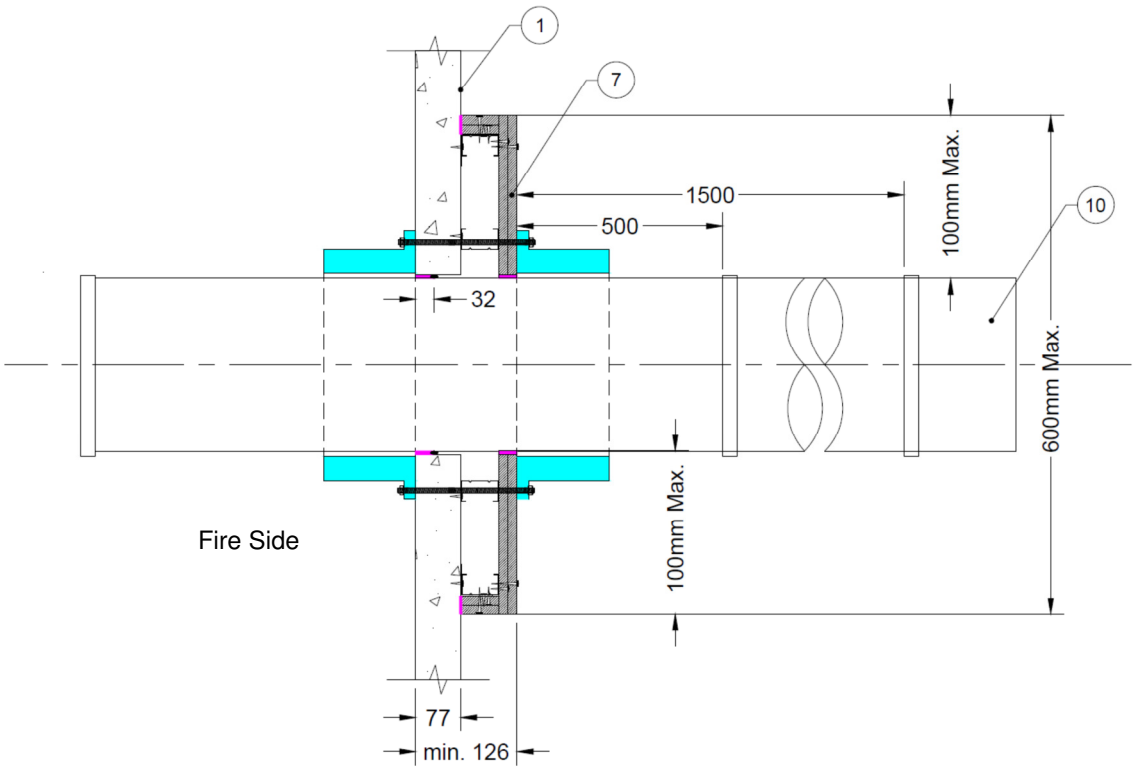


Figure 12 – Configuration for Ø317mm HDPE Pipe in Wall Conjunction

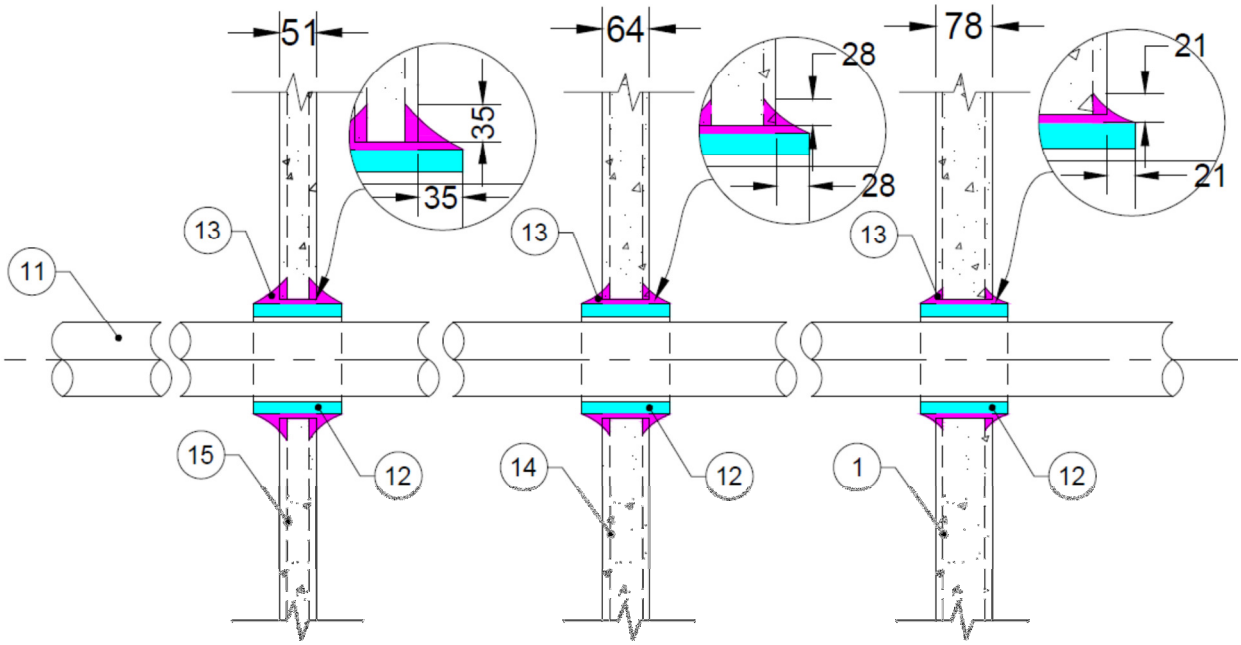


Figure 13 – uPVC Pipes with PROMASEAL® FCW Collars – Collar fitted centrally

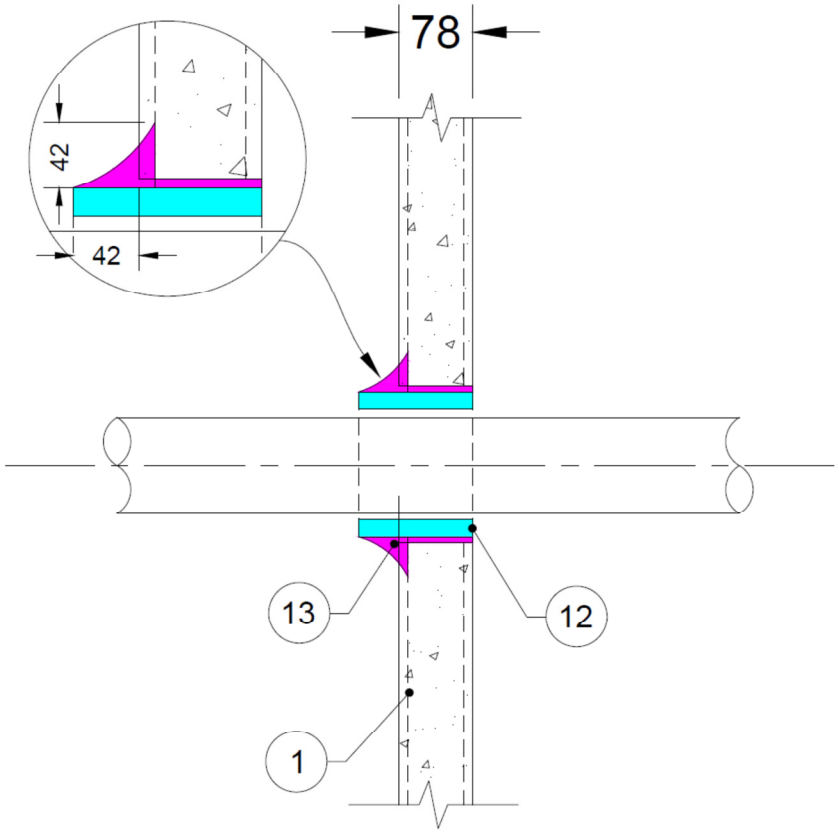


Figure 14 – uPVC Pipes with PROMASEAL® FCW Collars – Collar fitted flush to Wall Surface

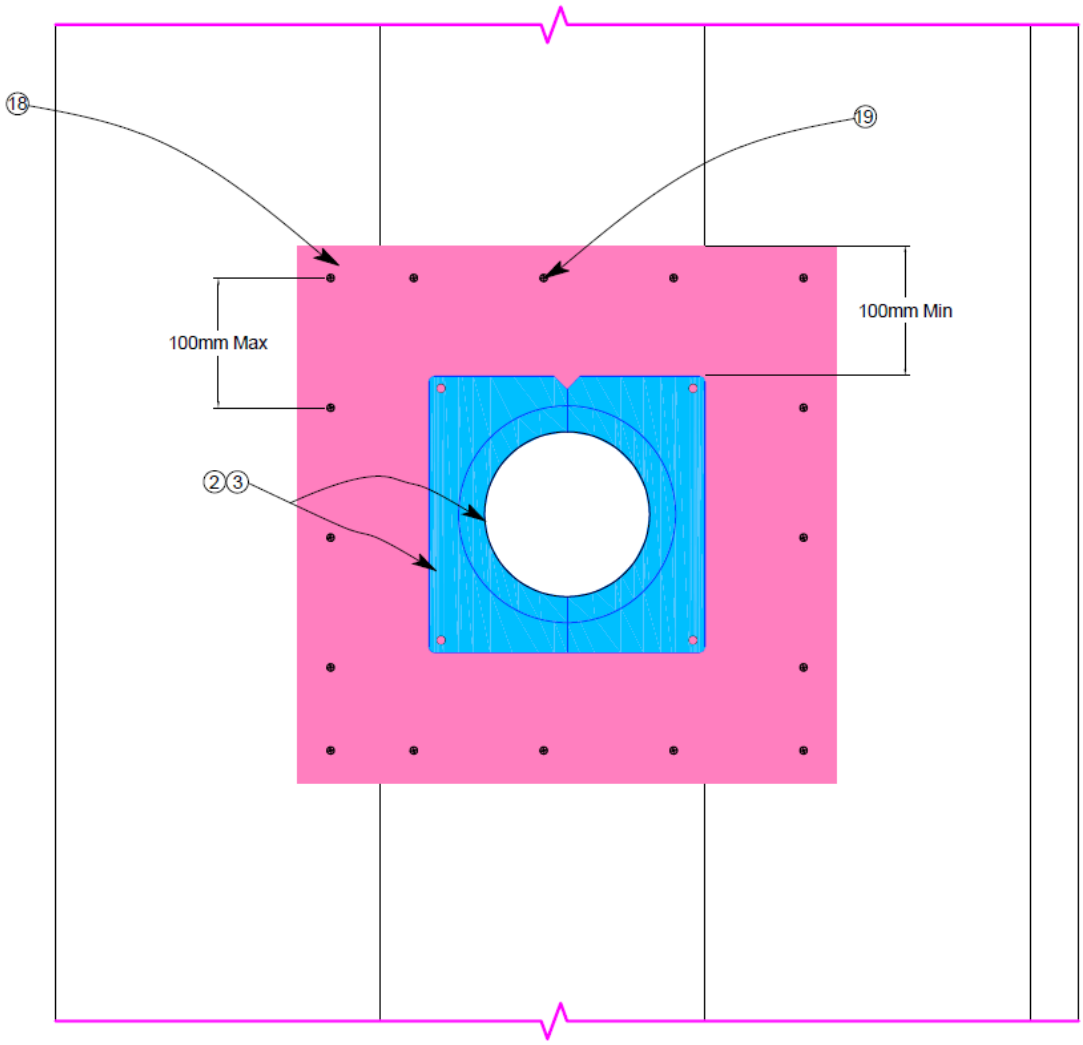


Figure 15 – uPVC Pipes with PROMASEAL® FC Collars – Collar fitted flush to 13mm fire rated plasterboard build-up on the Speedpanel wall Surface

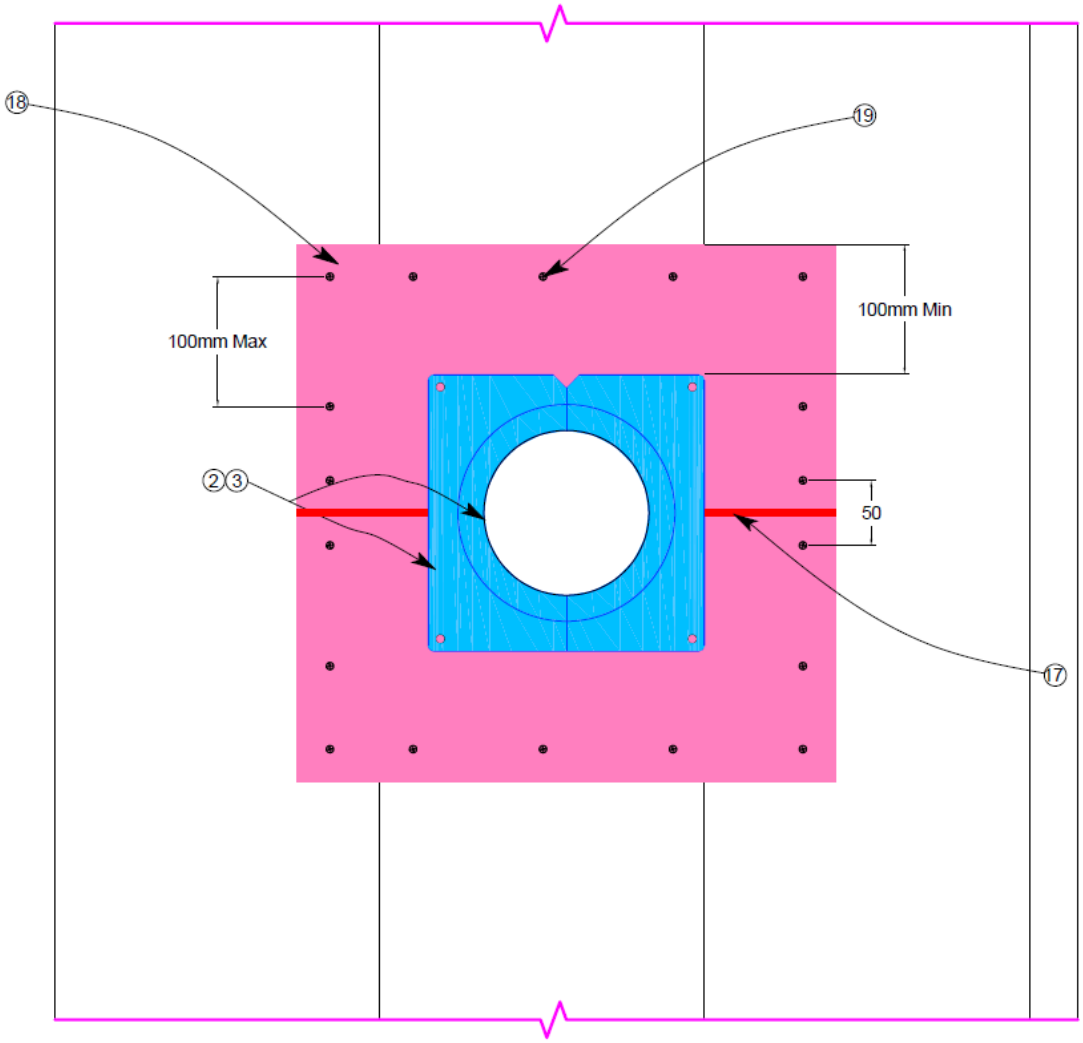


Figure 16 – uPVC Pipes with PROMASEAL® FC Collars – Collar fitted flush to 13mm fire rated plasterboard build-up on the Speedpanel wall Surface (build-up board in two parts and sealed along butt joint)

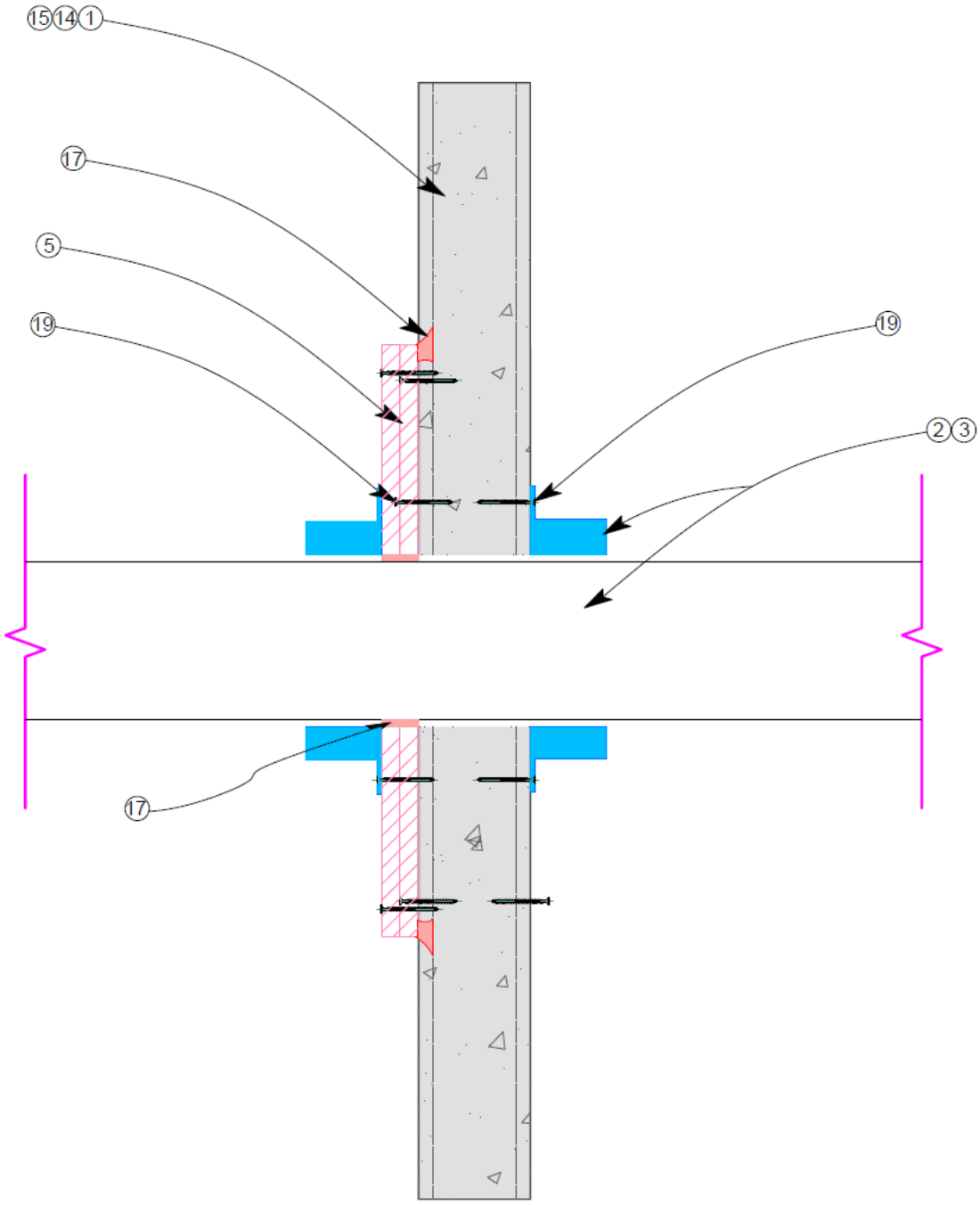


Figure 17 – uPVC Pipes with PROMASEAL® FC Collars – Collar fitted flush to two layers of 13mm fire rated plasterboard build-up on one side of the Speedpanel wall surface (FRL from either side)

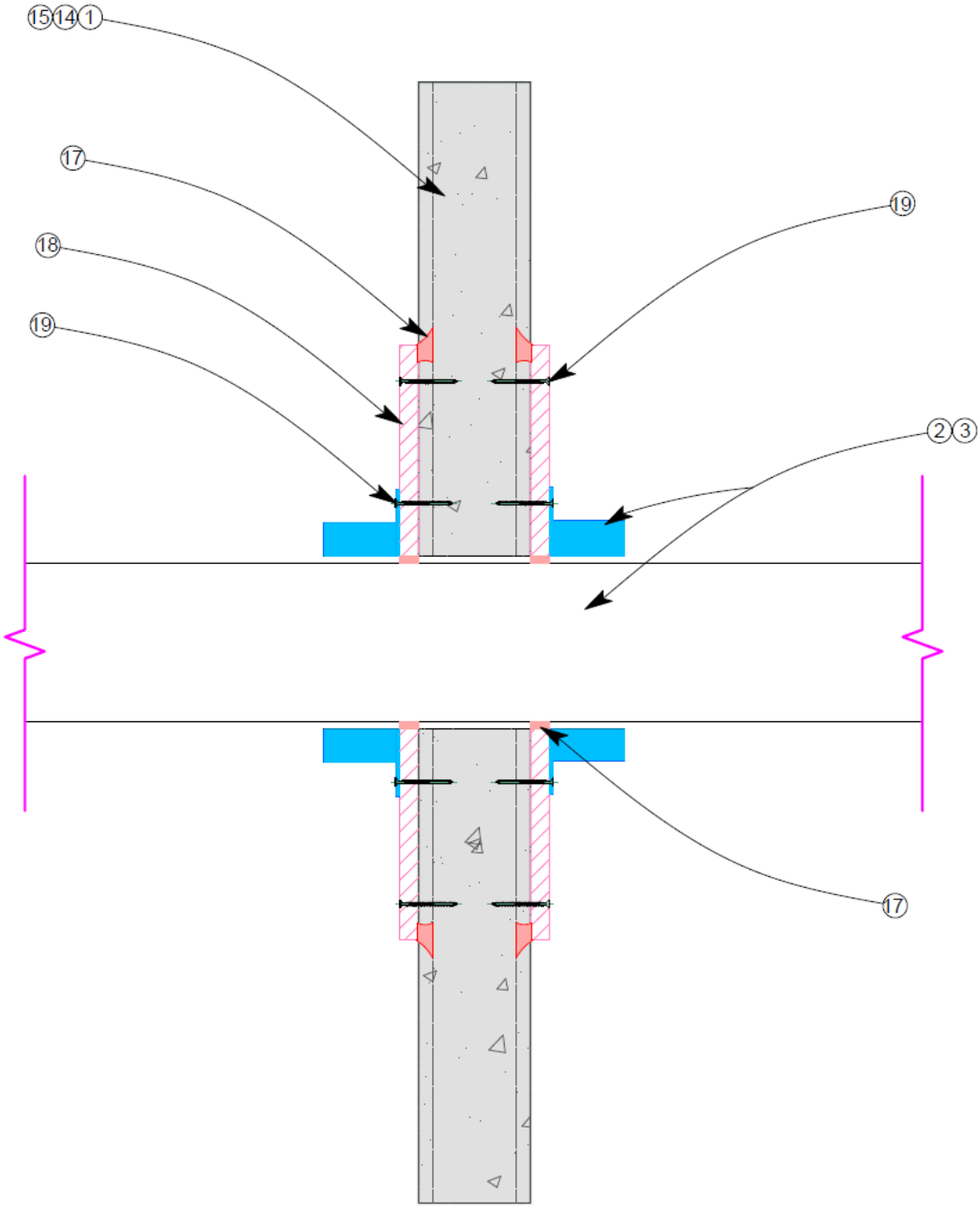


Figure 18 – uPVC Pipes with PROMASEAL® FC Collars – Collar fitted flush to a single layer of 13mm fire rated plasterboard build-up on both sides of the Speedpanel wall surface (FRL from either side)

4 REFERENCED TEST PROCEDURES

This report is prepared with reference to the requirements of AS 1530.4- 2005 and AS4072-2005 as appropriate.

5 FORMAL ASSESSMENT SUMMARY

On the basis of the discussion presented in this report, it is the opinion of this testing authority that if the tested prototypes described in Section 2 had been varied as in Section 3, they will achieve the fire resistance performances below if tested in accordance with the test method referenced in Section 4 and subject to the requirements of Section 7.

Table 2 - Performance of Plastic Pipes

Pipe Material	Outside Diameter	Pipe Wall Thickness	Pipe Collar	Construction Detail	FRL
uPVC	158mm	4.3mm	FC150	Figure 1-4 and 5	**-/120/60**
	105mm	3.5mm	FC100		**-/120/60**
	42.8mm	2.2mm	FC40		**-/120/120**
	105mm	3.4 to 4.3mm	FC100	Figures 15 to 18	**-/60/60 (51mm Panel)** **-/90/90 (64mm Panel)** **-/120/120 (78mm Panel)**
	158mm	4.0 to 6.5mm	FC150		
HDPE	317mm	13.5mm	PROMASEAL ® FC300	Figure 1-4 and 12	**-/120/120**

Table 3 - Performance of Metal Pipes

Pipe Material	Diameter	Pipe Wall Thickness	Construction Detail	FRL
Copper or Ferrous	150mm	2mm	Figure 1-4, 6 and 9	**-/120/-**
	102mm	1.2mm		**-/120/-**
	32mm	0.91mm		**-/120/-**
Copper	200mm	2mm		**-/120/-**

Table 4 - Performance of Insulated Metal Pipes

Pipe Material	Diameter	Pipe Wall Thickness	Rockwool Insulation	Construction Detail	FRL
Copper or Ferrous	150mm	2mm	38mm Fibretex 450 Rockwool 600mm each side only **OR** 50mm Fibretex 820 Rockwool 600mm each side and continuous through wall	Figures 1-4, 6, 7 and 8	**-/120/120**
	102mm	1.2mm			**-/120/120**
	32mm	0.91mm			**-/120/120**
Ferrous	320mm	2mm	50mm Fibretex 820 Rockwool 600mm each side **AND** continuous through wall	Figures 1-4, 6, 10 and 11	**-/120/120**

Table 5 - uPVC Pipes Protected with PROMASEAL® FCW collars in Walls

Pipe Material	Pipe and Collar Size			Wall Depth (mm)	Sealant Fillet (mm)	Refer Figure	FRL
	Pipe OD (mm)	Pipe Wall (mm)	Collar Code No.				
uPVC	43	2.2	FCW 40	51	35	Figure 1-4 and 13	**-/60/60**
	56	3	FCW 50	64	28	Figure 1-4 and 13	**-/90/90**
	69	2.9	FCW 65				
	83	3.4	FCW 80	78	21	Figure 1-4, 13 or 14	**-/120/120**
	111	3.7	FCW 100				

6 DIRECT FIELD OF APPLICATION

The results of this assessment are applicable to pipes penetrating walls when exposed to fire from either side of the wall.

7 REQUIREMENTS

This report details the methods of construction, test conditions and assessed results that would have been expected had the specific elements of construction described herein been tested in accordance with AS 1530.4- 2005.

Any further variations with respect to size, constructional details, loads, stresses, edge or end conditions, other than those identified in this report, may invalidate the conclusions drawn in this report.

8 VALIDITY

This assessment report does not provide an endorsement by Exova Warringtonfire Aus Pty Ltd of the actual products supplied.

The conclusions of this assessment 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 conditions.

Because of the nature of fire testing, and the consequent difficulty in quantifying the uncertainty of measurement, it is not possible to provide a stated degree of accuracy. The inherent variability in test procedures, materials and methods of construction, and installation may lead to variations in performance between elements of similar construction.

The assessment can therefore only relate only to the actual prototype test specimens, testing conditions, and methodology described in the supporting data, and does not imply any performance abilities of constructions of subsequent manufacture.

This assessment is based on information and experience available at the time of preparation. The published procedures for the conduct of tests and the assessment of test results are the subject of constant review and improvement and it is recommended that this report be reviewed on or, before, the stated expiry date.

The information contained in this report shall not be used for the assessment of variations other than those stated in the conclusions above. The assessment is valid provided no

modifications are made to the systems detailed in this report. All details of construction should be consistent with the requirements stated in the relevant test reports and all referenced documents.

9 AUTHORITY

9.1 APPLICANT UNDERTAKINGS AND CONDITIONS OF USE

By using this report as evidence of compliance or performance, the applicant(s) confirms that:

- to their knowledge the component or element of structure, which is the subject of this assessment, has not been subjected to a fire test to the Standard against which this assessment is being made, and
- they agree to withdraw this assessment from circulation should the component or element of structure be the subject of a fire test by a test authority in accordance with the Standard against which this assessment is being made and the results are not in agreement with this assessment, and
- they are not aware of any information that could adversely affect the conclusions of this assessment and if they subsequently become aware of any such information, agree to ask the assessing authority to withdraw the assessment.

9.2 GENERAL CONDITIONS OF USE

This report may only be reproduced in full without modifications by the report sponsor. Copies, extracts or abridgments of this report in any form shall not be published by other organisations or individuals without the permission of Exova Warringtonfire Aus Pty Ltd.

9.3 AUTHORISATION ON BEHALF OF EXOVA WARRINGTONFIRE AUS PTY LTD

Prepared by:

O.Saad

Reviewed by:

C M McLean

9.4 DATE OF ISSUE

16/02/2017

9.5 EXPIRY DATE

31/12/2021

APPENDIX A - SUMMARY OF SUPPORTING DATA

A.1 TEST REPORT- EWFA 2517300.2

A.1.1 Report Sponsor

A.1.1.1 Speedpanel (VIC) Pty. Ltd., 89-91 Canterbury Road, Kilsyth, VIC, 3137.

A.1.2 Test Laboratory

A.1.2.1 Exova Warringtonfire Aus Pty Ltd, Unit 2, 409-411 Hammond Road, Dandenong, Victoria 3175, Australia.

A.1.3 Test Date

A.1.4 The fire resistance test was conducted on 27th October, 2010.

A.1.5 Test standards prescribed

A.1.5.1 The test was performed in accordance with the requirements of AS1530.4-2005 sections 2 and 10 as appropriate.

A.1.5.2 The dampers were not tested in full accordance with AS1530.4-2005. Specifically, a pressure difference was not applied across the damper. In this assessment, only the behaviour of the junctions of the damper and the wall will be considered, as this was in accordance with AS1530.4-2005.

A.1.6 General description of tested specimens

A.1.6.1 The test assembly comprised a nominal 3000mm wide x 3000mm high x 77mm thick non load-bearing Speedpanel panel wall system.

A.1.6.2 The panels were stitched together on the unexposed side only at 1500mm centres.

A.1.6.3 The wall incorporated five pipe penetration systems, one cable tray and four dampers. Only the performance of the pipes is relevant to this assessment.

A.1.6.4 The details of the pipes are provided below:

Specimen	Protection	Size
E	FC150 collar	158mm x 4.3mm
F	PROMASEAL® Supa Mastic Sealant	31.75mm x 0.91mm
G	FC100 collar	105mm x 3.5mm
H	FC40 collar	42.8mm x 2.2mm
I	PROMASEAL® Supa Mastic Sealant	101.6mm x 1.22mm

A.1.7 Instrumentation

A.1.7.1 The instrumentation was provided in accordance with AS1530.4-2005, except for the variations previously stated

A.1.8 Test Results

A.1.8.1 The test duration was 195 minutes.

A.1.8.2 The pipe specimens achieved the following performance:

Specimen	Integrity (mins)	Insulation (mins)
E	147	67
F	161	-
G	195*	76
H	195*	139
I	195*	-

* No failure recorded during test duration

A.2 TEST REPORT - EWFA 2683500

A.2.1 Report Sponsor

A.2.1.1 Exova Warringtonfire Unit 2, 409-411 Hammond Road, Dandenong, VIC, 3175.

A.2.2 Test Laboratory

A.2.2.1 Exova Warringtonfire Unit 2, 409-411 Hammond Road, Dandenong, VIC, 3175.

A.2.3 Test Date

A.2.3.1 The fire resistance test was conducted on 11th January, 2012.

A.2.4 Test Standard

A.2.4.1 The test was conducted in accordance with AS1530.4-2005 and AS4072.1-2005.

A.2.5 Variations to Test Method

A.2.5.1 None stated.

A.2.6 General Description of Tested Specimen

A.2.6.1 The supporting construction comprised a 1.2m × 1.2m steel-framed plasterboard wall. The studs were 64mm studs in box configuration and were clad with three layers of 13mm thick CSR Gyprock Fyrchek on the exposed side and two layers of 13mm thick CSR Gyprock Fyrchek on the unexposed side. The overall thickness of the specimen was 97mm.

A.2.6.2 Two penetrations were included within the wall system, the details of which are provided below:

ID	Description	Protection	Support
1	Single-core XLPE insulated, PVC sheathed 0.6/1 kV 630mm^2 cable	PROMASEAL® Supa Mastic sealant in annular gap between cable and plasterboard to depth of plasterboard in addition to a 30mm fillet around cable-wall interface. Cable was wrapped with a single layer of Bradford Fibertex 450 blanket with a nominal 50mm overlap, with the wrap extending from the wall, 500mm down the cable. The wrap was secured using 3-off metal cable ties 50mm from each end and at the centre.	On unexposed side, 200mm and 550mm from the unexposed face.
2	150mm × 2.03mm thick type B copper pipe	PROMASEAL® Supa Mastic sealant in annular gap between pipe and plasterboard to depth of plasterboard in addition to a 30mm fillet around pipe-wall interface. Pipe was wrapped with a single layer of Bradford Fibertex 450 blanket with a nominal 50mm overlap, with the wrap extending from the wall, 500mm down the pipe. The wrap was secured using 3-off metal cable ties 50mm from each end and at the centre.	On unexposed side, 200mm and 550mm from the unexposed face.

A.2.6.3 The copper pipe extended 700mm (with 200mm un-insulated) on the unexposed side and 700mm (including the internal end cap and with 200mm un-insulated) on the exposed side.

A.2.7 Instrumentation

A.2.7.1 The instrumentation was provided and applied in accordance with AS1530.4-2005 with additional thermocouples at the unexposed ends of both specimens.

A.2.8 Test Results

A.2.8.1 The test duration was 241 minutes.

A.2.8.2 The ambient temperature was 24°C.

A.2.8.3 The specimens achieved the following performance when evaluated against the failure criteria of AS1530.4-1997:

Specimen	Integrity	Insulation
1	No failure at 241 minutes.	67 minutes.
2	189 minutes.	116 minutes.

A.2.8.4 The maximum temperature on the insulation 25mm from the wall at 120 minutes was 199°C.

A.2.8.5 The maximum temperature on the pipe 25mm from the end of the insulation at 120 minutes was 254°C.

A.2.8.6 The maximum temperature on the wall 25mm from the pipe at 120 minutes was 199°C.

A.2.8.7 The maximum temperature on the insulation 25mm from the end of the insulation at 120 minutes was 102°C.

A.3 TEST REPORT- FSP 1470

A.3.1 Report Sponsor

A.3.1.1 Lend Lease Project Management & Construction (Australia) Pty Ltd, 30 Hickson Road, Millers Point NSW.

A.3.2 Test Laboratory

A.3.2.1 CSIRO-Materials Science and Engineering, 14 Julius Avenue, Riverside Corporate Park, North Ryde, NSW 2113.

A.3.3 Test Date

A.3.3.1 The fire resistance test was conducted on 15th April 2011.

A.3.4 Test standards prescribed

A.3.4.1 The test was performed in accordance with the requirements of AS1530.4-2005 sections 2 and 10 as appropriate.

A.3.5 General description of tested specimens

A.3.5.1 The test assembly comprised a nominal 1200mm wide × 1200mm high × 156mm thick non load-bearing Powerscape steel framed wall system, consisting of 92mm wide metal studs clad on both sides with two layers of 16mm thick Powerscape board.

A.3.5.2 The wall was penetrated by a nominally 325mm O.D, steel pipe with a nominal wall thickness of 10mm.

A.3.5.3 The details of steel pipe are given below:

Specimen	Size	Protection	Length	Support
Steel Pipe	O.D.325mm ×10mm	Wrapped with a nominal 50mm thick Fibretex 820 Rockwool insulation of 100mm extension on the exposed side and 300mm extension on the unexposed side. Gap sealed with 10mm Promaseal IBS rod and Hilti CP 606 sealant fillet on the exposed side and Promaseal Supamastic sealant fillet on the unexposed side. Capped on the exposed side	660mm long on the unexposed side and 500mm long on the exposed side	The supports comprised of a brick pier on the exposed end and a steel support stand on the unexposed end of the pipe.

A.3.5.4 The ambient temperature was 15℃ and the test was terminated at 121 minutes.

A.3.5.5 The average furnace temperature at 60 minute was 942℃

A.3.5.6 The maximum temperature rise limit of 180K has been exceeded on top of the metal pipe, 25mm from the end of the insulation cladding at 56 minutes

A.3.5.7 The maximum temperature rise limit of 180K has been exceeded on top of the insulation cladding, 25mm from the face of the wall at 110 minute.

A.3.5.8 There was no integrity failure for 121 minutes test period.

A.4 TEST REPORT – FSRG A-08-528

A.4.1 Report Sponsor

A.4.1.1 Promat Australia Pty Ltd, Unit 1/175 Briens Road, Northmead, NSW, 2152.

A.4.2 Test Laboratory

A.4.2.1 Fire Science Research Group, 1 Scotland Road, Mile End South, Adelaide, SA, 5031.

A.4.3 Test Date

A.4.3.1 The fire resistance test was conducted on 1st February, 2008.

A.4.4 Test Standard

A.4.4.1 The test was conducted in accordance with AS1530.4-2005 and AS4072.1-2005.

A.4.5 Variations to Test Method

A.4.5.1 None.

A.4.6 General Description of Tested Specimen

A.4.6.1 The separating element frame consisted of 64mm wide steel studs and tracks (0.5mm) with vertical studs spaced at 600mm centres. Two layers of 16mm Fyrchek boards were fixed to both faces of the frame into the vertical studs with 6g × 40mm S-point screws at 300mm centres. Horizontal joints were sealed with one layer of Easy-Finish topping compound.

A.4.6.2 One pipe penetrations was included within the wall system, the details of which are provided below:

Specimen	Description	Protection	Support
A	Ø317mm × 13.5mm HDPE pipe	Annular gap between pipe and wall sealed to depth of board with PROMASEAL® AN Acrylic sealant. PROMASEAL® FC300 collar fixed to both sides of the wall.	On unexposed side, 500mm, 1250mm and 2270mm from the unexposed face.

A.4.6.3 The plastic pipes above extended 500mm and 4200mm on the exposed and unexposed sides respectively, and were capped on the exposed side.

A.4.7 Instrumentation

A.4.7.1 The instrumentation was provided and applied in accordance with AS1530.4-2005.

A.4.8 Test Results

A.4.8.1 The test duration was 182minutes.

A.4.8.2 The specimen achieved the following performance when evaluated against the failure criteria of AS1530.4-2005:

Specimen	Integrity	Insulation
A	No failure at 182 minutes	No failure at 182 minutes

A.5 TEST REPORT – EWFA 2798800.1_AS

A.5.1 Test Sponsor

A.5.1.1 Speedpanel Vic, Pty. Ltd., 89-91 Canterbury Road, Kilsyth, Vic 3137.

A.5.2 Test Laboratory

A.5.2.1 Exova Warringtonfire Aus Pty Ltd, Unit 2, 409-411 Hammond Road, Dandenong, VIC 3175.

A.5.3 Test Date

A.5.3.1 The test was conducted on 29th January 2013.

A.5.4 Test standard prescribed

A.5.4.1 The test was stated to be conducted in accordance with AS 1530.4-2005

A.5.5 Variations to Test Standard

A.5.5.1 No significant departures from the test methods.

A.5.6 Description of Tested Assembly

A.5.6.1 The test assembly comprised a nominal 1200mm wide × 1200mm high × 51mm thick Speedpanel wall system penetrated by various services.

A.5.6.2 For the purpose of the assessment, only Penetrations B and D are relevant and details of the service penetrations are summaries below:

ID	Pipe	Collar	Protection	Support
B	Ø42.9mm (OD) × 2.2mm uPVC pipe	PROMASEAL® FCW 40 collar installed centrally in the wall with gap sealed with Hilti CP 606	Hilti CP 606 was applied in the annular gap between collar and aperture to full depth of the wall. Sealant was finished off with 20mm sealant fillet on the unexposed side only.	On unexposed side, 530mm and 2000mm from the unexposed face.
D	Ø68.9mm × 2.8mm uPVC pipe	PROMASEAL® FCW 100 collar installed centrally in the wall with gap sealed with Hilti CP 606	Hilti CP 606 was applied in the annular gap between collar and aperture to full depth of the wall. Sealant was finished off with 20mm sealant fillet on the unexposed side only.	On unexposed side, 500mm and 1500mm from the unexposed face.

A.5.7 Instrumentation

A.5.7.1 The test instrumentation was stated to be in accordance with AS 1530.4-2005.

A.5.8 Results

A.5.8.1 The test was terminated at 132 minutes.

A.5.8.2 The ambient temperature at the start of the test was 23°C and did not vary significantly throughout the duration of the test.

A.5.8.3 **PERFORMANCE OF THE SERVICE PENETRATIONS ARE SUMMARIES BELOW:**

ID	Integrity	Insulation	Note
B	No failure at 132 minutes	Failure at 28 minutes	At 28 and 29 mins, the temperatures measured on the collar exceeded 180K rise. At 56 and 82 mins, the temperatures measured at 25mm from collar on the wall exceeded 180K rise
D	No failure at 132 minutes	Failure at 27 minutes	At 27 mins, the temperature measured on the collar exceeded 180K rise. At 75 and 76 mins, the temperatures measured at 25mm from collar on the wall exceeded 180K rise

A.6 TEST REPORT – WFRA F91622

A.6.1 Report Sponsor

A.6.1.1 Promat Fyreguard Pty Ltd, 10 Rosslyn Street, Mile End, SA 5031.

A.6.2 Test Laboratory

A.6.2.1 Warrington Fire Research (Aust) Pty Ltd, Unit 2, 409-411 Hammond Rd, Dandenong, Vic 3175.

A.6.3 Test Date

A.6.3.1 The fire resistance test was conducted on 18th October, 1995.

A.6.4 Test standards prescribed

A.6.4.1 The test was conducted in general accordance with AS1530.4- 1990.

A.6.5 General description of tested specimens

A.6.5.1 The test specimen comprised a 1.1m x 1.1m x 128mm thick framed wall constructed with 64mm studs clad either side with two layers of 16mm Gyprock Fyrchek plasterboard. The wall contained five service penetrations. Those relevant to this assessment are summarised below:

Ref.	Material	Dimensions (mm)	Protection
B	uPVC	Ø69 x 2.9	Fyreguard insert wall collar (FCW)
C		Ø83 x 3.4	

A.6.5.2 The pipes extended 2000mm on the unexposed side and 130mm on the fire side.

A.6.5.3 The 32mm deep annular gaps each side and between the Fyreguard insert wall collar and wall linings were sealed with Fyreseal mastic.

A.6.6 Instrumentation

A.6.6.1 The instrumentation was in general accordance with AS1530.4- 1990.

A.6.7 Results

A.6.7.1 The furnace pressure at the centre of the lowest penetration was maintained at approximately 8.0Pa.

A.6.7.2 The performance recorded for the specimens relevant to this assessment are summarised below:

Specimen	Integrity	Max. Temperature Rise (K) at 120 minutes	
		On Wall	On Pipe
69mm uPVC (B)	No failure at 120 minutes	54	35
83mm uPVC (C)	No failure at 120 minutes	71	42

A.7 TEST REPORT – WFRA F91633

A.7.1 Report Sponsor

A.7.1.1 Promat Fyreguard Pty Ltd, 10 Rosslyn Street, Mile End, SA 5031.

A.7.2 Test Laboratory

A.7.2.1 Warrington Fire Research (Aust) Pty Ltd, Unit 2, 409-411 Hammond Rd, Dandenong, Vic 3175.

A.7.3 Test Date

A.7.3.1 The fire resistance test was conducted on 4th December, 1995.

A.7.4 Test standards prescribed

A.7.4.1 The test was conducted in general accordance with AS1530.4- 1990.

A.7.5 General description of tested specimens

A.7.5.1 The test specimen comprised a 1.1m x 1.1m x 128mm thick framed wall constructed with 64mm studs clad either side with two layers of 16mm Gyprock Fyrchek plasterboard. The wall contained five service penetrations. Those relevant to this assessment are summarised below:

Ref.	Material	Dimensions (mm)	Protection
C	uPVC	Ø56 x 3.0	Fyreguard insert wall collar

A.7.5.2 The pipes extended 2000mm on the unexposed side and 125mm on the fire side.

A.7.5.3 The 32mm deep annular gaps each side and between the Fyreguard insert wall collar and wall linings were sealed with Fyreseal mastic.

A.7.6 Instrumentation

A.7.6.1 The instrumentation was in general accordance with AS1530.4- 1990.

A.7.7 Results

A.7.7.1 The furnace pressure at the centre of the lowest penetration was maintained at approximately 8.0Pa.

A.7.7.2 The performance recorded for the specimens relevant to this assessment are summarised below:

Specimen	Integrity	Max. Temperature Rise (K) at 120 minutes	
		On Wall	On Pipe
56mm uPVC	No failure at 121 minutes	63	46

A.8 RELEVANCE OF AS1530.4-1990 TEST DATA TO AS1530.4-2005

A.8.1 General

A.8.1.1 The referenced test reports F91622 and F91633 describe tests conducted in accordance with AS1530.4-1990, which differs from the current standard AS1530.4-2005 and AS4072.1-2005.

A.8.1.2 The potential effect of these differences on specimen performance is discussed below.

Furnace Temperature Measurement

A.8.1.3 The specifications for furnace thermocouples in AS1530.4-2005 are similar to as specified in AS1530.4-1990.

Furnace Temperature Regime

A.8.1.4 AS1530.4-2005 specifies furnace temperature to follow the following trend:

$$T_{AS1530.4\text{-}2005} = 345\log_{10}(8t+1) + 20$$

A.8.1.5 AS1530.4-1990 specifies furnace temperature to follow the following trend:

$$T_{AS1530.4\text{-}1997} = 345\log_{10}(8t+1) + T_0;\ 10℃ \leq T_0 \leq 40℃$$

A.8.1.6 The parameters outlining the accuracy of control of the furnace temperature in AS1530.4-2005 and AS1530.4-1990 are not appreciably different.

Furnace Pressure Regime

A.8.1.7 The furnace pressure level and control parameters in AS1530.4-2005 and AS1530.4-1997 are not appreciably different.

A.8.1.8 For wall elements, AS1530.4-2005 specifies that the pressure established at the lowest penetration is 15Pa.

A.8.1.9 Tests F91622 and F91633 both stated the furnace pressure measured at approximately level with the underside of the lowest penetration seal was maintained at approximately 8Pa.

Specimen

A.8.1.10 The AS1530.4-2005 standard prescribes that, for plastic pipes, the penetrating services shall extend a minimum of 500mm past the separating element into the furnace and a minimum of 2000mm past the separating element away from the furnace. The AS1530.4-1990 standard has the same minimum 2000mm extension requirement away from the furnace, but prescribes only 100mm minimum extension into the furnace. It is confirmed that some of the referenced test specimens did not meet the AS1530.4-2005 requirement for length of extension into the furnace.

A.8.1.11 Since the pipes are plastic, and have a corresponding low melting temperature, the length of the pipe extending into the furnace is not considered to be critical to the performance of the collar, as this length will melt away very early in the test regardless of length. The important aspect of specimen size is the length of pipe extending away from the furnace. This length requirement is 2000mm minimum and identical between the AS1530.4-1990 and AS1530.4-2005 standards.

Specimen Temperature Measurement

A.8.1.12 AS 1530.4-2005 specifies specimen thermocouples as Type K, MIMS thermocouples with a stainless steel sheaf having a wire diameter not exceeding 0.5 mm and an overall diameter of 3mm. The thermocouples shall be supported by a heat-resisting tube with the measuring junction protruding a minimum 25 mm. Each thermocouple shall have the tail of its measuring junction soldered to the centre of a 12mm diameter × 0.2mm thick copper disc. The disc shall be covered by 30 ± 0.5mm × 30 ± 0.5mm × 2.0 ± 0.5mm thick inorganic insulating pad having a density of 900 ± 100kg/m3.

A.8.1.13 AS 1530.4-1990 specifies specimen thermocouples as Type K, MIMS thermocouples with a stainless steel sheaf having a wire diameter not exceeding 0.5 mm and an overall diameter of 3mm. The thermocouples shall be supported by a heat-resisting tube with the measuring junction protruding a minimum 25 mm. Each thermocouple shall have the tail of its measuring junction soldered to the centre of a 12mm diameter × 0.2mm thick copper disc. The disc shall be covered by an oven-dry pad, not less than 30mm square, made from material having a

√kQC value not greater than 150°C, and of such thickness as will give a thermal resistance (R = t/K) of 0.015 K/W – 0.025 K/W at 150°C.

A.8.1.14 For penetrating elements, AS1530.4-2005 requires thermocouples to be located as follows:

A.8.1.15 At not less than two points located approximately 25mm from the edge of the hole made for the passage of the service (one in uppermost vertical plane).

A.8.1.16 At least two points 25mm from the plane of the penetrated element and insulated topping, if any (one in uppermost vertical plane). Where the insulation or packing is taped or stepped, two additional thermocouples beyond the end of the step/taper if higher temperatures are expected at these points.

A.8.1.17 Where practicable, at two points on the packing around the penetrating service.

A.8.1.18 Before/during the heating period, additional thermocouples at any point appearing hotter than the points being measured.

A.8.1.19 For the specimen constructions considered in this assessment, AS1530.4-1907 differs only in that it does not require thermocouples 400mm from the separating element.

Integrity Performance Criteria

A.8.1.20 AS1530.4-2005 deems integrity failure to have occurred upon collapse, sustained (10 seconds) flaming, ignition of an applied cotton pad or if a 6mm gap gauge can protrude into the furnace and can be moved 150mm along the gap (not applicable at the sill), or if a 25mm gap gauge can protrude into the furnace.

A.8.1.21 AS 1530.4-1990 deems integrity failure to occur upon collapse, the development of cracks, fissures or, other openings through which flames or hot gases can pass. AS1530.4-1990 differs in that it does not require the application of a cotton pad.

A.8.1.22 The integrity performance of the specimen tested in WFRA F91566, FP 1613, NI 4290 and NI 3790 should be used with caution after gaps formed in the specimen as the report does not include details of the cotton pads applied.

Insulation Performance Criteria

A.8.1.23 For plastic pipe services, AS1530.4-2005 deems insulation failure to have occurred upon a measured temperature rise of 180K by any of the specimen thermocouples. The insulation failure criterion in AS1530.4-1990 is the same.

A.8.2 Application of Test Data to AS1530.4-2005

A.8.2.1 The minor variations in furnace heating regimes and specimen thermocouple specification are not considered likely to significantly affect the behaviour of the specimens relevant to this assessment.

A.8.2.2 For the specimens tested in F91622 and F91633, though the furnace pressure at the penetrations was lower than that required by AS1530.4-2005, there was no integrity failure during the test duration. It is therefore considered no gaps were formed during the test and hence the effect of the furnace pressure is expected to be minor.

A.8.2.3 In light of the above, it is considered that the behaviour of the specimens relevant to this assessment in tests F91622 and F91633 can be used as indicative of the relative integrity and insulation performance if similar specimens were tested in accordance with AS1530.4-2005.

A.9 TEST REPORT – BWA 2286900.5

A.9.1 Test Sponsor

A.9.1.1 Speedpanel Vic, Pty. Ltd., 89-91 Canterbury Road, Kilsyth, Vic 3137.

A.9.2 Test Laboratory

A.9.2.1 Bodycote Warringtonfire Aus Pty Ltd, Unit 2, 409-411 Hammond Road, Dandenong, Victoria 3175, Australia.

A.9.3 Test Date

A.9.3.1 The test was conducted on 18th August 2008.

A.9.4 Test standard prescribed

A.9.4.1 The test was conducted in accordance with AS 1530.4-2005 Sections 2 & 3.

A.9.5 Variations to Test Standard

A.9.5.1 None

A.9.6 Description of Tested Assembly

A.9.6.1 The test specimen comprised a nominal 2790mm wide x 3000mm high x 78mm thick loadbearing wall made of vertically oriented 78mm thick Speedpanel panels that incorporated a “tongue and groove” detail on their vertical edges. The panels were made form 0.42mm galvanized mild steel.

A.9.6.2 The perimeter framing comprised 83mm wide x 58mm high x 1.2mm thick steel C-tracks on the top and bottom of the wall system. End cap on the west side was 50mm wide x 59mm high x 0.6mm thick C-track and on the east side was 17mm wide x 60mm high x 0.6mm thick C-track.

A.9.6.3 The panels were fixed to the top and bottom C-tracks at nominal 250mm centres and fixed to each other along the horizontal centreline on both exposed and unexposed sides with 15mm long self-tapping screws.

A.9.6.4 Fire rated acrylic sealant was used to seal any gaps in the construction prior to testing.

A.9.6.5 The wall was loaded from the base of the wall at six points at 500mm centres. The average load that was applied at each point for the duration of the test was approximately 2.0kN per load point (4.3kN/m).

A.9.7 Instrumentation

A.9.7.1 The test instrumentation was in accordance with AS 1530.4-2005.

A.9.8 Conditioning

A.9.8.1 The test load was applied to the wall for 15 minutes prior to the commencement of the fire resistance test.

A.9.9 Results

A.9.9.1 The test was terminated at 144 minutes.

A.9.9.2 The ambient temperature at the start of the test was 29°C and varied between 29°C and 30°C during the test.

A.9.9.3 The specimen achieved the following performance :

Criteria	Performance
Structural adequacy	144 minutes
Integrity	120 minutes Ignition of sealant at interface of top C-track and panel initiated failure of specimen by sustained flaming for longer than 10 seconds.
Insulation	64 minutes Maximum temperature on top C-track (T/C B6) exceeded 180 K

Criteria	Performance
(Wall System)	above the initial temperature.
Insulation (Panel only)	80 minutes Maximum temperature 15 mm from the edge of a vertical joint (T/C B8) exceeded 180 K above the initial temperature.

A.10 TEST REPORT – EWFA 2848300.2

A.10.1 Test Sponsor

A.10.1.1 Speedpanel Vic, Pty. Ltd., 89-91 Canterbury Road, Kilsyth, Vic 3137.

A.10.2 Test Laboratory

A.10.2.1 Exova Warringtonfire Aus Pty Ltd, Unit 2, 409-411 Hammond Road, Dandenong, VIC 3175.

A.10.3 Test Date

A.10.3.1 The test was conducted on 29th May 2013

A.10.4 Test standard prescribed

A.10.4.1 The test was stated to be conducted in accordance with AS 1530.4-2005

A.10.5 Variations to Test Standard

A.10.5.1 None.

A.10.6 Description of Tested Assembly

A.10.6.1 The test assembly comprised a nominal 3000mm wide × 3000mm high × 64mm thick Speedpanel wall system.

A.10.6.2 The tested configuration incorporated 64mm thick Speedpanel panels vertically orientated to form a vertical wall system with 0.75mm BMT perimeter track. The panels incorporate a 'tongue and groove' detail on their vertical edges.

A.10.6.3 The side and bottom tracks were made of 67mm wide × 51mm deep × 0.8mm galvanised steel track.

A.10.6.4 Flat top self-drilling, zinc coated steel screws, 10g × 16mm fixed the side tracks to the panels at 500mm centres on exposed and unexposed side.

A.10.6.5 Flat top self-drilling, zinc coated steel screws, 10g × 30mm, fixed the head and bottom tracks to the panels at every second panel join on both exposed and unexposed sides. Head fixings were staggered.

A.10.6.6 Flat top self-drilling, zinc coated steel screws, 10g × 16mm used to fix panels to each other at every second panel join at 1500mm height from bottom on both exposed and unexposed sides.

A.10.6.7 These fixings were staggered such that one join had one screw fixing at 1500mm height.

A.10.6.8 Hilti CP 606 Fire resistant joint filler applied to the joints between the panel and the C-track at head, base and vertical edges on both exposed and unexposed sides and also applied to joints between tracks and surround block work along head, base and fixed edges.

A.10.7 Instrumentation

A.10.7.1 The test instrumentation was stated to be in accordance with AS 1530.4-2005.

A.10.8 Results

A.10.8.1 The test was terminated at 181 minutes.

A.10.8.2 The ambient temperature at the start of the test was 18°C and did not vary significantly throughout the duration of the test.

Wall Panel Performance

Criteria	Result	Location
Structural Adequacy	Not applicable	Not applicable
Integrity	No failure	Not applicable
Insulation	93 minutes	The maximum temperature measured at 15mm from a vertical join exceeded the maximum temperature rise of 180K.

A.11 TEST REPORT – EWFA 2736002.1

A.11.1 Test Sponsor

A.11.1.1 Speedpanel Vic, Pty. Ltd., 89-91 Canterbury Road, Kilsyth, Vic 3137.

A.11.2 Test Laboratory

A.11.2.1 Exova Warringtonfire Aus Pty Ltd, Unit 2, 409-411 Hammond Road, Dandenong, Victoria 3175, Australia.

A.11.3 Test Date

A.11.3.1 The test was conducted on 13th July 2012.

A.11.4 Test standard prescribed

A.11.4.1 The test was conducted in accordance with AS 1530.4-2005.

A.11.5 Variations to Test Standard

A.11.5.1 Average furnace temperature was outside the limits prescribed in AS1530.4-2005 Clause 2.10.2.2(a) between 21 minutes and 22 minutes 25 seconds.

A.11.6 Description of Tested Assembly

A.11.6.1 The test specimen comprised a nominal 3010mm wide x 2970mm high x 51mm thick loadbearing wall made of vertically orientated 255mm wide ×51mm thick Speedpanel panels that incorporated a “tongue and groove” detail on their vertical edges. The panels were made from 0.2mm BMT (0.27mm measured thickness) galvanised mild steel. Steel skin was joined on male and female sides with pop-rivets at nominal 50mm centres.

A.11.6.2 The test assembly was asymmetric with the West edge fixed and the East edge free from lateral restraint from the formal segment of the test. The fixed edge was then released for the second stage of the test.

A.11.6.3 The perimeter framing comprised two kinds of head tracks. The west side head track was 885mm long × 53mm deep × 50mm high × 1.01mm thick (measured) galvanised steel C-track with intumescent strip in channels in web. 2-off 2mm thick × 9mm wide strips, 2-off 4mm thick × 10mm wide strips and 1-off 4mm thick ×7mm wide strips were fixed on the top face of the track web and 2-off 4mm thick × 10mm wide and 1-off 4mm thick × 7mm wide strips on the bottom face of the track web. Strips were held in place using Firetherm Intumastic acrylic sealant mastic.

A.11.6.4 The east side head track was 2135mm long × 55mm deep ×50mm high × 0.75mm (measured) galvanised steel C-track with intumescent strips installed in a similar manner to the west side head track.

A.11.6.5 The head track fixed to the lintel with 6.5mm × 50mm galvanised steel spikes, mushroom head at 400mm centres.

A.11.6.6 The perimeter framing also comprised side tracks were made of 56mm deep × 55mm wide × 0.6mm thick (measured) galvanised steel C-track and bottom track was made of 55mm deep × 52mm wide × 1.21mm thick (measured) galvanised steel C-track.

A.11.6.7 The panels were fixed to the top and bottom C-tracks at nominal 500mm centres and fixed to each other along the horizontal centreline` on both exposed and unexposed side with 16mm long self tapping screws.

A.11.6.8 Hilti CP 606 Fire Resistance Acoustic Mastic was used to seal any gaps in the construction prior to testing.

A.11.6.9 A load of 2.876kN was applied at three points 1450mm apart at the base of the wall. The applied load at each hydraulic jack was 0.959kN and was applied for the duration of the formal part of the test. The load was later increased and post-test observations were collected.

A.11.7 Instrumentation

A.11.7.1 The test instrumentation was in accordance with AS 1530.4-2005.

A.11.8 Results

A.11.8.1 The ambient temperature at the start of the test was 15°C and varied between 15°C and 18°C during the test.

A.11.8.2 The test was terminated at 94 minutes.

A.11.8.3 Formal part of the test was terminated at 66 minutes and specimen prepared for load increased section of test and furnace operation continued. Fixed edge screws were removed.

A.11.8.4 A load of 2.876kN was applied via 3-off points at the bottom of the wall. The load was applied for the duration of the formal part of the test. The load was later gradually increased up to 15.15kN.

A.11.8.5 The deflection measured at the centre of wall at 60 minutes was 162mm. The centre deflection increased to 240mm when the applied load increased to 15.15kN.

A.11.8.6 The concrete lintel spalled heavily during the test affecting the validity of some of the thermocouple readings along the head of the specimen. Thermocouples 031 to 033, 034 to 035, and 047-049 were not affected.

A.11.8.7 The specimen achieved the following performance :

Criteria	Performance
Structural adequacy	No failure at 66 minutes
Integrity	No failure at 66 minutes
Insulation (Head Track)	Failed at 23 minutes, Maximum temperature on head C-track (T/C 017) exceeded 180K rise above the initial temperature. Maximum temperature on top C-track (T/C B6) exceeded 180 K above the initial temperature.
Insulation (Panels only)	Failed at 61 minutes Maximum temperature on top west quarter of panel (T/C 011) exceeded 180K rise above the initial temperature.

A.12 TEST REPORT – FSRG A-14-903

A.12.1 Report Sponsor

A.12.1.1 Promat Australia Pty Ltd, Unit 1/175 Briens Road, Northmead, NSW, 2152.

A.12.2 Test Laboratory

A.12.2.1 Fire Science Research Group, 1 Scotland Road, Mile End South, Adelaide, SA, 5031.

A.12.3 Test Date

A.12.3.1 The fire resistance test was conducted on 31st July 2014.

A.12.4 Test Standard

A.12.4.1 The test was conducted in accordance with AS1530.4-2005 and AS4072.1-2005.

A.12.5 Variations to Test Method

A.12.5.1 None.

A.12.6 General Description of Tested Specimen

A.12.6.1 The separating element consisted of a refractory concrete slab 1860mm x 1860mm x 120mm thick with a 1000mm x 1000mmm opening at its centre, 5 individual concrete slabs were then poured into the centre of the slab to form 4 individual control joints at 120mm thick.

A.12.6.2 For the purpose of the assessment, only Specimen B.1 and B.2 are relevant and the details of the specimens are summarised below.

Specimen B.1

A.12.6.3 A 500mm long x 20mm wide control joint in a 120mm thick concrete slab protected by a system containing 29mm raw foam backing rod inserted into the control joint from the top to a depth of 10mm as well as from the bottom to a depth of 10mm, the 10mm was then filled top and bottom with PROMASEAL® Supa Mastic flush with the top and bottom of the slab.

Specimen B.2

A.12.6.4 A 500mm long x 20mm wide control joint in a 120mm thick concrete slab protected by a system containing 29mm raw foam backing rod inserted into the control joint from the top as well as from the bottom to a depth of 10mm, the 10mm was then filled top and bottom with PROMASEAL® Supa Mastic flush with the top and bottom of the slab.

A.12.7 Instrumentation

A.12.7.1 The instrumentation was provided and applied in accordance with AS1530.4-2005.

A.12.8 Test Results

A.12.8.1 The test duration was 244 minutes.

A.12.8.2 The specimen achieved the following performance when evaluated against the failure criteria of AS1530.4-2005:

Specimen	Integrity	Insulation
B.1	232 minutes	217 minutes exceeded the maximum temperature rise on floor slab 229 minutes, exceeded the maximum temperature rise on the unexposed side of sealant.
B.2	No failure at 244 minutes	239 minutes, exceeded the maximum temperature

A.13 TEST REPORT – FSV 0562

A.13.1 Test Sponsor

A.13.1.1 Speedwall Building Product, Lot 4, Liverpool Road

A.13.2 Test Laboratory

A.13.2.1 CSIRO, 14 Julius Avenue, North Ryde, NSW 2133, Australia

A.13.3 Test Date

A.13.3.1 The test was conducted on 26th March 1998

A.13.4 Test standard prescribed

A.13.4.1 The test was stated to be conducted in accordance with AS 1530.4-1997

A.13.5 Variations to Test Standard

A.13.5.1 No significant departures from the requirements of AS 1530.4-1997

A.13.6 Description of Tested Assembly

A.13.6.1 The test assembly comprised a nominal 3000mm wide × 3000mm high × 77mm thick Speedpanel wall. Both faces of the wall (the unexposed and exposed face) where clad with a single layer of plasterboard. From the unexposed face, the left hand side of the wall (Side A) had 10mm standard board directly fixed to it (on both faces) and the right hand side of the wall (Side B) had 13mm fire rated plasterboard fixed directly to it (on both faces).

A.13.7 Instrumentation

A.13.7.1 The test instrumentation was stated to be in accordance with AS 1530.4-1997.

A.13.8 Results

A.13.8.1 The test was terminated at 240 minutes.

A.13.8.2 The ambient temperature at the start of the test was 27°C

A.13.8.3 The maximum temperature recorded on the unexposed side of Side A at 120 minutes was approximately 110°C (over the joint of the board). This equates to a temperature rise of approximately 83°C above ambient.

A.13.8.4 Integrity failure of Side A occurred after 150 minutes due to sustained flaming (flaming more than 10 seconds), on the unexposed face, at the top corner of the plasterboard.

A.13.8.5 The maximum temperature recorded on the unexposed side of Side B at 120 minutes was approximately 85°C (over the joint of the board). This equates to a temperature rise of approximately 58°C above ambient.

A.13.8.6 Integrity failure of Side B occurred after 221 minutes due to sustained flaming (flaming more than 10 seconds), on the unexposed face, at the top corner of the plasterboard.

A.14 TEST REPORT – FR 3754

A.14.1 Test Sponsor

A.14.1.1 Speedwall New Zealand Ltd, 78 Maui Street, Te Rapa Hamilton, New Zealand.

A.14.2 Test Laboratory

A.14.2.1 BRANZ Limited, Moonshire Road, Judgeford, Private Bag 50908, Porirua City, New Zealand.

A.14.3 Test Date

A.14.3.1 The test was conducted on 17th May 2006.

A.14.4 Test standard prescribed

A.14.4.1 The test was conducted in accordance with AS 1530.4-2005 Sections 2 & 3.

A.14.5 Variations to Test Standard

A.14.5.1 None

A.14.6 Description of Tested Assembly

A.14.6.1 The test specimen consisted of a non-loadbearing Speedwall® panel wall 3000mm high by 3000mm wide. The wall comprised eleven interlocking panels (tongue and groove), each 285mm wide × 76mm thick × 2900mm high and one interlocking panel 250mm wide.

A.14.6.2 The panels consisted of a light weight concrete core with 0.44mm thick galvanised steel sheathing to form a 76mm thick panel.

A.14.6.3 The 64mm × 55mm × 1.15mm thick steel angles were fixed to the top, base and left hand perimeter edges of the wall with bolts at 500mm centres. The angles were sealed to the specimen frame and the panels with Bostik Firecaulk fire rated acrylic sealant.

A.14.6.4 The panel were fixed together and to the angles with Hilti DB7 6mm diameter fasteners. The panels were fixed to the angles at the top and base at each end of the panel on each face. Along the left hand vertical edge the panel was fixed to the angle at 400-450mm centres. Each panel was fixed to the next at 1000mm centres.

A.14.6.5 A 10mm expansion gap was provided between the top edge of the panels and the specimen frame, and filled with a bead of sealant. A second set of angles were screws fixed to the unexposed face of the panels at the top, base and left hand side with Hilti DB7 fasteners at 400-450mm centres and a bead of sealant, and to the specimen frame at 500mm centres and a bead of sealant.

A.14.7 Instrumentation

A.14.7.1 The test instrumentation was in accordance with AS 1530.4-2005.

A.14.8 Results

A.14.8.1 The test was terminated at 245 minutes.

A.14.8.2 The ambient temperature at the start of the test was 16℃.

A.14.8.3 The specimen achieved the following performance:

Criteria	Performance
Integrity	No failure at 245 minutes
Insulation (Wall System)	123 minutes, the maximum temperature rise measured by any of the thermocouples exceeded the failure criterion of 180K on the left hand side of the top edge channel.

A.15 ASSESSMENT REPORT – EWFA 29592300.3

A.15.1 Report Sponsor

A.15.1.1 Promat Australia Pty Ltd, 1 Scotland Road, Mile End, SA 5031, Australia

A.15.2 Assessment Laboratory

A.15.2.1 Exova Warringtonfire (Aus) Pty. Ltd., Suite 2002a, 44 Market Street, Sydney, NSW 2000, Australia

A.15.3 Assessment Date

A.15.3.1 The assessment was conducted in 17th February 2015.

A.15.4 Test standard

A.15.4.1 The assessment was conducted in general accordance with AS AS1530.4-2005 and AS4072.1-2005.

A.15.5 Description of Assessment

A.15.5.1 The assessment determines the likely FRL of different Promat penetration systems if installed in fire resistant walls and floors.

A.15.5.2 Included in the assessment are 110mm and 150mm uPVC pipes installed in Speedpanel 78mm thick walls comprising 1 layer of 25mm thick PROMATECT® 50 or PROMATECT® 100 fixed to both faces of the Speedpanel wall.

A.15.5.3 The boards were assessed to be fixed either as one section of board or alternatively multiple sections of board and could be sealed along the board joins with PROMASEAL® AN Acrylic sealant.

A.15.5.4 The boards were fixed with 10g x 40mm coarse thread bugle head screws at 100mm maximum centres.

A.15.5.5 PROMASEAL® AN Acrylic sealant was also located at the edge of the board that was interfaced with the Speedpanel wall. This included the gap between the Speedpanel wall and the board due to the Speedpanel profile.

A.15.5.6 The annualar gap around the pipe was also filled to the depth of the board (i.e. the board thickness)

A.15.6 Assessed results

A.15.6.1 The following uPVC pipe diameters protected with PROMASEAL® FC fire collars were assessed in Speedpanel 78mm thick panel walls:

Pipe Diameter (OD mm)	Pipe wall thickness (mm)	FC Collar Code	FRL
42.8	2.2	FC40	-/ 120/ 120
55.7	2.2	FC50	
68.9	2.8	FC65	
82.5	3.0	FC80	
110.0	4.3	FC100	
158.0	4.3	FC150	

APPENDIX B - ASSESSMENT OF SPECIFIC VARIATIONS

B.1 PLASTIC PIPES PROTECTED WITH PROMAT FC COLLARS

B.1.1 Proposal

B.1.1.1 The uPVC pipes protected by Promat FC fire collars in the proposed construction shall be as tested in EWFA 2517300.2.

B.1.1.2 The proposed construction is to be as tested in EWFA 2517300.2, subject to the following variations:

- Inclusion of a Ø317mm HDPE pipe with a minimum pipe wall thickness of 13.5mm and sealed to wall with PROMASEAL® AN Acrylic sealant. The wall system incorporates a 77mm Speedpanel wall and a 51mm or 64mm steel stud wall frame lined with two layers of 16mm fire grade plasterboard adjacent to the Speedpanel wall to make a minimum thickness of 126mm.

B.1.2 Discussion

Performance of uPVC Pipes

B.1.2.1 The construction tested in EWFA 2517300.2 included uPVC pipes nominally 158mm × 4.3mm, 105mm × 3.5mm and 42.8mm × 2.2mm protected with various Promat FC collars and PROMASEAL® Supa Mastic Sealant, penetrating a 77mm thick Speedpanel wall.

B.1.2.2 When tested the collars achieved performance summarised below:

Pipe Material	Pipe Size	Pipe Collar	Integrity	Insulation
uPVC	158mm x 4.3mm	Promat FC150	147 mins	67mins
	105mm x 3.5mm	Promat FC100	195 mins	76mins
	42.8mm x 2.2mm	Promat FC40	195 mins	139mins

B.1.2.3 It is proposal that wall construction and sealant installation are similar to that tested in EWFA 2517300.2; it is therefore considered there will be no detrimentally significant effect on the performance of uPVC pipes.

B.1.2.4 In light of above, it is considered the proposed construction will achieve performance summarised below if tested in accordance with AS1530.4-2005.

Pipe Material	Pipe Size	Pipe Collar	Integrity	Insulation
uPVC	158mm x 4.3mm	Promat FC150	120 mins	60mins
	105mm x 3.5mm	Promat FC100	180 mins	60mins
	42.8mm x 2.2mm	Promat FC40	180 mins	120mins

Performance of Ø300mm HDPE Pipe

B.1.2.5 With reference to test EWFA 2517300.2 there were some key observations from this test

- The PROMASEAL® SupaMastic sealant used was observed undergo melting during the test. The sealant was employed to fill the profile of the panels on the fire side.
- The heating of the collar was not considered to be attributable it contact with the Speedpanel, since there was no clear correlation between collar temperature and adjacent wall temperature for any of the pipe penetrations tested.

- the fire side collar, once closed, is expected act as a radiant plug of intumescent, emitting radiation towards the non-fire side element. Also, the pipe is considered capable of conducting some heat along its length.

B.1.2.6 In light of the above, three modes of heat transfer have been identified:

- Heat conduction along the plastic pipe
- Hot gas flow through the gap between Speedpanel profile a collar body
- Radiation from fire side intumescent plug to non-fire side assembly.

B.1.2.7 With reference to test FSRG A-08-526, the 300mm HDPE pipe protected with PROMASEAL® FC300 collar installed in a steel framed plasterboard lined wall achieved integrity and insulation performance of 182 minutes with no sign of impending failures during the test.

B.1.2.8 With reference to test FSRG A-08-526, the maximum temperature measured on unexposed side of FC 300 collar was 64℃ and the maximum temperature measured on the unexposed side of HPDE pipe 25mm away from the collar was 39℃ at 120 minutes.

B.1.2.9 The significance of the test result demonstrates the ability of FC collar to close the HDPE pipe and that the integrity is maintained for at least 120 minutes and the collar was twice hotter than the adjacent pipe. This is most easily explained by closure the non-fire side collar, which was observed in the test photographs, thus keeping heat from reaching the non-fire side section of the pipe.

B.1.2.10 The proposed wall construction incorporates a 77mm thick Speedpanel wall penetrated by the tested Ø 317mm HDPE pipe and 2 layers of 16mm fire grade plasterboard lined surround pipe penetration with a minimum coverage of 250mm. The wall conjunction shall have a minimum wall thickness of 128mm.

B.1.2.11 With reference to test FSRG A-08-526, the annular gap between plasterboard lined wall and pipe was sealed with PROMASEAL® AN Acrylic sealant to depth of board.

B.1.2.12 Upon inspection of test observation of test FSRG A-08-526, the tested sealant swelled and hence prevented hot venting passed through the annular gap to the non-fire side element.

B.1.2.13 When the proposed wall conjunction construction is exposed from the Speedpanel side, the additional steel stud wall frame lined with two layers of 16mm fire grade plasterboard will not introduce any foreseeable integrity weakness to the proposed system.

B.1.2.14 It is considered the 77mm thick Speedpanel wall is likely to absorb more heat from the pipe than the plasterboard lining. It is therefore expected the temperature on the unexposed side of the pipe would be similar or slightly lower than tested in FSRG A-08-526.

B.1.2.15 When the proposed wall construction is exposed from the fire grade plasterboard side, it is expected the behaviour of the HDPE pipe would be similar to that tested in FSRG A-08-526.

B.1.2.16 Based on the above, it is confirmed the proposed wall conjunction system with sealant in a similar manner to that tested in FSRG A-08-526 will not have a detrimentally significant effect on the integrity and insulation performance of the tested Ø300mm HDPE pipe protected with PROMASEAL® FC 300 collars if tested in accordance with AS1530.4-2005.

B.2 METAL PIPES

B.2.1 Proposal

B.2.1.1 The proposed construction is to be as tested in EWFA 2517300.2, subject to the following variations:

- Copper and ferrous pipes up to 150mm diameter sealed to wall wrapped with 38mm Fibretex 450 for 600mm each side only or 50mm Fibretex 820 for 600mm each side and continuous through the wall.
- O.D.325mm steel pipe with a minimum pipe wall thickness of 2mm lagged with 50mm thick Fibretex 820 for 600mm each side and continuous through the wall and sealed to wall with Promat Supamastic. The wall system incorporates a 77mm Speedpanel wall and a 51mm or 64mm steel stud wall frame lined with two layers of 16mm fire grade plasterboard adjacent to the Speedpanel wall to make a minimum thickness of 156mm.
- Inclusion of a 200mm copper pipe with a minimum pipe wall thickness of 2mm without insulation.

B.2.2 Discussion

Copper and Ferrous Pipes up to 150mm

Integrity

B.2.2.1 The construction tested in EWFA 2517300.2 included copper pipes nominally 102mm x 1.22 and 32mm x 0.9mm protected with PROMASEAL® Supa Mastic Sealant. When tested the pipes achieved a performance of achieved an integrity performances of 195 minutes and 161 minutes respectively.

B.2.2.2 The construction tested in EWFA 2683500 included copper pipe nominally 150mm × 2mm protected with PROMASEAL® Supa Mastic Sealant, penetrating a steel framed wall lined with three layers of fire grade plasterboard on the exposed side and two layers of fire grade plasterboard on the unexposed side. When tested, the copper pipe achieved a performance of achieved integrity performance of 189 minutes.

B.2.2.3 The proposed construction is to include ferrous metal pipes. This variation is allowed by AS1530.4-2005 Section 10.11.3.2, which states that *'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'*.

B.2.2.4 The proposed 150mm pipes are larger in diameter that the 102mm pipe tested in EWFA2517300.2 and such a conservative approach has been taken to reduce the integrity performance from 195 minutes to 120 minutes to allow for the increase in pipe size.

B.2.2.5 Further confidence in the proposed construction is offered by reference the O.D.325mm lagged steel pipe tested in FSP 1470 sealed to wall with Promat Supamastic. When tested it achieved 121 minutes integrity without failure.

B.2.2.6 Based on the above discussion is confirmed that the results of the copper pipe tests can be applied the following pipes can be considered as equivalent at a given FRL:

Pipe Material	Max. Diameter	Min. Wall Thickness	Integrity Performance
Copper or Ferrous	150mm	2mm	120mins
	102mm	1.2mm	120mins
	32mm	0.91mm	120mins

Insulation

B.2.2.7 With reference to the performance of the specimen tested in EWFA 2683500, the 150mm diameter copper pipe was insulated for 500mm each side of the wall with 38mm Rockwool. When tested it reached a temperature of 254℃ a rise of 230K at 120 minutes.

B.2.2.8 The proposed construction comprises pipes insulated with 600mm length of insulation in lieu of the 500mm tested and fixed with 4 cable ties. The additional length of insulation will reduce the temperature of the part of the pipe that emerges from the insulation on the non-fire side by virtue of a number of simultaneously acting effect. Firstly the length of the protection on the exposed side that sees the radiation effects of the furnace will be longer thereby increasing the distance the heat needs to conduct. Secondly the protection on the non-fire side being further from the furnace will similarly provide a longer distance for the heat to conduct down the pipe.

B.2.2.9 Based on the decrease in exposed temperature of the insulation, the effect of the non-fire side extension of insulation on the exposed pipe can be calculated as below:

$$T_{rise} = \{[199℃-(199℃-102℃) \times (600/500)] \times (245℃/102℃)\}-24℃ = 174K$$

B.2.2.10 The above estimate meets the limiting temperature rise of 180K at 120 minutes, and conservatively ignores the additional protection offered by the additional insulation on the fire side.

B.2.2.11 Based on the above discussion, it is confirmed that a 150mm copper pipe insulated each side with 600mm of 38mm Fibretex 450 Rockwool when penetrating a 97mm plasterboard barrier will achieve an insulation performance of 120 minutes if tested in accordance with AS1530.4-2005.

B.2.2.12 It is also considered that substitution with 50mm Fibretex 820 Rockwool which has higher density and melting point will achieve a similarly or better performance that to 38mm Fibretex 450 Rockwool insulation

B.2.2.13 As discussed previously, the performance of copper pipe tested in 2368500 will not detrimentally affected by penetrating a thinner Speedpanel wall with 77mm thickness.

B.2.2.14 It is therefore the proposed construction for copper or ferrous pipes with diameter not greater than 150mm, and wall thickness not less than 2mm is positively assessed for an insulation performance for 120 minutes.

B.2.2.15 It is apparent that larger diameter metal pipes shall be more onerous as heat convection from the exposed side is relatively faster to increase the temperature on the unexposed side.

B.2.2.16 Based on this discussion, it is considered that up to 120 minutes if 102mm diameter and 32mm diameter copper pipes were insulated for a distance of 600mm on each side they will achieve insulation performance of 120 minutes.

B.2.2.17 With reference to AS1530.4-2005 Clause 10.11.3.1, the following pipes can be considered as equivalent at a given FRL:

Pipe Material	Max. Diameter	Min. Wall Thickness	Insulation Performance
Copper or Ferrous	150mm	2mm	120mins
	102mm	1.2mm	120mins
	32mm	0.91mm	120mins

Ø200mm × 2 mm Copper Pipes

Integrity

B.2.2.18 It is proposed construction tested in EWFA 2517300.2 includes a 200mm diameter copper pipe with a minimum pipe wall thickness of 2mm.

B.2.2.19 With reference to the observations of Ø100mm ×1.2mm copper pipe tested in 2517300.2, it is observed the sealant around the perimeter of the service swelled and remained in place for 195 minutes with no sign of impending integrity failure or gap formations.

B.2.2.20 With reference to the observation of Ø325mm × 10mm steel pipe tested in FSP 1470, smoke was emitted from the sealant/penetration surface during the test though no glowing or flaming that would warrant application of a cotton pad for 121 minutes the duration of the test.

B.2.2.21 The significance of the above observed behaviour is that the sealant appeared to exhibit good fire side integrity performance limiting the exposure to the non-fire side. The fire side seal remained in place for a period of 120 minutes.

B.2.2.22 Based on the above discussion, it is expected an Ø200mm large copper pipe tested in EWFA 2517300.2 with the service supported in similar manner, the seal around pipe perimeter would behave in a similar manner to that in FSP 1470.

B.2.2.23 Further confidence is addressed a 200mm diameter pipe with a nominally large pipe wall thickness will potential decrease the temperature on the unexposed side.

B.2.2.24 In light of above discussion, it is considered the proposed construction will achieve 120 minutes integrity if tested in accordance with AS1530.4-2005.

Ø325mm (OD) × 2mm Steel Pipe

Integrity

B.2.2.25 The tested assembly in test report FSP 1470 comprised a Powerscape steel framed wall system, consisting of 92mm wide metal studs clad on both sides with two layers of 16mm thick Powerscape board, with overall thickness of 156mm. the wall was penetrated by one steel pipe. The penetrating service comprised a nominally O.D.325mm steel pipe with a nominal wall thickness of 10mm wrapped with 50mm thick Fibretex 820 Rockwool insulation.

B.2.2.26 When tested the pipe penetration maintained integrity performance for the test duration of 121 minutes without sign of impending any cracks, fissures or gap formations.

B.2.2.27 Upon inspection of test observations no glowing or flaming that would warrant application of a cotton pad for the duration of the test from the sealant/penetration surface.

B.2.2.28 The significance of the above observed behaviour is that the sealant appeared to exhibit good fire side integrity performance limiting the exposure to the non-fire side. The fire side seal remained in place for a period of 120 minutes.

B.2.2.29 The proposed wall construction incorporates a 77mm thick Speedpanel wall penetrated by the tested 325mm diameter steel pipe and 2 layers of 16mm fire grade plasterboard lined surround pipe penetration with a minimum coverage of 250mm. There are two options to fix the fire grade plasterboard to Speedpanel wall as shown in Figure 8 and 9. The wall conjunction shall have a minimum wall thickness of 156mm.

B.2.2.30 With reference to test EWFA 2517300 which was constructed with a 77mm thick Speedpanel wall system, consisting various pipe penetrations. When tested an integrity failure was measured at 145 minutes due to flaming for greater than 10 seconds was observed at mid-width of the wall system between the top track and concrete lintel

B.2.2.31 When the proposed wall conjunction construction is exposed from the Speedpanel side, the additional steel stud wall frame lined with two layers of 16mm fire grade plasterboard will not introduce any foreseeable integrity weakness to the proposed system.

B.2.2.32 When the proposed wall construction is exposed from the fire grade plasterboard side, the Speedpanel wall system will not receive direct heating from the furnace and therefore the performance of wall system would be expected to be similarly or slightly better than the barrier tested in 2517300.

B.2.2.33 Based on the above discussion, it is confirmed the proposed wall conjunction system with the sealant in a similar manner to that in FSP1470 will not have a detrimentally significant effect on the integrity performance of tested steel pipe penetration.

B.2.2.34 The proposed steel pipe has a minimum 2mm thick pipe wall thickness. With reference to the observations of Ø100mm ×1.2mm copper pipe tested in 2517300.2, it was observed the sealant around the perimeter of the service swelled and remained in place for 195 minutes with no sign of impending integrity failure or gap formations.

B.2.2.35 Based on the above discussion, it is expected an Ø325mm steel pipe with thinner 2mm thick pipe wall thickness in the proposed construction, the seal around pipe perimeter would behave in a similar manner to that in FSP 1470.

B.2.2.36 In light of above, it is considered the proposed construction will achieve an integrity performance of 120 minutes if tested in accordance with AS1530.4-2005.

Insulation

B.2.2.37 With reference to the performance of the specimen tested in FSP 1470, the steel pipe was insulated for 100mm long on the exposed side and 300mm long on the unexposed side with 50mm Rockwool. The un-insulated length of steel pipe on the exposed side was 400mm long. When tested the thermocouple on the lagging located at 25mm away from wall on the unexposed side reached a temperature of 216℃ a rise of 200K and the thermocouple on the pipe located at 25mm away from the end of insulation reached a temperature of 347℃ a rise of 332K at 120 minutes.

B.2.2.38 The proposed construction comprises the steel pipe insulated with 600mm length of Rockwool insulation each side and the un-insulated length on the exposed side reduces to 200mm. the insulation is continuous through the wall.

B.2.2.39 The additional 500mm protection on the exposed side that sees the heat radiation effects of the furnace will be longer thereby increasing the distance the heat needs to conduct to make the temperatures of both pipe and Rockwool insulation on the unexposed side cooler.

B.2.2.40 Further confidence is addressed by shorten the un-insulation pipe length on the exposed side to 200mm that sees the heat conducted on the exposed side will be less.

B.2.2.41 Based on the above discussion, it is concerned to be enough the increase the recorded performance of the mentioned Rockwool insulation by more than 11 minutes (21 ℃) margin.

B.2.2.42 Similar calculation has been done for calculating the effect of the non-fire side extension of Rockwool insulation on the exposed pipe, the temperature rise on pipe on the unexposed side is 117K at 120 minutes with a reasonable margin, and conservatively ignores the additional protection offered by the additional insulation on the fire side.

B.2.2.43 Further confidence is addressed by the thicker wall construction where the proposed construction provides a larger cavity that will potentially have a small positive effect on the insulation performance by some margins.

B.2.2.44 The proposed construction also includes pipes equal of thinner wall thickness. Thinner pipes are expected to conduct heat at a reduced rate than for thicker pipes and therefore safer for their insulation performance.

B.2.2.45 In light of the above, it is considered the proposed construction will achieve an insulation performance of 120 minutes if tested in accordance with AS1530.4-2005.

Performance of increased annular gap around pipe

Integrity

B.2.2.46 It is proposed that the annular gap between wall and pipe shall be maximum 20mm wide and sealed with PROMASEAL® Supa Mastic with a minimum depth of 10mm each side.

B.2.2.47 The tested assembly in test FSRG A-14-903 comprised a 20mm wide control join in a 120mm thick concrete floor. The tested control joint was sealed with 10mm thick PROMASEAL® Supa Mastic sealant on each side of the floor and backed with raw backing road.

B.2.2.48 When tested, the control joint maintain integrity performance of 232 minutes and insulation performance of 217 minutes. Upon inspection of the temperature curve measured on the

unexposed side of non-fire side sealant, it is expected the fire side seal remained in place for at least 180 minutes after that the temperature raised more sharply.

B.2.2.49 The significance of the above behaviour is that the sealant appeared to exhibit good fire side integrity performance limiting the exposure to the non-fire side in a 20mm wide gap.

B.2.2.50 Based on the above, it is considered the proposed annular gap size is positively assessed to maintain 120 minute integrity performance if tested in accordance with AS1530.4-2005.

B.3 UPVC PIPES PROTECTED WITH PROMASEAL® FCW COLLARS

B.3.1 Proposal

B.3.1.1 The proposed construction is to be as tested in EWFA 2517300.2, subject to the following variations,

- Inclusion of 40mm, 50mm, 65mm, 80mm and 100mm uPVC pipes that are protected by PROMASEAL® FCW 40, 50, 65, 80 and 100 collars fitted centrally in 51mm, 64mm and 78mm Speedpanel panels based on reference to EWFA 2798800.1. A fillet of sealant around the full circumference of the collar fully covering the exposed casing (not the mesh) on each side as shown in figure 12.
- Inclusion of 40mm, 50mm, 65mm, 80mm and 100mm uPVC pipes that are protected by PROMASEAL® FCW 40, 50, 65, 80 and 100 collars fitted flush to Speedpanel panel surface in 78mm Speedpanel panels. A fillet of sealant around the full circumference of the collar fully covering the exposed casing (not the mesh) on one side as shown in figure 13.

B.3.2 Discussion

PROMASEAL® FCW Collars fitted centrally in 51mm Speedpanel Walls

B.3.2.1 The test assembly in test EWFA 2798800.1_AS included uPVC pipes nominally 42.9mm (OD) × 2.2mm (Specimen B) and 111mm (OD) × 3.7mm (Specimen D) protected with PROMASEAL® FCW 40 and FCW 100 collars, penetrating a 51mm thick Speedpanel wall. The PROMASEAL® FCW collars were centrally installed in the aperture and the annular gaps between PROMAEALR® FCW collars and supporting wall were sealed with Hilti CP 606 mastic. The Hilti CP 606 mastic sealant was finished off with 20mm sealant fillet on the unexposed side only. The sealant fillet was partially covered the PROMASEAL® FCW collars.

B.3.2.2 When tested, the 42.9mm and 111mm uPVC pipe penetrations maintained integrity performance for the test duration of 132 minutes without sign of impending formation of cracks, fissures or gaps.

B.3.2.3 Upon inspection of the temperatures measurements in test EWFA 2798800.1, both 40mm and 100mm pipe penetrations failed insulation performance when the temperature measured on the collar (not the sealant fillet) at unexposed side exceeded the maximum temperature rise at 28 minutes and 27 minutes respectively.

B.3.2.4 With reference to the test EWFA 2798800.1, there were some key observations from the test:

- The PROMASEAL® FCW 40 and 100 collars successfully closed the 42.9mm and 111mm uPVC pipes around 10 minutes on the fire side.
- The part of collar covered with Hilti CP 606 mastic sealant had approximately five times lower temperature compared with the part not covered with mastic. It was observed the temperatures measured on the pipes 25mm from the collars were around 102℃ to 109℃ at 120 minutes and the temperatures measured on the mastic fillet on the unexposed side of the collar were below 180K maximum temperature rise at 120 minutes.

B.3.2.5 The significance of the above observation is that the heating of the collars was not a result of being installed within a Speedpanel wall, rather was directly conducted from the exposed side through the steel collar casing. It is for this reason the unexposed side of the collar was much hotter than the pipe.

B.3.2.6 The proposed construction comprises Hilti CP 606 mastic fillet on each side of the pipe penetrations and is fully covered the PROMASEAL® FCW collars on both sides.

B.3.2.7 The benefits of the proposed variation is that is performance can be best predicted by the thermocouples on the mastic which remained below 180K maximum temperature rise at 120 minutes as tested in EWFA 2798800.1. The only exposed part of the collar on the non fire side was not of sufficient size or shape to fit a thermocouple to.

B.3.2.8 The test assembly in test F91622 included uPVC pipes nominally 69mm (OD) × 2.9mm (Specimen B) and 83mm (OD) ×3.4mm (Specimen C) protected with PROMASEAL® FCW 65 and 80 collars penetrating a 128mm thick plasterboard wall lined with two layers of 16mm Gyprock Fyrchek plasterboard. The 120mm long PROMASEAL® FCW collars were recessed within the aperture in the plasterboard lined wall and the gap between wall linings and PROMASEAL® FCW collars were sealed with Fyreseal Mastic.

B.3.2.9 When tested, the 69mm and 83mm uPVC pipe penetrations maintained integrity and insulation performance for the test duration of 132 minutes without sign of impending failure.

B.3.2.10 The test assembly in test F91633 included an uPVC pipe nominally 56mm (OD) × 3.0mm (Specimen C) protected with PROMASEAL® FCW 50 collar penetrating a 128mm thick plasterboard wall lined with two layers of 16mm thick Gyprock Fyrchek plasterboard. The 120mm long PROMASEAL® FCW collars were recessed within the aperture in the plasterboard lined wall and the gap between wall linings and PROMASEAL® FCW collars were sealed with Fyreseal Mastic to depth of board.

B.3.2.11 When tested, the 56mm uPVC pipe penetration maintained integrity and insulation performance for the test duration of 120 minutes with no sign of impending failure.

B.3.2.12 The significance of the above test results is that it demonstrates the ability of PROMASEAL® FCW 50, 65 and 80 collars to close the 56mm, 69mm and 83mm uPVC pipes when more shielded than in the proposed construction.

B.3.2.13 The proposed wall construction incorporates a 51mm thick Speedpanel wall and extensions of PROMASEAL® FCW collars on each side of the wall are fully covered with Hilti CP 606 mastic. It is hence considered the temperatures on the 56mm, 69mm and 83mm uPVC pipes will be similar to that tested in F91622 and F91633, and the temperatures measured on the collars on the unexposed side will be similar to that tested in EWFA 2798800.1.

B.3.2.14 With reference to test EWFA 2798800.1, it was observed the insulation performance on the 51mm thick Speedpanel wall 25mm away from the collar was varied between 56 minutes and 80 minutes. The insulation performance of the wall panels away from the penetrations was varies between 75 minutes and 91 minutes.

B.3.2.15 Based on the above performance, it is considered the heating of the pipe penetration is contributed to increase the temperature of surrounding Speedpanel panels.

B.3.2.16 It is considered the proposed Hilti CP 606 mastic sealant is 75% larger than that tested in EWFA 2798800.1 and it is expected the thermocouple on the panel would conduct less heat from the penetration and hence be the temperatures measured on the 51mm thick Speedpanel wall panel would below 180K maximum temperature rise for at least 60 minutes

B.3.2.17 Based on the above, it is considered the proposed construction will achieve integrity and insulation performance of 60 minutes if installed in 51mm thick Speedpanel wall systems and if tested in accordance with AS1530.4-2005.

Applicability to 64mm and 78mm Speedpanel Walls

B.3.2.18 With reference to the test EWFA 2848300.2 which comprised a 64mm thick Speedpanel wall system, the wall panels maintained an insulation performance for 93 minutes. The maximum temperature recorded on the unexposed face 15mm from a vertical join in the panel at 90 minutes was 186℃, while the rest of the panel remained around 100℃. The average unexposed face temperature was 91℃ at 90 minutes.

B.3.2.19 By inspection of the above observations, it indicates the concrete core of 64mm thick Speedpanel wall panel was still releasing steam at 90 minutes and the steam significantly affected the heat transfer, namely caused the temperature rise to dwell around 100℃.

B.3.2.20 In addition, the PROMASEAL® FCW collars in 64mm thick Speedpanel wall is more shielded than that tested in EWFA 2798800.1.

B.3.2.21 Based on the above, it is therefore expected the temperatures on the unexposed side of uPVC pipes and PROMASEAL® FCW collars in 64mm Speedpanel panel walls would be much cooler than tested in a 51mm thick Speedpanel wall for at least 90 minutes

B.3.2.22 With reference to FR 3754, which comprised a 78mm Speedpanel system incorporating panel joints fixings at 1000mm centres and when tested it achieved an insulation performance of 123 minutes.

B.3.2.23 With reference to test BWA 2286900, test results indicates the concrete core of 78mm Speedpanel wall panel started dehydrating around 120 minutes, the temperature on the Speedpanel wall panel at 120 minutes was around 120 ℃. It is therefore expected up to 120 minutes, the steam still affected the heat transfer marginally.

B.3.2.24 In addition, the PROMASEAL® FCW collars in 78mm thick Speedpanel wall is more shielded than that tested in EWFA 2798800.1.

B.3.2.25 Based on the above, it is therefore expected the temperatures on the unexposed side of uPVC pipes and PROMASEAL® FCW collars in 78mm Speedpanel panel walls would be much cooler than tested in a 51mm thick Speedpanel wall for at least 120 minutes.

B.3.2.26 Based on the above, it is considered the proposed construction will achieve integrity and insulation performance of 90 minutes if installed in 64mm thick Speedpanel wall systems and if tested in accordance with AS1530.4-2005.

B.3.2.27 Based on the above, it is considered the proposed construction will achieve integrity and insulation performance of 120 minutes if installed in 78mm thick Speedpanel wall systems and if tested in accordance with AS1530.4-2005.

PROMASEAL® FCW Collars fitted flush to wall surface in 78mm Speedpanel Walls

B.3.2.28 It is proposed the PROMASEAL® FCW collars can be optionally fitted in 78mm thick Speedpanel walls so that collars are flush to one side of Speedpanel panel face. A fillet of Hilti CP 606 mastic shall be applied around the full circumference of the collar fully covering the exposed casing. The proposed construction is shown in figure 13.

B.3.2.29 Upon inspection of the proposed construction, it is considered if the fire is exposed from the side with Hilti CP 606 mastic on the collar, the collar is expected to activate and close the pipe in a similar manner to that tested in EWFA 2798800.1.

B.3.2.30 The collar on the unexposed side is flush to the 78mm Speedpanel surface which is not of sufficient size or shape to fit a thermocouple to.

B.3.2.31 Based on previous discussion and with reference to EWFA 2798800.1, it is expected the insulation performance can be best predict by the thermocouples on the 78mm wall and pipe which both remained below 180K maximum temperature rise at 120 minutes.

B.3.2.32 It is considered if the fire is exposed from the side which the collar is flush to wall surface, the PROMASEAL® FCW collar is more shielded than that tested in EWFA 2798800.1.

B.3.2.33 With reference to tests F91622 and F91633, the uPVC pipes protected with PROMASEAL® FCW collars penetrating a 128mm thick plasterboard wall and the collars were recessed within the aperture in the wall and sealed with Fyreseal Mastic.

B.3.2.34 When tested, all pipe penetrations maintained integrity and insulation performance for at least 120 minutes with no sign of impending failure.

B.3.2.35 The significance of the above test results indicates the ability of PROMASEAL® FCW collars to close the uPVC pipes when the collars were shielded and recessed within the wall.

B.3.2.36 Based on the above test observations, it is therefore expected the collar which is flush to the Speedpanel surface will activate and close uPVC pipe penetrations at the early stage of the test in a similar manner to that tested in F91622 and F91633.

B.3.2.37 Based on the above, it is considered the proposed construction will achieve integrity and insulation performance of 120 minutes if installed in 78mm thick Speedpanel systems and if tested in accordance with AS1530.4-2005.

B.4 PERFORMANCE AT BUTT JOINS ADJACENT TO PIPE PENETRATIONS

B.4.1 Proposal

B.4.1.1 The proposed construction is to be as tested in EWFA 2517300.2, subject to the following variations:

- Inclusion installation options of pipe penetrations in Speedpanel wall as shown in figures 1, 2 and 3.
- The retained Speedpanel panel cut shall be fully filled with PROMASEAL® Supa Mastic sealant.
- Additional minimum 256mm wide x 0.42mm BMT metal flashing shall be applied over the butt joints at one side with minimum 100mm wide overlap.
- The metal flashing is held in place with 10 gauge and 16mm along self-drilling screws with PROMAESEAL® Supa Mastic or Hilti CP 606 applied around the perimeter of flashing.

B.4.2 Discussion

B.4.2.1 With reference to test EWFA 2517300.4 there were significant and distributed penetrations over an area larger than 1000mm high and 2000mm wide. When tested, the wall deflections were reduced and no impending vertical wall failure was observed.

B.4.2.2 The significance of the above result is that tested with apertures, the Speedpanel wall tended to deflect less as apertures acted to interrupt the thermal driven deflection of the wall. It is understood that this thermal deflection is driven by the expansion of the fire side of the panel with respect the relatively cooler non-fire side. It is expected the butt joins in the panel could result in the same outcome or somewhere between the performance of the continuous panel and that of the interrupted panel.

B.4.2.3 Based on the above observation, the proposed Speedpanel walls with butt joins is considered to act as having penetrations less than that tested in EWFA 2517300.4. It is therefore expected the performance of the Speedpanel wall with butt joins would be similar to the wall tested in EWFA 2517300.4.

B.4.2.4 The proposed construction comprised 200mm × 250mm × 0.4mm thick metal flashing at one side of the butt join at or around pipe penetrations.

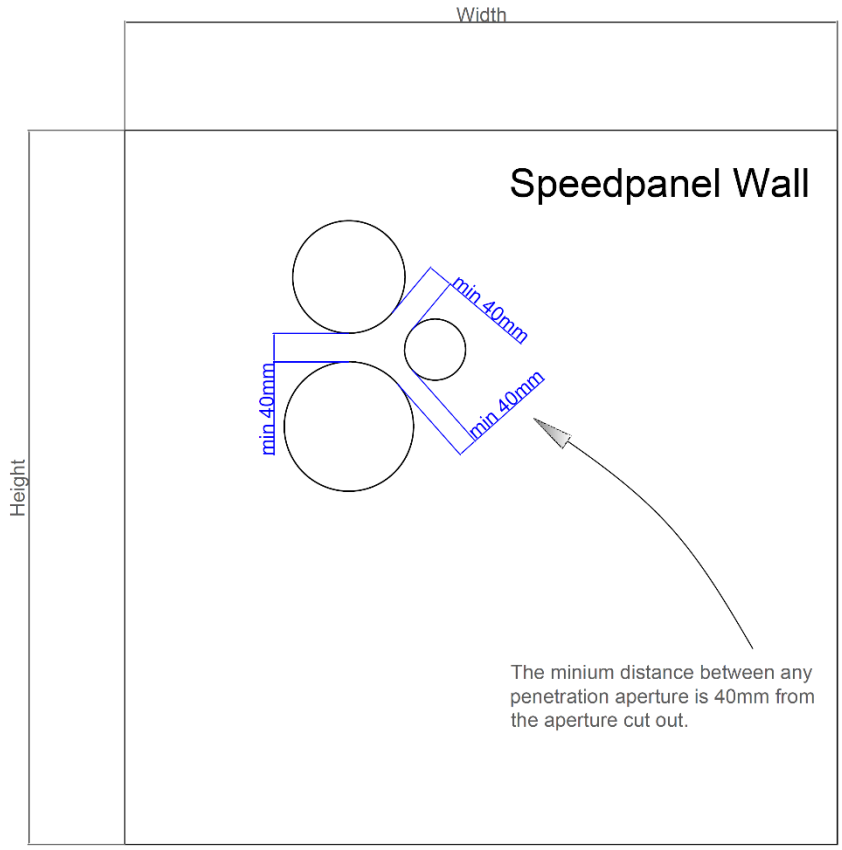
B.4.2.5 The presence of the metal flashing is likely to reduce the gap formation at the butt join when the panels deflect towards to the heat exposure and likely to improve the insulation performance at the butt joins location with small margins.

B.4.2.6 Based on the above it is considered the presence of the butt join will not decrease the performance at the pipe penetration and may potential improve the insulation around the pipe.

B.4.2.7 Based on the above, it is considered the proposed construction would not introduce any detrimental effect on integrity and insulation performance of the wall system for at least 120 minutes for 78mm panels if tested in accordance with AS1530.4-2005.

B.5 CONFIRMATION OF SERVICE SPACING

B.5.1.1 AS4072.1-2005 (clause 4.9.3) states that: “the minimum distance between penetrations in a modular system shall be not less than 40mm, unless otherwise tested in specimen form”. It is noted that AS4072.1-2005 (clause 1.4.10) defines a “penetration” as “an aperture through a fire-separating element for the passage of a service or services”.



B.5.1.2 In light of the above, it is considered that the AS4072.1-2005 clause mentioned is applicable to the specimens considered in this assessment report. The minimum spacing of said specimens is thus 40mm from aperture-to-aperture or service to service whichever is less.

B.6 51MM, 64MM AND 78MM THICK SPEEDPANEL WALLS WITH FC100 AND FC150 PROMAT COLLARS WITH 13MM FIRE RATED PLASTERBOARD BUILD UP.

B.6.1 Proposal

B.6.1.1 The proposed construction is made of 78mm thick vertically orientated Speedpanel as tested in BWA2257600 with consideration given to 110mm and 150mm uPVC pipes penetrating through the walls and protected with FC100 and FC150 Promat pipe collars. Furthermore, each face of the Speedpanel wall will be faced with 13mm fire rated plasterboard or alternatively one face fixed with 2 layers of fire rated plasterboard to achieve an FRL of -/120/120.

B.6.2 Discussion

Integrity Performance for walls and pipes

B.6.2.1 Within test report 2517300.2, the test included two specimen's samples; a uPVC pipe with 158mm outside diameter (OD) and a pipe with 105mm OD, specimen E and G, respectively.

B.6.2.2 Specimen E and G were protected with a Promat FC150 and FC100 fire collar, respectively. The collars were fixed directly to the 78mm Speedpanel wall without any board build up and included a 5mm deep seal within the pipe/wall annular gap. The size of the annular gap around the pipe was not specified in the test report.

B.6.2.3 The sealant used to fill the annular gap (5mm deep) was reported to be PROMASEAL® Supa mastic sealant.

B.6.2.4 In terms of integrity, specimen G (105 OD with FC100 collar) did not fail for the 195 minutes test duration.

B.6.2.5 In terms of integrity, specimen E (158 OD with FC150 collar) failed after 147 minutes due to sustained flaming exceeding 10 seconds between the collar casing and Speedpanel wall face.

B.6.2.6 Both specimens achieved the designed FRL performance in terms of integrity which was 120 minutes with a large degree of over performance.

Insulation Performance for walls and pipes

B.6.2.7 Within test report 2517300.2, the test included two specimen's samples; a uPVC pipe with 158mm outside diameter (OD) and a pipe with 105mm OD, specimen E and G, respectively.

B.6.2.8 Specimen E and G were protected with a Promat FC150 and FC100 fire collar, respectively. The collars were fixed directly to the 78mm Speedpanel wall without any board build up and included a 5mm deep seal within the pipe/wall annular gap. The size of the annular gap around the pipe was not specified in the test report.

B.6.2.9 The sealant used to fill the annular gap (5mm deep) was reported to be PROMASEAL® Supa mastic sealant.

B.6.2.10 In terms of insulation, specimen G (105 OD with FC100 collar) failed after 76 minutes due to an increase of 180℃ above ambient occurring on the wall element 25mm from the collar edge (thermocouple E3).

B.6.2.11 None of the other thermocouples for this specimen exhibited failure of the temperature criteria, as defined by AS1530.4, before 120 minutes, however the thermocouple (E4) in line with thermocouple E3, exhibited failure of the temperature criteria as defined in AS1530.4 after 128 minutes. All other thermocouples demonstrated at least another 40 minutes performance after 120 minutes exposure to the furnace conditions. It is therefore considered that the initial thermal failure that occurred at thermocouple E3 impacted the thermal failure at thermocouple E4 at 128 minutes due to conduction and/or convective heat transfer. The thermocouples located in a similar distance and location on top of the specimen, D6 and D7, demonstrated better thermal performance in excess of 160 minutes.

B.6.2.12 In terms of insulation, specimen E (158 OD with FC150 collar) failed after 67 minutes due to an increase of 180℃ above ambient occurring on the fire collar casing 25mm from the wall face (thermocouple F10).

B.6.2.13 It is observed in the test results that the thermocouple F9, which was located 25mm away from the collar and in line with F10, showed a similar trend and rise at 120 minutes.

Furthermore as F9 continued to increase (i.e. the wall temperature 25mm from the collar edge continued to increase), it surpassed F10 albeit F10 continued to increase at a lower rate.

B.6.2.14 This phenomenon was also exhibited by thermocouples D8 and D9 after 80 minutes where the wall temperature surpassed the collar case temperature after 120 minutes.

B.6.2.15 For both specimens the temperatures measured by the thermocouples located on the pipes (for both specimens) did not exceed the temperature failure criteria, as defined by AS1530.4-2005.

B.6.2.16 It is therefore considered that the thermal failure of the element i.e. on the Speedpanel wall 25mm from the collar casing impacted the thermal performance of both specimen systems.

B.6.2.17 In light of the above and to mitigate this insulation failure from occurring, the proposed construction highlights the use of 13mm fire rated plasterboard build up in one or two layers configurations on both sides of the panel.

Behaviour of tested uPVC pipes in Speedpanel

B.6.2.18 Paragraphs B.6.2.19 to B.6.2.22 is an abridged extract from assessment report EWFA 29592300

B.6.2.19 In EWFA 2517300.2, the PROMASEAL® SupaMastic sealant used was observed to undergo melting/flowing during the test. The sealant employed to fill the profile of the panels on the fire side would thus have melted away, allowing hot gases to enter the annular gap between the pipe and the panels. This gas could then pass to the non-fire side, where it, assuming some de-bonding of the Speedpanel faces occurred, could enter between the steel facing and the concrete of the panels (heating the steel facing). The gas would also reach the non-fire side collar (contributing to temperature increase at that location).

B.6.2.20 For the 150mm service, the collar was much hotter than the adjacent pipe. This is most easily explained by closure of the non-fire side collar, which was observed in the test photographs, thus keeping heat from reaching the non-fire side section of pipe. For the smaller services, the closure on the non-fire side was less extensive (as per the photographs) and accordingly the pipe temperatures were similar (or hotter in some cases) to the adjacent collar.

B.6.2.21 Not previously mentioned, the fire side collar, once closed, will act as a radiant plug of intumescent, emitting radiation towards the non-fire side elements. Also, the uPVC pipe is capable of conducting some heat along its length.

B.6.2.22 In short, three modes of heat transfer have been identified:

- Heat conduction along the plastic pipe.
- Hot gas flow through the opening caused by Speedpanel profile (and melted sealant within it), into the annular gap between pipe and panels and to the non-fire side elements.
- Radiation from fire side intumescent plug.

B.6.2.23 As the thermal measurements for the pipes in test report 2517300.2 do not support the hypothesis of the first mode of heat transfer occurring along the pipe and the third mode (radiation from the fire side intumescent plug) is difficult to quantify and therefore assumed to be less severe than the second mode of heat transfer (the intumescent will eventually fail on the fire side); it is considered the likely cause of insulation failure is due to the second mode of heat transfer ‘Hot gas flow through the opening caused by the Speedpanel profile’

B.6.2.24 It is considered that as the Speedpanel steel skin on the unexposed face has delaminated from the aerated core during the fire exposure (which is a normal phenomenon) it will allow the passage of hot gases to travel via the annular gap of the pipe (if it still exists) and directly into the space between the Speedpanel steel skin and aerated concrete.

B.6.2.25 Therefore, it is considered that sealing the annular gap is critical to mitigating this mode of insulation failure but if the annual gap is initially too big or not filled with sealant correctly this can potentially degrade the thermal performance of the combined collar, sealant and wall system FRL.

B.6.2.26 To mitigate this effect it has been considered in assessment EWFA 29592300.3 that, for plastic pipes up to 250mm diameter, a single layer of 25mm Promatect 50 or Promatect 100

fixed on both sides of the Speedpanel wall and aligned with the pipe penetration and the FC collar fixed on top will provide adequate protection to maintain the integrity and insulation performance of the wall/collar system.

Replacing 25mm Promatect 100 with 13mm fire rated plasterboard

B.6.2.27 In fire resistance test EWFA 2798800.1 a 51mm thick Speedpanel wall with penetrations was exposed to the conditions of AS1530.4-2005 for 132 minutes.

B.6.2.28 Based on the supporting test evidence in section 2 of this report, the 51mm thick Speedpanel wall is considered to have achieved an FRL performance of -/60/60 (the 64mm thick has also achieved an FRL performance of -/90/90).

B.6.2.29 In test EWFA2798800.1 a 100mm wide x 750mm long section of 13mm fire rated plasterboard was directly fixed to the unexposed face of the 51mm Speedpanel wall on the west side and a layer of Promatect® 100 (same size) was fixed on the East side. See figure below.

Figure B. 1 – Performance of 100mm and 150mm diameter uPVC pipes in Speedpanel Wall System

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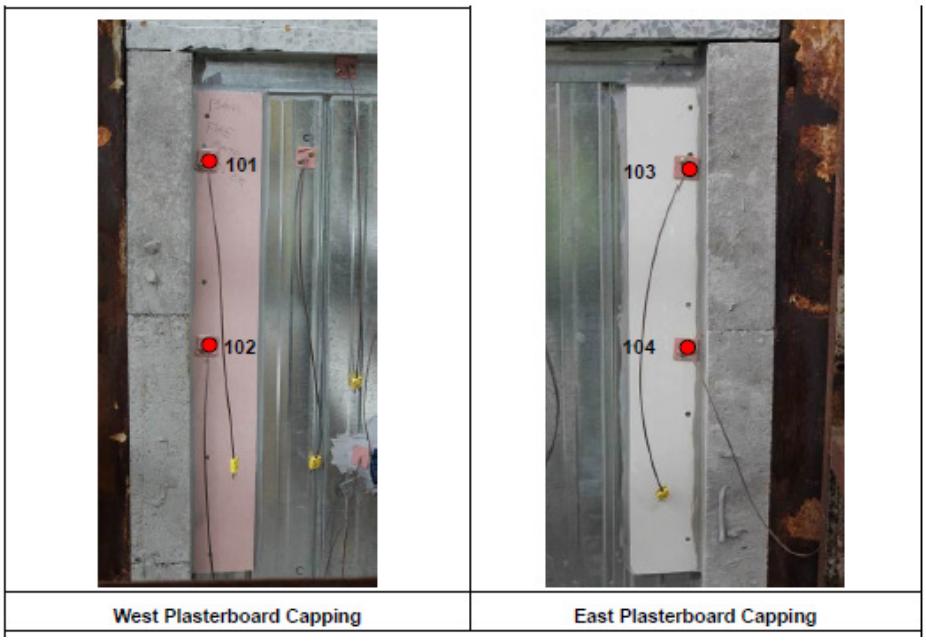

B.6.2.30 The thermal performance of both samples, as described in the test report, showed good agreement in terms of integrity and thermal performance at 60 minutes with the fire rated plasterboard displaying only 14℃ increase difference compared to the Promatect 100 board.

B.6.2.31 At 90 minutes exposure to the furnace conditions, the fire rated plasterboard showed 24℃ increased difference compared to the Promatect 100 board.

B.6.2.32 The fire rated plasterboard exceeded the temperature failure criteria for maximum temperature as described in AS1530.4-2005 after 123 minutes. Both boards did not fail integrity for the 132 minutes duration of the test.

B.6.2.33 This test shows that for the design FRL of the Speedpanel wall (60 minutes in this case) the 25mm thick Promatect 100 has the same performance characteristics as the 13mm fire rated plasterboard for up to 90 minutes (50% margin more than the required performance). Furthermore, the Integrity performance is the same as the 25mm Promatect 100 board for similar applications in Speedpanel walls. It is also observed that both board types did not exceed the insulation failure criteria as defined by AS1530.4 for 120 minutes (double the required insulation performance).

B.6.2.34 It is therefore considered that using 13mm fire rated board, as an alternative to 25mm thick Promatect 100, will achieve the same integrity and thermal performance for at least the required FRL of the Speedpanel wall and collar system. This is subject to the constraints of the fire rated sealant locations, board dimensions, location and fixing details. See Figure 15 and Figure 17.

Locating two layers of 13mm fire rated plasterboard on one side only (Figure 18)

B.6.2.35 As alternative to locating one layer of fire rated plasterboard on each side of the Speedpanel wall (shown in Figure 17). It can be considered that locating 2 layers of fire rated plasterboard on one side only would still provide the required FRL of the Speedpanel wall as shown in Figure 18.

B.6.2.36 This is considered adequate based on the performance of the collars (without any board build up) in test report EWFA 2517300.2 where the FC100 did not fail integrity for the 195 minutes test duration and the FC150 did not fail integrity until after 147 minutes due to flaming at the collar/Speedpanel wall interface.

Replacing PROMASEAL® Supa mastic sealant with PROMASEAL® AN Acrylic sealant

B.6.2.37 Promat AN Acrylic sealant is interchangeable with Speedpanel systems and has been deemed to have the same performance attributes.

Conclusion

B.6.2.38 Based on the discussion presented in this report, it is the opinion of this registered testing authority that if the tested prototype described in Section 2 had been modified as described in Section 3, it will achieve the FRL as stated below if tested in accordance with the method referenced in Section 4 and subject to the requirements of Section 7.

Table B.1 – Performance of 100mm and 150mm diameter uPVC pipes in Speedpanel Wall Systems

Wall Depth (mm)	FRL	Construction Details
51	**-/60/60**	Refer to Figure 15 to 18
64	**-/90/90**	
78	**-/120/120**	