

Fire resistance of SNAP Utility fire collars when tested in accordance with AS 1530.4-2014 and assessed in accordance with AS 4072.1-2005

Assessment Report

Author: Keith Nicholls

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Client: IG6 Pty Ltd

Commercial-in-confidence

Inquiries should be addressed to:

Fire Testing and Assessments	Author	The Client
NATA Registered Laboratory	Infrastructure Technologies	IG6 Pty Ltd
14 Julius Avenue	14 Julius Avenue	3 Skirmish Court
North Ryde, NSW 2113	North Ryde, NSW 2113	Victoria Point QLD 4165
Telephone +61 2 94905444	Telephone +61 2 94905500	Telephone +61 7 3390 5420


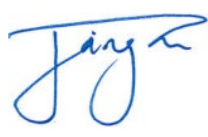

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AUTHOR	REVIEWED BY	AUTHORISED BY
Keith Nicholls	Jing Xu	Keith Nicholls
		
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1 Introduction

This report is an assessment of fire resistance of SNAP Utility fire collars when tested in accordance with AS 1530.4-2014 and assessed in accordance with AS 4072.1-2005.

This report is prepared for meeting the requirements of NCC 2019 Volume 1 Schedule 5 clauses 2b) and 2 c) or NCC 2022 Volume 1 Clauses S1C2 (b) and (c) as appropriate for FRL.

This report reviews and confirms the extent to which the reference fire resistance tests listed in section 2 meet the requirements of the standard fire test standards listed in section 4 of the report. The proposed variations to the tested construction presented in section 3 are subject to an analysis in Appendix B and the conclusions are presented in Section 5 of this report.

The field of applicability of the results of this assessment report is presented in Section 6 and subject to the requirements, validity and limitations of Sections 7, 8 and 9.

2 Supporting Data

This assessment report refers to various test reports to support the analysis and conclusions of this report. They are listed below;

Table 1: Reference test data

Report Reference	Test Standard	Outline of Test Specimen
FSP2333	AS 1530.4 -2014	A fire resistance test of pipe penetrations in a 120 mm thick concrete slab.
FSP2338	AS 1530.4 -2014	A fire resistance test of pipe penetrations in a 150 mm thick concrete slab.
FSP2347	AS 1530.4 -2014	A fire resistance test of pipe penetrations in a 120 mm thick concrete slab.
FSP2358	AS 1530.4 -2014	A fire resistance test of pipe penetrations in a 120 mm thick concrete slab.
FSP2366	AS 1530.4 -2014	A fire resistance test of pipe penetrations in a 150 mm thick concrete slab.
FSP 2371	AS 1530.4 -2014	A fire resistance test of pipe penetrations in a 120 mm thick concrete slab.
FSP2337	AS 1530.4 -2014	A fire resistance test of pipe penetrations in a 90mm thick plasterboard wall
FSP2354	AS 1530.4 -2014	A fire resistance test of pipe penetrations in a 90mm thick plasterboard wall
FSP2362	AS 1530.4 -2014	A fire resistance test of pipe penetrations in a 90mm thick plasterboard wall
FSP2374	AS 1530.4 -2014	A fire resistance test of pipe penetrations in a 90mm thick plasterboard wall
FSP2375	AS 1530.4 -2014	A fire resistance test of pipe penetrations in a 90mm thick plasterboard wall
FSP2320	AS 1530.4 -2014	A fire resistance test of pipe penetrations in a 116mm thick plasterboard wall
FSP2345	AS 1530.4 -2014	A fire resistance test of pipe penetrations in a 116mm thick plasterboard wall
FSP2361	AS 1530.4 -2014	A fire resistance test of pipe penetrations in a 116mm thick plasterboard wall
FSP2368	AS 1530.4 -2014	A fire resistance test of pipe penetrations in a 116mm thick plasterboard wall
FSP2336	AS 1530.4 -2014	A fire resistance test of pipe penetrations in a 75mm Hebel Powerpanel Wall
FSP2367	AS 1530.4 -2014	A fire resistance test of pipe penetrations in a 75mm Hebel Powerpanel Wall
FSP2369	AS 1530.4 -2014	A fire resistance test of pipe penetrations in a 75mm Hebel Powerpanel Wall
FSP2370	AS 1530.4 -2014	A fire resistance test of pipe penetrations in a 75mm Hebel Powerpanel Wall
FSP 1953	AS 1530.4 -2014	A fire resistance test of pipe penetrations in a 120 mm thick Bondek concrete slab.

The referenced tests were tested at CSIRO and sponsored by IG 6 Pty Ltd.

3 Proposed Variations

3.1 SNAP Utility collars protecting plastic pipes

The proposed construction shall be Snap Utility collars tested in Table 1 and as shown in Figures 1 and 2 and Table 2 subject to the following variations:

- The inclusion of plastic pipes as shown in Tables 3 - 8
- The inclusion of pipe coupling within or not within the collar made from same wall thickness as proposed pipe
- Plastic pipes to be supported above the slab and each side of the wall as tested
- Stack pipes in slabs to have a straight pipe configuration below the slab

Table 2: Utility collar and number of collar segments

Collar name	Number of Collar Segments
Utility 40	15
Utility 40 +	17
Utility 50	18
Utility 50 +	20
Utility 65	21
Utility 65 +	23
Utility 80	24
Utility 80 +	26
Utility 80 +	26
Utility 90 +	27
Utility 100	29
Utility 100 +	31
Utility 150	2 x 40

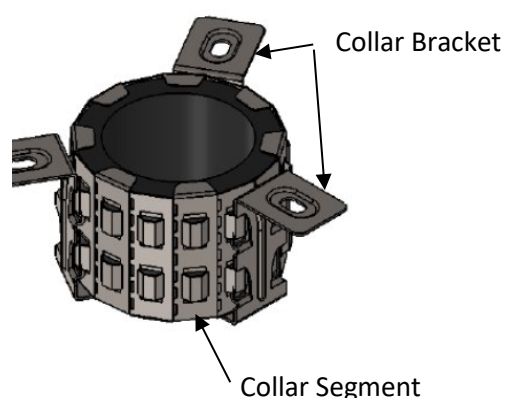


Table 3: Concrete slab/Bondek formwork slab with SNAP collars protecting PVC stack pipes

Pipe nominal diameter (mm)	Pipe wall thickness (mm)	Collar	Config.	Pipe coupling within the collar allowed	Section 3.3 variation allowed	Config. under the slab	Minimum slab thickness (X) (mm)
40	2.1-2.4	Utility 40	Stack	No	Yes	Straight	120
40	2.1-2.4	Utility 40+	Stack	Yes	Yes	Straight	120
50	2.4-2.5	Utility 50	Stack	No	Yes	Straight	120
50	2.4-2.5	Utility 50+	Stack	Yes	Yes	Straight	120
65	2.9-3.2	Utility 65	Stack	No	Yes	Straight	120
65	2.9-3.2	Utility 65+	Stack	Yes	Yes	Straight	120
80	3.1-3.2	Utility 80	Stack	No	Yes	Straight	120
80	3.1-3.2	Utility 80+	Stack	Yes	Yes	Straight	120
90	3.1-3.4	Utility 80+	Stack	No	Yes	Straight	120

Pipe nominal diameter (mm)	Pipe wall thickness (mm)	Collar	Config.	Pipe coupling within the collar allowed	Section 3.3 variation allowed	Config. under the slab	Minimum slab thickness (X) (mm)
90	3.1-3.4	Utility 90+	Stack	Yes	Yes	Straight	120
100	3.1-3.4	Utility 100	Stack	No	Yes	Straight	120
100	3.1-3.4	Utility 100+	Stack	Yes	Yes	Straight	120
150	4.2-4.5	2 x Utility 150	Stack	N	Yes	Straight	150

Table 4: Plasterboard lined steel stud wall with SNAP collars protecting PVC pipes

Pipe nominal diameter (mm)	Pipe wall thickness (mm)	Collar	Config.	Pipe coupling within the collar allowed	Section 3.3 variation allowed	Minimum wall thickness (X) (mm)
40	2.1-2.4	Utility 40	Stack	No	Yes	90
40	2.1-2.4	Utility 40+	Stack	Yes	Yes	90
50	2.4-2.5	Utility 50	Stack	No	Yes	90
50	2.4-2.5	Utility 50+	Stack	Yes	Yes	90
65	2.9-3.2	Utility 65	Stack	No	Yes	90
65	2.9-3.2	Utility 65+	Stack	Yes	Yes	90
80	3.1-3.2	Utility 80	Stack	No	Yes	90
80	3.1-3.2	Utility 80+	Stack	Yes	Yes	90
90	3.1-3.4	Utility 80+	Stack	No	Yes	90
90	3.1-3.4	Utility 90+	Stack	Yes	Yes	90
100	3.1-3.4	Utility 100	Stack	No	Yes	90
100	3.1-3.4	Utility 100+	Stack	Yes	Yes	90
150	4.2-4.5	2x Utility 150	Stack	No	Yes	90

Table 5: Hebel wall with SNAP collars protecting PVC pipes

Pipe nominal diameter (mm)	Pipe wall thickness (mm)	Collar	Config.	Pipe coupling within the collar allowed	Section 3.3 variation allowed	Minimum wall thickness (X) (mm)
40	2.1-2.4	Utility 40	Stack	No	Yes	75
40	2.1-2.4	Utility 40+	Stack	Yes	Yes	75
50	2.4-2-5	Utility 50	Stack	No	Yes	75
50	2.4-2-5	Utility 50+	Stack	Yes	Yes	75
65	2.9-3.2	Utility 65	Stack	No	Yes	75
65	2.9-3.2	Utility 65+	Stack	Yes	Yes	75
80	3.1-3.2	Utility 80	Stack	No	Yes	75
80	3.1-3.2	Utility 80+	Stack	Yes	Yes	75
90	3.1-3.4	Utility 80+	Stack	No	Yes	75
90	3.1-3.4	Utility 90+	Stack	Yes	Yes	75
100	3.1-3.4	Utility 100	Stack	No	Yes	75
100	3.1-3.4	Utility 100+	Stack	Yes	Yes	75
150	4.2-4.5	2x Utility 150	Stack	No	Yes	75

Table 5a: Dincel wall, Logicwall and AFS Rediwall with SNAP collars protecting PVC pipes

Pipe nominal diameter (mm)	Pipe wall thickness (mm)	Collar	Config.	Pipe coupling within the collar allowed	Section 3.3 variation allowed	Support construction
40	2.1-2.4	Utility 40	Stack	No	Yes	110mm/155mm Dincel wall Or 110mm AFS Rediwall Or 120mm Logic wall Or 78mm Speedpanel wall
40	2.1-2.4	Utility 40+	Stack	Yes	Yes	
50	2.4-2-5	Utility 50	Stack	No	Yes	
50	2.4-2-5	Utility 50+	Stack	Yes	Yes	
65	2.9-3.2	Utility 65	Stack	No	Yes	
65	2.9-3.2	Utility 65+	Stack	Yes	Yes	
80	3.1-3.2	Utility 80	Stack	No	Yes	
80	3.1-3.2	Utility 80+	Stack	Yes	Yes	
90	3.1-3.4	Utility 80+	Stack	No	Yes	
90	3.1-3.4	Utility 90+	Stack	Yes	Yes	
100	3.1-3.4	Utility 100	Stack	No	Yes	
100	3.1-3.4	Utility 100+	Stack	Yes	Yes	
150	4.2-4.5	2x Utility 150	Stack	No	Yes	

Table 6: SNAP collars protecting HDPE pipes without coupling within collar

Pipe nominal diameter (mm)	PE grade	Pipe wall thickness (mm)	Collar	Config.	Section 3.3 variation allowed	Support construction options
40	(PE80)	3.2- 3.4	Utility 40	Stack	Yes	<ul style="list-style-type: none"> • Min. 120mm thick Slab • Min. 90mm thick Plasterboard lined stud Wall • 75mm thick Hebel PowerPanel • 110mm/155mm Dincel wall • 110mm AFS Rediwall • 120mm Logic wall • 78mm Speedpanel wall
50	(PE100 SDR 26)	3.2- 3.4	Utility 50	Stack	Yes	
56	(PE100 SDR 26)	3.2- 3.4	Utility 50	Stack	Yes	
63	(PE100 SDR 26)	3.2- 3.4	Utility 50+	Stack	Yes	
75	(PE100 SDR 26)	3.2- 3.4	Utility 65+	Stack	Yes	
90	(PE100 SDR 26)	3.4 - 3.5	Utility 80+	Stack	Yes	
110	(PE100 SDR 26)	4.6 - 4.9	Utility 100	Stack	Yes	
160	(PE100 SDR 26)	6.7 - 7.2	2 x Utility 150	Stack	Yes	<ul style="list-style-type: none"> • Min. 150mm thick Slab • Min. 90mm thick Plasterboard lined stud Wall • 75mm thick Hebel PowerPanel • 110mm/155mm Dincel wall • 110mm AFS Rediwall • 120mm Logic wall • 78mm Speedpanel wall

Table 7: SNAP collars protecting Valsir Triplus Polypropylene pipes without coupling within collar

Pipe nominal diameter (mm)	Pipe wall thickness (mm)	Collar	Config.	Section 3.3 variation allowed	Support construction
40	1.8 - 2.2	Utility 40	Stack	Yes	<ul style="list-style-type: none"> • Min. 120mm thick Slab • Min. 90mm thick Plasterboard lined stud Wall • 75mm thick Hebel PowerPanel • 110mm/155mm Dincel wall • 110mm AFS Rediwall • 120mm Logic wall • 78mm Speedpanel wall
50	1.8 - 2.2	Utility 50	Stack	Yes	
75	2.6 - 3.1	Utility 65+	Stack	Yes	
90	3.1 - 3.7	Utility 80+	Stack	Yes	
110	3.7 - 4	Utility 100	Stack	Yes	
160	4.9 - 5.6	2 x Utility 150	Stack	Yes	<ul style="list-style-type: none"> • Min. 150mm thick Slab • Min. 90mm thick Plasterboard lined stud Wall • 75mm thick Hebel PowerPanel • 110mm/155mm Dincel wall • 110mm AFS Rediwall • 120mm Logic wall • 78mm Speedpanel wall

Table 8: SNAP collars protecting Rehau Raupiano Polypropylene pipes without coupling within collar

Pipe nominal diameter (mm)	Pipe wall thickness (mm)	Collar	Config.	Section 3.3 variation allowed	Support construction
40	1.8- 2.1	Utility 40	Stack	Yes	<ul style="list-style-type: none"> • Min. 120mm thick Slab • Min. 90mm thick Plasterboard lined stud Wall • 75mm thick Hebel PowerPanel • 110mm/155mm Dincel wall • 110mm AFS Rediwall • 120mm Logic wall • 78mm Speedpanel wall
50	1.8 - 2.1	Utility 50	Stack	Yes	
75	1.9 - 2.1	Utility 65+	Stack	Yes	
110	3 - 3.1	Utility 100	Stack	Yes	
160	3.9 - 4.4	2 x Utility 150	Stack	Yes	<ul style="list-style-type: none"> • Min. 150mm thick Slab • Min. 90mm thick Plasterboard lined stud Wall • 75mm thick Hebel PowerPanel • 110mm/155mm Dincel wall • 110mm AFS Rediwall • 120mm Logic wall • 78mm Speedpanel wall

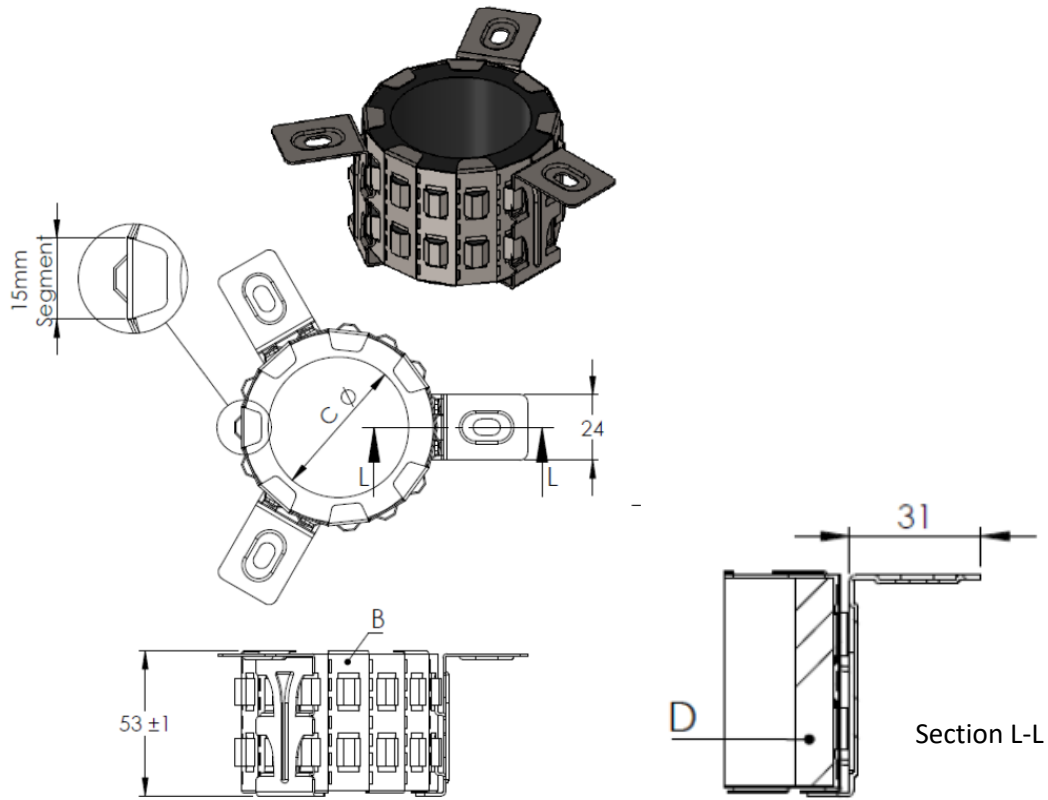


Figure 1: Single Utility collar

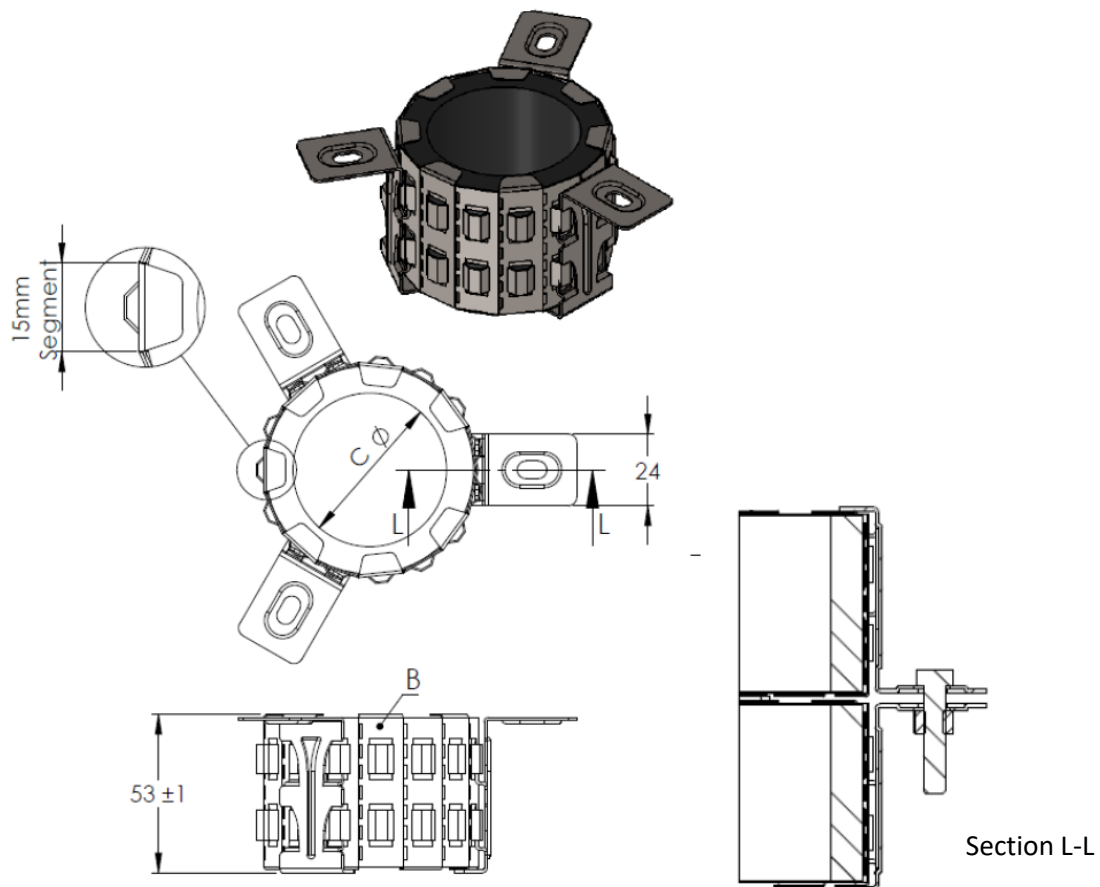


Figure 2: Double Utility 150 collar

3.2 Various ways of installing SNAP Utility collars and pipes in combination

The proposed construction in Section 3.1 of this report may include the following variations in isolation or combination:

- a. The inclusion of all the pipes and collars listed in Tables 3-8
- b. The inclusion of concrete slab as a separating element
 - Inclusion of min. 120mm, 150mm and 175mm thick slab in accordance with AS3600-2018
 - Inclusion of min. 120mm, 150mm and 175mm thick Bondek steel formwork slab tested or assess for an FRL of at least 120/120/120, 180/180/180 and 240/240/240 respectively and the channel next to collar to be fully filled with Fuller Firesound sealant as per Figure 6.
 - The pipework is to be vertically supported above the slab and straight under the slab as tested
- c. The inclusion of the following walls as a separating element
 - Inclusion of 90mm thick plasterboard lined steel stud walls with glasswool in cavity, tested or tested or assess for an FRL of at least -/60/60. The wall shall be symmetrically lined on each side.
 - Inclusion of 116mm thick plasterboard lined steel stud walls, tested or tested or assessed for an FRL of at least -/120/120. The wall shall be symmetrically lined on each side.
 - Inclusion of 75mm single cage and double caged Hebel walls tested or tested or assessed for an FRL of at least -/90/90 and -/120/120 respectively
 - Inclusion of 78mm thick Speedpanel wall without lining or framing on each side, tested or assess for an FRL of at least -/120/120
 - Inclusion of 250mm x 250mm plasterboard patch as per Table 9a over a section of Speedpanel wall at the location of the penetrating pipes.
 - A fillet of Fuller Firesound to fully seal all gaps between plasterboard patch and Speedpanel wall.
 - Fixings for collars to plasterboard patch shall be 14g-10 65mm Hex Head Screws with number of brackets as per FCO 3520 Table 13 for Hebel walls.
 - Fixings for plasterboard patch to Speedpanel wall shall be 14g-10 65mm Hex Head Screws at maximum 100mm centres
 - Inclusion of 110mm Dintel wall or AFS Rediwall without lining or framing on each side, tested or assessed for an FRL of at least 90/90/90 as a support construction
 - Fixings to be away from void with a minimum of 25mm embedment into concrete part of the wall
 - Inclusion of 120mm thick AFS Logic wall without lining or framing on each side, tested or assessed for an FRL of at least 120/120/120 respectively as a support construction
 - Fixings to be away from void with a minimum of 25mm embedment into concrete part of the wall
 - Inclusion of 155mm Dintel wall without lining or framing on each side, tested or assessed for an FRL of at least 180/180/180 as a support construction
 - Fixings to be away from void with a minimum of 25mm embedment into concrete part of the wall
 - Pipework is to be supported on each side of the wall as tested
- d. Variation to gap treatment between pipe and separating element as per Table 9
- e. Fixings for each support construction type shall be as per Tables 10-12
- f. Number of collar brackets shall be as per Table 13
- g. Variations Installation methods

- Paint on collar body, though no paint is allowed on the active area of the collar
- Collars can be installed in a minimum spacing of 40mm from outer edge of collar to outer edge of collar

Table 9: Gap treatment between the plastic pipe and opening in separating element

Pipe diameter (mm)	No Sealant		10mm deeper Fuller Firesound sealant with PE foam backing rod	
	Min Annular Gap	Max Annular Gap	Min Annular Gap	Max Annular Gap
40 – 110	0mm	2mm	0mm	8.5mm
150/160	0mm	2mm	0mm	4mm

Table 9a: Plasterboard patch for pipe penetrations in Speedpanel

Application	250mm x 250mm plasterboard patch
60 minutes	1 layer of minimum 13mm FR each side
90 minutes	1 layer of minimum 16mm FR each side
120 minutes	2 layer of minimum 13mm FR each side

Table 10: Fixing type for each support construction with PVC pipes










Element	Utility Collar Size	Collar Fixing type	
Min. 120mm Concrete slab Or 110mm/155mm Dincel wall Or 110mm AFS Rediwall Or 120mm Logic wall	40-150	5x30mm Concrete Screw Bolt	
		6x35mm Steel Wedge Anchor	
		6.5x40mm Steel Sleeve Anchor	
		5x32mm Mushroom Head Spike	
Min. 1 x 13mm Fire-rated Plasterboard line stud wall	40-100	<ul style="list-style-type: none"> • 10G x 38mm Coarse Thread Laminating Screw • M4 16-23mm steel Expandable Anchor with stainless steel washer 	
	40-100 pipe with coupling		
	150		M4 16-23mm steel Expandable Anchor with stainless steel washer
Min. 2 x 13mm Fire-rated Plasterboard line stud wall	40-100	<ul style="list-style-type: none"> • 10G x 38mm Coarse Thread Laminating Screw • M4 16-23mm steel Expandable Anchor with stainless steel washer 	
	40-100 pipe with coupling		
	150		M4 16-23mm steel Expandable Anchor with stainless steel washer
Min. 75mm thick Hebel Powerpanel Min. 78mm Speedpanel	40-150	14g-10 65mm Hex Head Screws	

Table 11: Fixing type for each support construction with HDPE pipes










Element	Utility Collar Size	Collar Fixing type	
Min. 120mm Concrete slab Or 110mm/155mm Dintel wall Or 110mm AFS Rediwall Or 120mm Logic wall	40-150	5x30mm Concrete Screw Bolt	
		6x35mm Steel Wedge Anchor	
		6.5x40mm Steel Sleeve Anchor	
		5x32mm Mushroom Head Spike	
Min. 1 x 13mm Fire-rated Plasterboard line stud wall	40-100	M4 16-23mm steel Expandable Anchor with stainless steel washer	
Min. 2 x 13mm Fire-rated Plasterboard line stud wall	40-100	<ul style="list-style-type: none"> 10G x 38mm Coarse Thread Laminating Screw M4 16-23mm steel Expandable Anchor with stainless steel washer 	 
	150	M4 16-23mm steel Expandable Anchor with stainless steel washer	
Min. 75mm thick Hebel Powerpanel Or Min. 78mm Speedpanel	40-150	14g-10 65mm Hex Head Screws	

Table 12: Fixing type for each support construction with Raupiano/Triplus pipes

Element	Utility Collar Size	Collar Fixing type	
Min. 120mm Concrete slab Or 110mm/155mm Dintel wall Or 110mm AFS Rediwall Or 120mm Logic wall	40-150	5x30mm Concrete Screw Bolt	
		6x35mm Steel Wedge Anchor	
		6.5x40mm Steel Sleeve Anchor	
		5x32mm Mushroom Head Spike	
Min. 1 x 13mm Fire-rated Plasterboard line stud wall	40-100	<ul style="list-style-type: none"> 10G x 38mm Coarse Thread Laminating Screw M4 16-23mm steel Expandable Anchor with stainless steel washer 	 
	150	M4 16-23mm steel Expandable Anchor with stainless steel washer	
Min. 2 x 13mm Fire-rated Plasterboard line stud wall	40-100	<ul style="list-style-type: none"> 10G x 38mm Coarse Thread Laminating Screw M4 16-23mm steel Expandable Anchor with stainless steel washer 	 



Element	Utility Collar Size	Collar Fixing type	
	150	M4 16-23mm steel Expandable Anchor with stainless steel washer	
Min. 75mm thick Hebel Powerpanel Or Min. 78mm Speedpanel	40-150	14g-10 65mm Hex Head Screws	

Table 13: Number of brackets for various sizes of Utility collars

Support construction	Pipe details	# Brackets Used for Pipe Diameter (Nominal) (mm)										
		40	50	56	63	65	75	80	90	100	110	150/160
Slabs/ Bondek slab/Dincel wall/AFS Rediwall/ Logic wall	PVC	2	2	NA	NA	2	NA	3	3	3	NA	4
	PVC with coupling	2	2	NA	NA	2	NA	3	3	3	NA	4
	HDPE	2	2	2	2	NA	3	NA	3	NA	3	4
	Raupiano	2	2	NA	NA	NA	3	NA	NA	NA	3	4
	Triplus	2	2	NA	NA	NA	3	NA	3	NA	3	4
Framed Wall Systems	PVC	3	3	NA	NA	3	NA	3	3	3	NA	4
	PVC with coupling	3	3	NA	NA	3	NA	3	3	3	NA	4
	HDPE	3	3	3	3	NA	3	NA	3	NA	3	5
	Raupiano	3	3	NA	NA	NA	3	NA	NA	NA	3	4
	Triplus	3	3	NA	NA	NA	3	NA	3	NA	3	4
Hebel walls Or Speedpanel wall	PVC	3	3	NA	NA	3	NA	3	3	3	NA	4
	PVC with coupling	3	3	NA	NA	3	NA	3	3	3	NA	4
	HDPE	3	3	3	3	NA	3	NA	3	NA	3	4
	Raupiano	3	3	NA	NA	NA	3	NA	NA	NA	3	4
	Triplus	3	3	NA	NA	NA	3	NA	3	NA	3	4

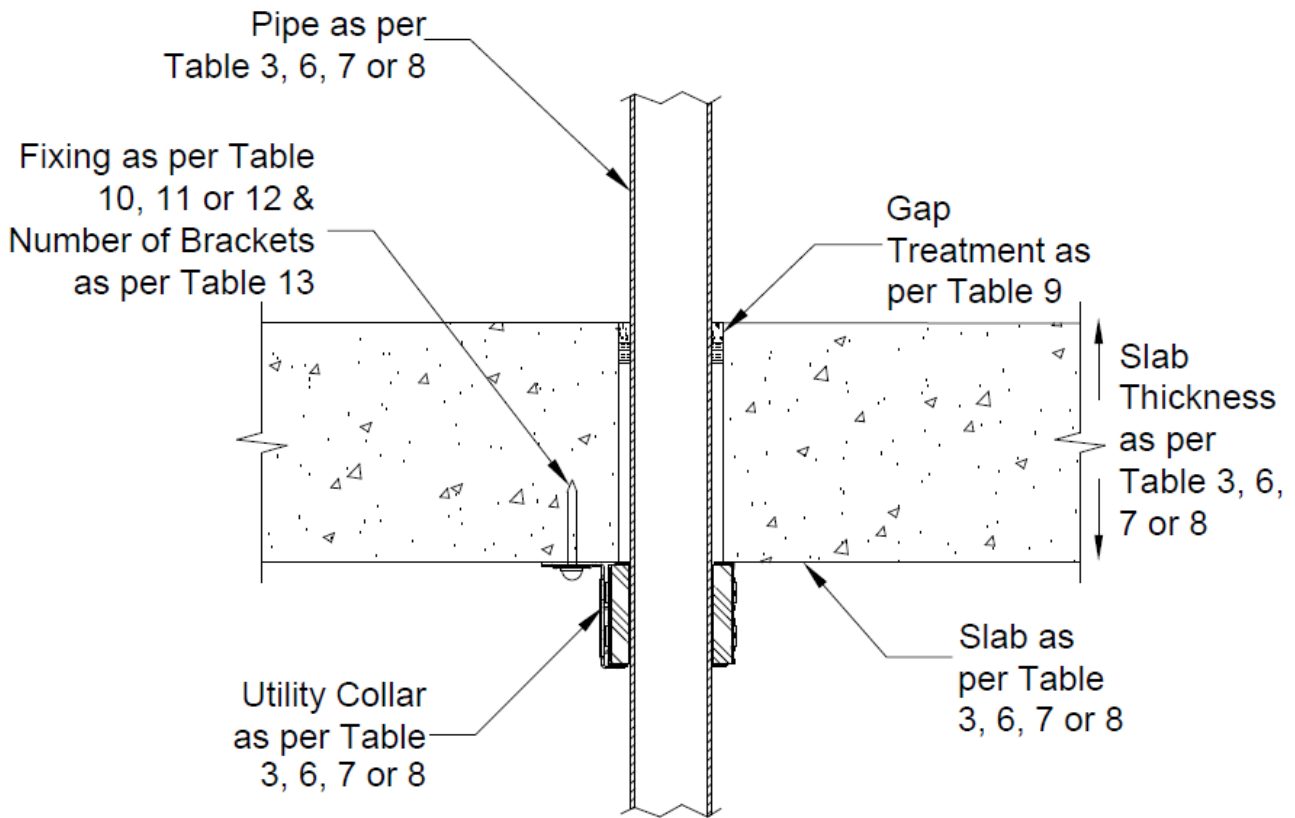


Figure 3: General installation of pipe in a slab

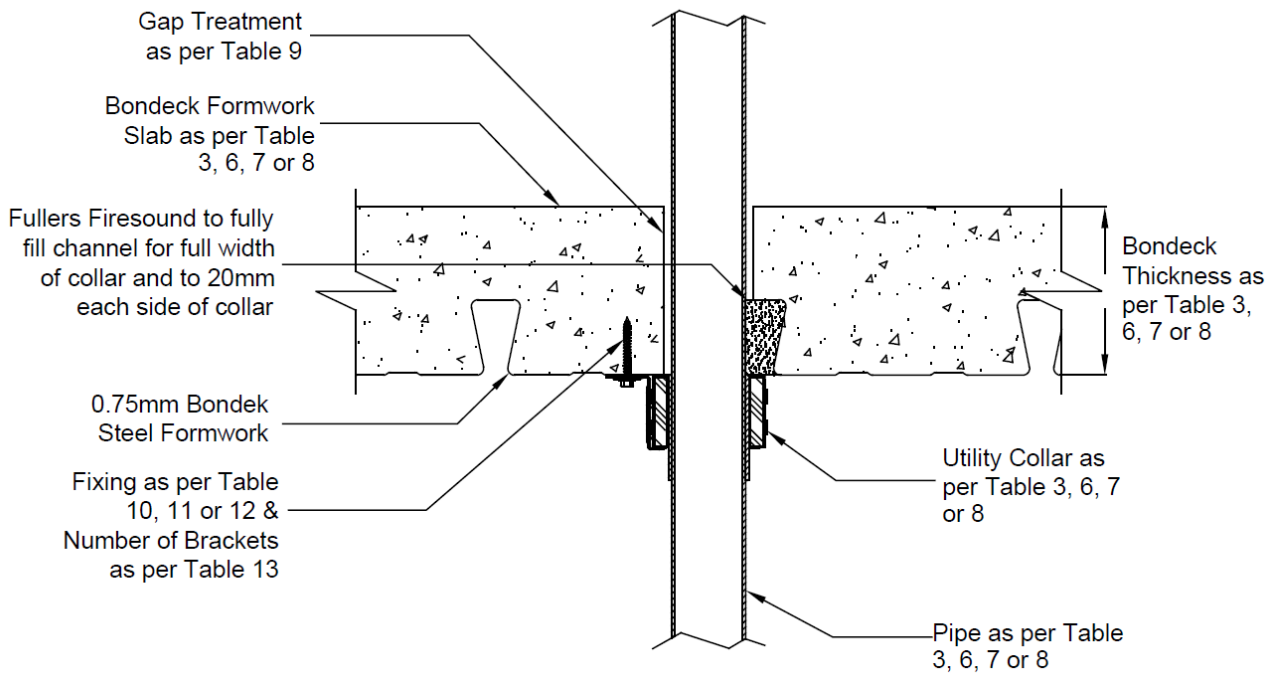


Figure 4: Bondek with pipe next to channel

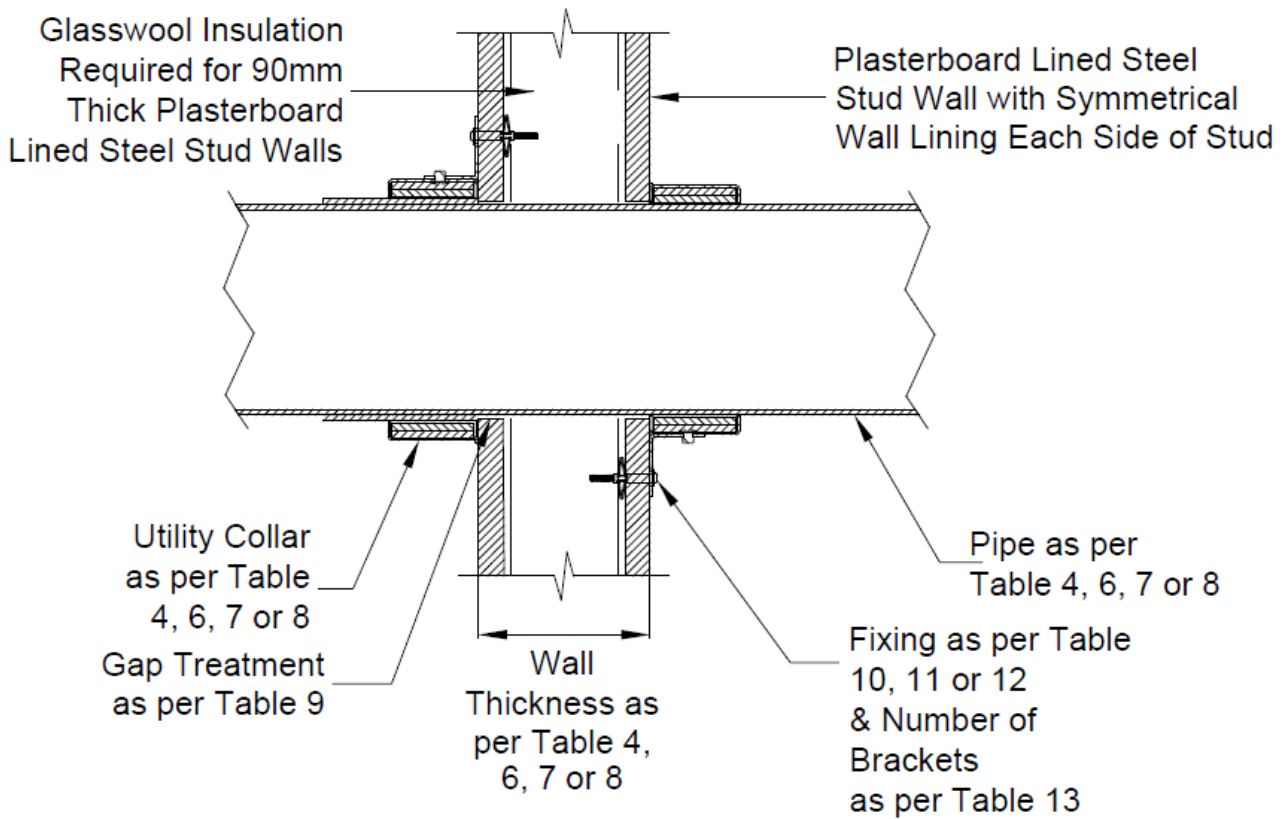


Figure 5: General installation of pipe in a plasterboard wall

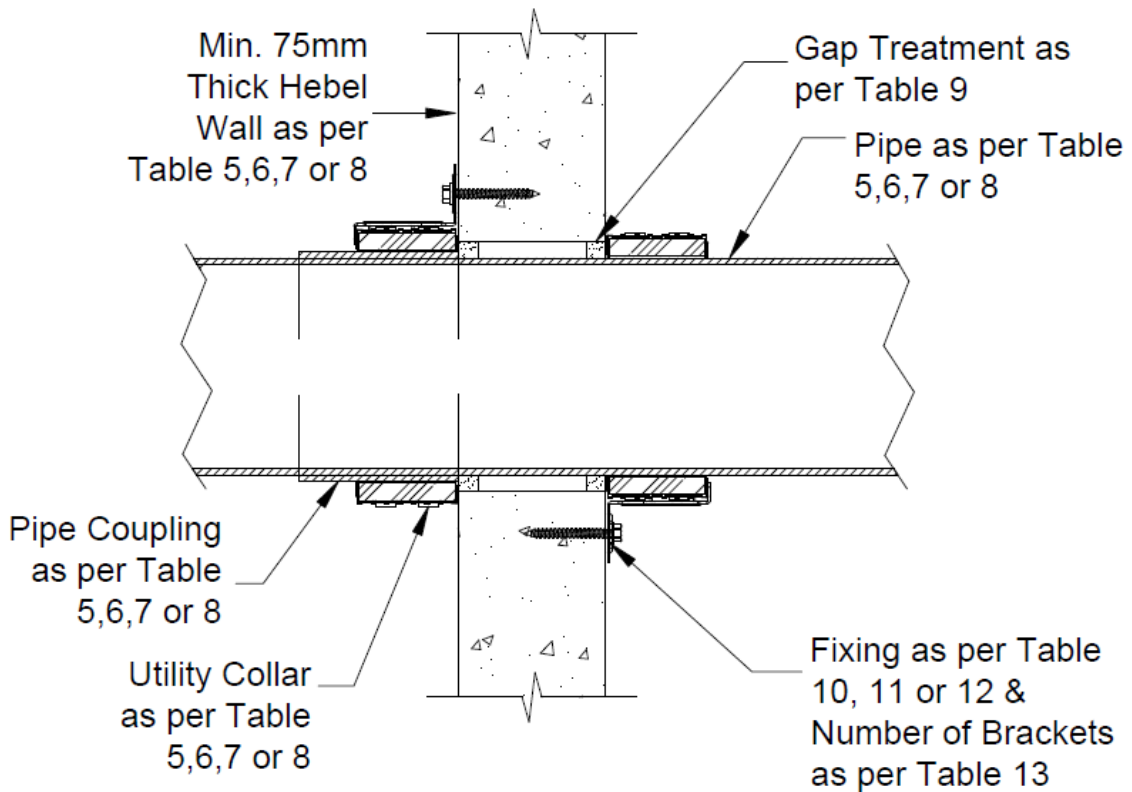


Figure 6: General installation of pipe in a Hebel wall

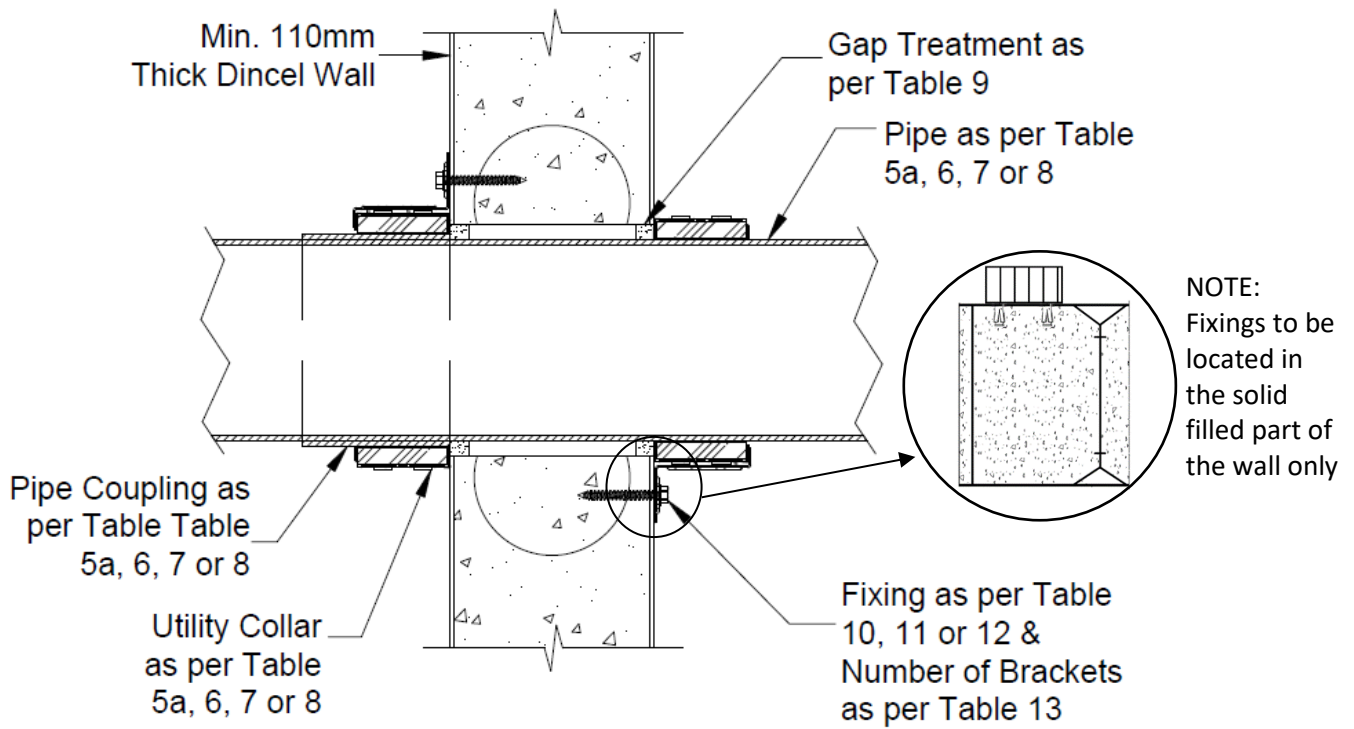


Figure 7: General installation of pipe in a Dintel wall

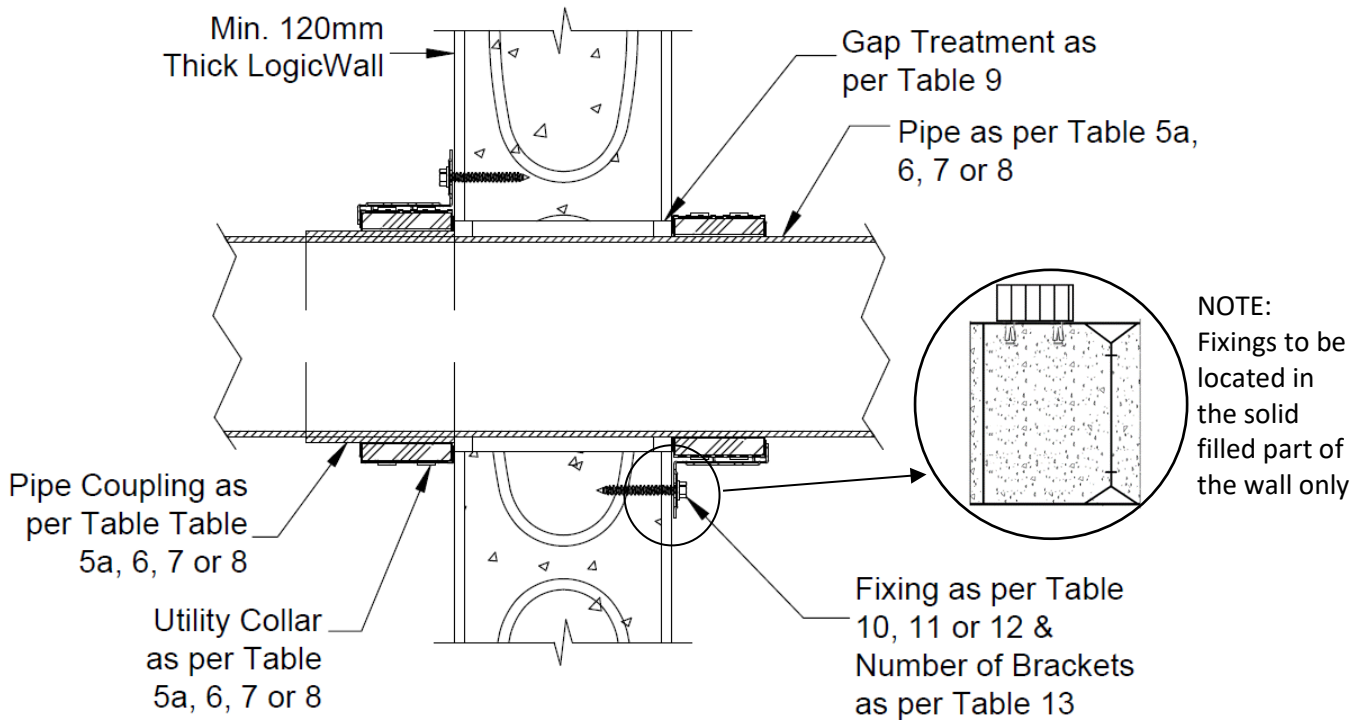


Figure 8: General installation of pipe in a AFS Logic wall

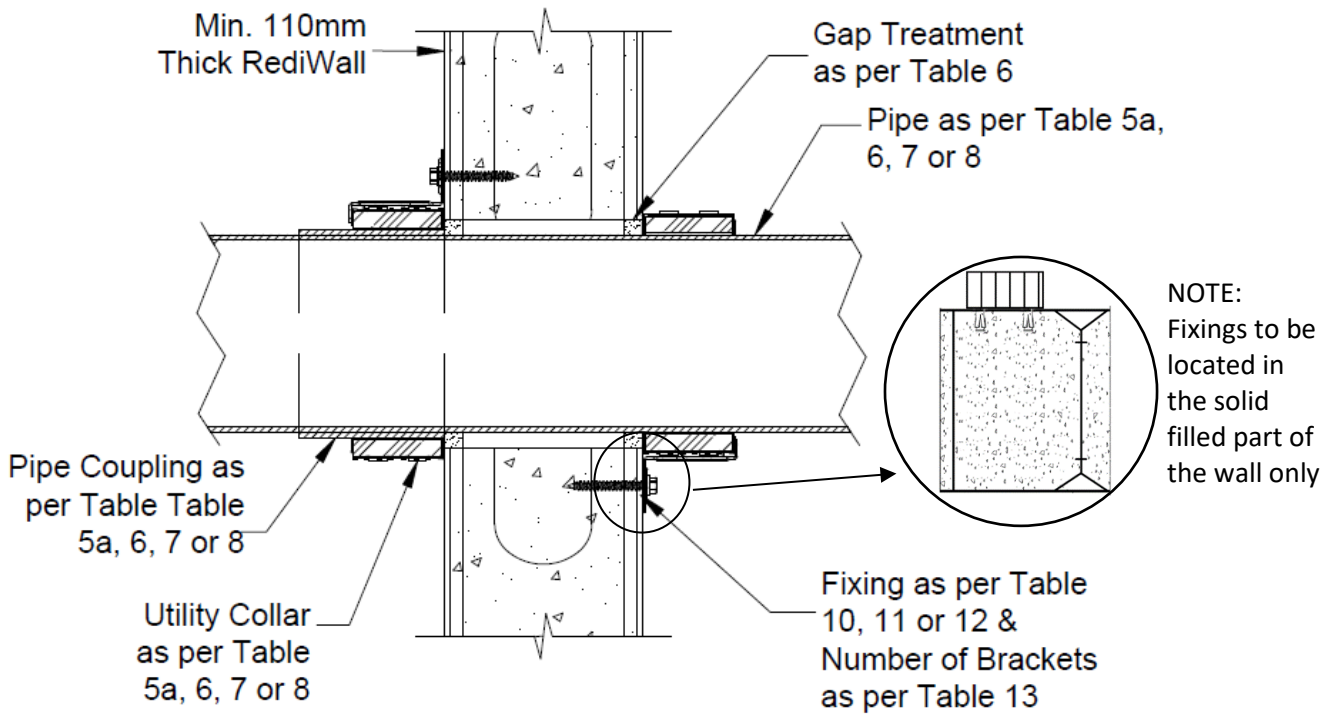


Figure 9: General installation of pipe in a AFS Rediwall

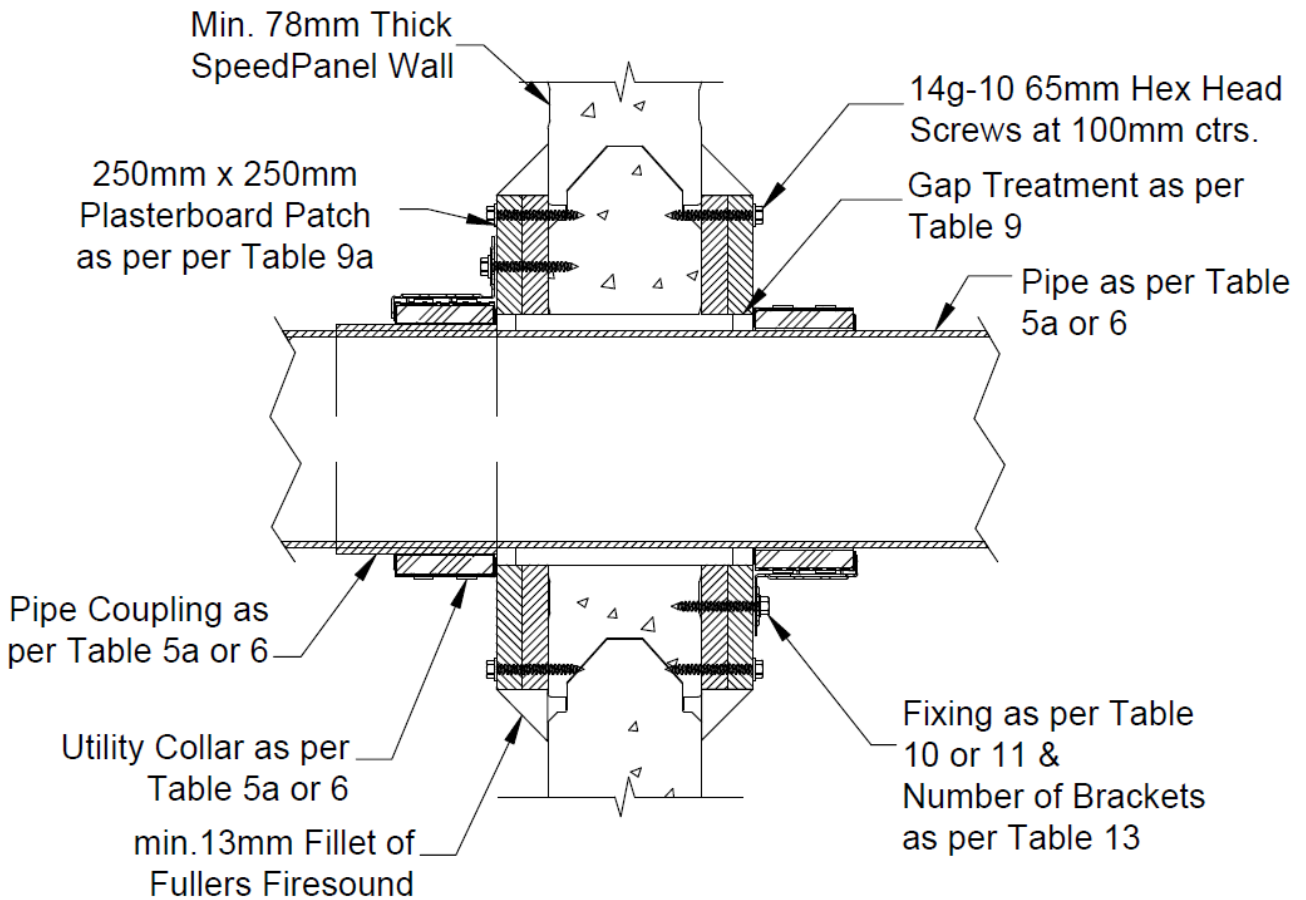


Figure 10: General installation of pipe in a Speedpanel wall

4 Referenced Standards

- AS 1530.4-2014 Methods for fire tests on building materials, components and structures Part 4: Fire resistance tests of elements of building construction, Section 10 as appropriate for service penetrations.
- AS 4072.1-2005 Components for the protection of openings in fire-resistant separating elements Part 1: Service penetrations and control joints. Section 10 as appropriate for service penetrations.

5 Conclusion

On the basis of the analysis presented in this report, it is the opinion of this Accredited Testing Laboratory that the tested prototypes described in Section 2 when varied as described in Section 3 will achieve the Fire Resistance stated below when submitted to a standard fire test in accordance with the test methods referenced in Section 4 and subject to the requirements of section 7, the validity of section 8 and limitation of section 9.

Table 14: PVC pipes in slab/Bondek formwork slab

Nominal diameter (mm)	Pipe coupling within the collar	Collar	Construction Details	FRL		
				Minimum slab/Bondek thickness (X)		
				≥120mm	≥150mm	≥175mm
40	No	Utility 40	Figures 1, 2, 3, 4 Table 2, 3, 9, 10, 13	-/120/120	-/180/180	-/240/240
40	Yes	Utility 40+		-/120/120	-/180/180	-/240/240
50	No	Utility 50		-/120/120	-/180/180	-/240/240
50	Yes	Utility 50+		-/120/120	-/180/180	-/240/240
65	No	Utility 65		-/120/120	-/180/180	-/240/240
65	Yes	Utility 65+		-/120/120	-/180/180	-/240/240
80	No	Utility 80		-/120/120	-/180/180	-/240/240
80	Yes	Utility 80+		-/120/120	-/180/180	-/240/240
90	No	Utility 80+		-/120/120	-/180/180	-/240/240
90	Yes	Utility 90+		-/120/120	-/180/180	-/240/240
100	No	Utility 100		-/120/120	-/180/180	-/240/240
100	Yes	Utility 100+		-/120/120	-/180/180	-/240/240
150	No	2 x Utility 150		NA	-/180/180	-/240/240

Table 15: HDPE pipes in slabs

Nominal diameter (mm)	Pipe coupling within the collar	Collar	Construction Details	FRL		
				Minimum Slab Thickness		
				≥120mm	≥150mm	≥175mm
40	No	Utility 40	Figure 1, 2, 3, 4 Table 2, 6, 9, 11, 13	-/120/120	-/180/180	-/240/240
50	No	Utility 50		-/120/120	-/180/180	-/240/240
56	No	Utility 50		-/120/120	-/180/180	-/240/240
63	No	Utility 50+		-/120/120	-/180/180	-/240/240
75	No	Utility 65+		-/120/120	-/180/180	-/240/240
90	No	Utility 80+		-/120/120	-/180/180	-/240/240
110	No	Utility 100		-/120/120	-/180/180	-/240/240
160	No	2 x Utility 150		n/a	-/180/180	-/240/240

Table 16: Valsir Triplus Polypropylene pipes in slabs

Nominal diameter (mm)	Pipe coupling within the collar	Collar	Construction Details	FRL		
				Minimum Slab Thickness		
				≥120mm	≥150mm	≥175mm
40	No	Utility 40	Figure 1, 2, 3, 4 Table 2, 7, 9, 12, 13	-/120/120	-/180/180	-/240/240
50	No	Utility 50		-/120/120	-/180/180	-/240/240
75	No	Utility 65+		-/120/120	-/180/180	-/240/240
90	No	Utility 80+		-/120/120	-/180/180	-/240/240
110	No	Utility 100		-/120/120	-/180/180	-/240/240
160	No	2 x Utility 150		n/a	-/180/180	-/240/240

Table 17: Rehau Raupiano Polypropylene pipes in slabs

Nominal diameter (mm)	Pipe coupling within the collar	Collar	Construction Details	FRL		
				Minimum Slab Thickness		
				≥120mm	≥150mm	≥175mm
40	No	Utility 40	Figure 1, 2, 3, 4 Table 2, 8, 9, 12, 13	-/120/120	-/180/180	-/240/240
50	No	Utility 50		-/120/120	-/180/180	-/240/240
75	No	Utility 65+		-/120/120	-/180/180	-/240/240
110	No	Utility 100		-/120/120	-/180/180	-/240/240
160	No	2 x Utility 150		n/a	-/180/180	-/240/240

Table 18: PVC pipes in Plasterboard lined steel stud wall

Nominal diameter (mm)	Pipe coupling within the collar	Collar	Construction Details	FRL	
				Wall Lining of a stud wall	
				≥1x13mm sheets each side	≥2x13mm sheets each side
40	No	Utility 40	Figures 1, 2, 5 Table 2, 4, 9, 10, 13	-/60/60	-/120/120
40	Yes	Utility 40+		-/60/60	-/120/120
50	No	Utility 50		-/60/60	-/120/120
50	Yes	Utility 50+		-/60/60	-/120/120
65	No	Utility 65		-/60/60	-/120/120
65	Yes	Utility 65+		-/60/60	-/120/120
80	No	Utility 80		-/60/60	-/120/120
80	Yes	Utility 80+		-/60/60	-/120/120
90	No	Utility 80+		-/60/60	-/120/120
90	Yes	Utility 90+		-/60/60	-/120/120
100	No	Utility 100		-/60/60	-/120/120
100	Yes	Utility 100+		-/60/60	-/120/120
150	No	2 x Utility 150		NA	-/120/120

Table 19: HDPE pipes in plasterboard walls

Nominal diameter (mm)	Pipe coupling within the collar	Collar	Construction Details	FRL	
				Wall Lining	
				≥1x13mm Sheets either side	≥2x13mm sheets either side
40	No	Utility 40	Figures 1, 2, 5 Table 2, 6, 9, 11, 13	-/60/60	-/120/120
50	No	Utility 50		-/60/60	-/120/120
56	No	Utility 50		-/60/60	-/120/120
63	No	Utility 50+		-/60/60	-/120/120
75	No	Utility 65+		-/60/60	-/120/120
90	No	Utility 80+		-/60/60	-/120/120
110	No	Utility 100		-/60/60	-/120/120
160	No	2 x Utility 150		n/a	-/120/90

Table 20: Valsir Triplus Polypropylene pipes in plasterboard walls

Nominal diameter (mm)	Pipe coupling within the collar	Collar	Construction Details	FRL	
				Wall Lining	
				≥1x13mm Sheets either side	≥2x13mm sheets either side
40	No	Utility 40	Figures 1, 2, 5 Table 2, 7, 9, 12, 13	-/60/60	-/120/120
50	No	Utility 50		-/60/60	-/120/120
75	No	Utility 65+		-/60/60	-/120/120
90	No	Utility 80+		-/60/60	-/120/120
110	No	Utility 100		-/60/60	-/120/120
160	No	2 x Utility 150		-/60/60	-/120/120

Table 21: Rehau Raupiano Polypropylene pipes in plasterboard walls

Nominal diameter (mm)	Pipe coupling within the collar	Collar	Construction Details	FRL	
				Wall Lining	
				≥1x13mm Sheets either side	≥2x13mm sheets either side
40	No	Utility 40	Figures 1, 2, 5 Table 2, 8, 9, 12, 13	-/60/60	-/120/120
50	No	Utility 50		-/60/60	-/120/120
75	No	Utility 65+		-/60/60	-/120/120
110	No	Utility 100		-/60/60	-/120/120
160	No	2 x Utility 150		-/60/60	-/120/120

Table 22: PVC pipes in Hebel wall

Nominal diameter (mm)	Pipe coupling within the collar	Collar	Construction Details	FRL	
				Type of Hebel panel	
				75mm Hebel panel wall (single mesh)	75mm Hebel panel wall (caged mesh)
40	No	Utility 40	Figures 1, 2, 6 Table 2, 5, 9, 10, 13	-/90/90	-/120/120
40	Yes	Utility 40+		-/90/90	-/120/120
50	No	Utility 50		-/90/90	-/120/120
50	Yes	Utility 50+		-/90/90	-/120/120
65	No	Utility 65		-/90/90	-/120/120
65	Yes	Utility 65+		-/90/90	-/120/120
80	No	Utility 80		-/90/90	-/120/120
80	Yes	Utility 80+		-/90/90	-/120/120
90	No	Utility 80+		-/90/90	-/120/120
90	Yes	Utility 90+		-/90/90	-/120/120
100	No	Utility 100		-/90/90	-/120/120
100	Yes	Utility 100+		-/90/90	-/120/120
150	No	2 x Utility 150		NA	-/120/90

Table 23: HDPE pipes in Hebel walls

Nominal diameter (mm)	Pipe coupling within the collar	Collar	Construction Details	FRL	
				Type of Hebel panel	
				75mm Hebel panel wall (single mesh)	75mm Hebel panel wall (caged mesh)
40	No	Utility 40	Figures 1, 2, 6 Table 2, 6, 9, 11, 13	-/90/90	-/120/120
50	No	Utility 50		-/90/90	-/120/120
56	No	Utility 50		-/90/90	-/120/120
63	No	Utility 50+		-/90/90	-/120/120
75	No	Utility 65+		-/90/90	-/120/120
90	No	Utility 80+		-/90/90	-/120/120
110	No	Utility 100		-/90/90	-/120/120
160	No	2 x Utility 150		-/90/60	-/120/90

Table 24: Valsir Triplus Polypropylene pipes in Hebel walls

Nominal diameter (mm)	Pipe coupling within the collar	Collar	Construction Details	FRL	
				Type of Hebel panel	
				75mm Hebel panel wall (single mesh)	75mm Hebel panel wall (single mesh)
40	No	Utility 40	Figures 1, 2, 6 Table 2, 7, 9, 12, 13	-/90/90	-/120/120
50	No	Utility 50		-/90/90	-/120/120
75	No	Utility 65+		-/90/90	-/120/120
90	No	Utility 80+		-/90/90	-/120/120
110	No	Utility 100		-/90/90	-/120/120
160	No	2 x Utility 150		-/90/90	-/120/120

Table 25: Rehau Raupiano Polypropylene pipes in Hebel walls

Nominal diameter (mm)	Pipe coupling within the collar	Collar	Construction Details	FRL	
				Type of Hebel panel	
				75mm Hebel panel wall (single mesh)	75mm Hebel panel wall (single mesh)
40	No	Utility 40	Figures 1, 2, 6 Table 2, 8, 9, 12, 13	-/90/90	-/120/120
50	No	Utility 50		-/90/90	-/120/120
75	No	Utility 65+		-/90/90	-/120/120
110	No	Utility 100		-/90/90	-/120/120
160	No	2 x Utility 150		-/90/90	-/120/120

Table 26: PVC pipe in Dintel wall, Logicwall and AFS Logicwall

Nominal diameter (mm)	With Fitting Inside Collar	Collar	Construction Details	FRL			
				Dintel	AFS Rediwall	Logic Wall	Dintel
				110mm (90 minute)	110mm (90 minute)	120mm LW120 (120min)	155mm (180 minute)
40	No	Utility 40	Figures 1, 2, 7, 8, 9 Table 2, 5a, 9, 10, 13	-/90/90	-/90/90	-/120/120	-/180/180
40	Yes	Utility 40+		-/90/90	-/90/90	-/120/120	-/180/180
50	No	Utility 50		-/90/90	-/90/90	-/120/120	-/180/180
50	Yes	Utility 50+		-/90/90	-/90/90	-/120/120	-/180/120
65	No	Utility 65		-/90/90	-/90/90	-/120/120	-/180/180
65	Yes	Utility 65+		-/90/90	-/90/90	-/120/120	-/180/120
80	No	Utility 80		-/90/90	-/90/90	-/120/120	-/180/180
80	Yes	Utility 80+		-/90/90	-/90/90	-/120/120	-/180/120
90	No	Utility 80+		-/90/90	-/90/90	-/120/120	-/180/180
90	Yes	Utility 90+		-/90/90	-/90/90	-/120/120	-/180/120
100	No	Utility 100		-/90/90	-/90/90	-/120/120	-/180/180
100	Yes	Utility 100+		-/90/90	-/90/90	-/120/120	-/180/120
150	No	2 x Utility 150		-/90/90	-/90/90	-/120/120	-/180/120

Table 27: HDPE pipe in Dincel wall, Logicwall and AFS Logicwall

Nominal diameter (mm)	With Fitting Inside Collar	Collar	Construction Details	FRL			
				Dincel	AFS Rediwall	Logic Wall	Dincel
				110mm (90 minute)	110mm (90 minute)	120mm LW120 (120min)	155mm (180 minute)
40	No	Utility 40	Figures 1, 2, 7, 8, 9 Table 2, 6, 9, 11, 13	-/90/90	-/90/90	-/120/120	-/180/120
50	No	Utility 50		-/90/90	-/90/90	-/120/120	-/180/120
56	No	Utility 50		-/90/90	-/90/90	-/120/120	-/180/120
63	No	Utility 50+		-/90/90	-/90/90	-/120/120	-/180/120
75	No	Utility 65+		-/90/90	-/90/90	-/120/120	-/180/120
90	No	Utility 80+		-/90/90	-/90/90	-/120/120	-/180/120
110	No	Utility 100		-/90/90	-/90/90	-/120/120	-/180/120
160	No	2 x Utility 150		-/90/90	-/90/90	-/120/90	-/180/90

Table 28: Valsir Triplus Polypropylene pipe in Dincel wall, Logicwall and AFS Logicwall

Nominal diameter (mm)	With Fitting Inside Collar	Collar	Construction Details	FRL			
				Dincel	AFS Rediwall	Logic Wall	Dincel
				110mm (90 minute)	110mm (90 minute)	120mm LW120 (120min)	155mm (180 minute)
40	No	Utility 40	Figures 1, 2, 7, 8, 9 Table 2, 7, 9, 12, 13	-/90/90	-/90/90	-/120/120	-/180/120
50	No	Utility 50		-/90/90	-/90/90	-/120/120	-/180/120
75	No	Utility 65+		-/90/90	-/90/90	-/120/120	-/180/120
90	No	Utility 80+		-/90/90	-/90/90	-/120/120	-/180/120
110	No	Utility 100		-/90/90	-/90/90	-/120/120	-/180/120
160	No	2 x Utility 150		-/90/90	-/90/90	-/120/120	-/180/120

Table 29: Rehau Raupiano Polypropylene pipe in Dincel wall, Logicwall and AFS Logicwall

Nominal diameter (mm)	With Fitting Inside Collar	Collar	Construction Details	FRL			
				Dincel	AFS Rediwall	Logic Wall	Dincel
				110mm (90 minute)	110mm (90 minute)	120mm LW120 (120min)	155mm (180 minute)
40	No	Utility 40	Figures 1, 2, 7, 8, 9 Table 2, 8, 9, 12, 13	-/90/90	-/90/90	-/120/120	-/180/180
50	No	Utility 50		-/90/90	-/90/90	-/120/120	-/180/180
75	No	Utility 65+		-/90/90	-/90/90	-/120/120	-/180/180
110	No	Utility 100		-/90/90	-/90/90	-/120/120	-/180/180
160	No	2 x Utility 150		-/90/90	-/90/90	-/120/120	-/180/180

Table 30: PVC pipe in 78mm Speedpanel wall

Nominal diameter (mm)	With Fitting Inside Collar	Collar	Construction Details	FRL		
				Plasterboard patching each side of wall		
				1 x min. 13mm FR	1 x min. 16mm FR	2 x min. 13mm FR
40	No	Utility 40	Figures 1, 2, 10 Table 2, 5, 9, 10, 13	-/60/60	-/90/90	-/120/120
40	Yes	Utility 40+		-/60/60	-/90/90	-/120/120
50	No	Utility 50		-/60/60	-/90/90	-/120/120
50	Yes	Utility 50+		-/60/60	-/90/90	-/120/120
65	No	Utility 65		-/60/60	-/90/90	-/120/120
65	Yes	Utility 65+		-/60/60	-/90/90	-/120/120
80	No	Utility 80		-/60/60	-/90/90	-/120/120
80	Yes	Utility 80+		-/60/60	-/90/90	-/120/120
90	No	Utility 80+		-/60/60	-/90/90	-/120/120
90	Yes	Utility 90+		-/60/60	-/90/90	-/120/120
100	No	Utility 100		-/60/60	-/90/90	-/120/120
100	Yes	Utility 100+		-/60/60	-/90/90	-/120/120
150	No	2 x Utility 150		-/60/60	-/90/90	-/120/120

Table 31: HDPE pipe in 78mm Speedpanel wall

Nominal diameter (mm)	With Fitting Inside Collar	Collar	Construction Details	FRL		
				Plasterboard patching each side of wall		
				1 x min. 13mm FR	1 x min. 16mm FR	2 x min. 13mm FR
40	No	Utility 40	Figures 1, 2, 10 Table 2, 6, 9, 9a, 11, 13	-/60/60	-/90/90	-/120/120
50	No	Utility 50		-/60/60	-/90/90	-/120/120
56	No	Utility 50		-/60/60	-/90/90	-/120/120
63	No	Utility 50+		-/60/60	-/90/90	-/120/120
75	No	Utility 65+		-/60/60	-/90/90	-/120/120
90	No	Utility 80+		-/60/60	-/90/90	-/120/120
110	No	Utility 100		-/60/60	-/90/90	-/120/120
160	No	2 x Utility 150		-/60/60	-/90/90	-/120/90

Table 32: Valsir Triplus Polypropylene pipe in 78mm Speedpanel wall

Nominal diameter (mm)	With Fitting Inside Collar	Collar	Construction Details	FRL		
				Plasterboard patching each side of wall		
				1 x min. 13mm FR	1 x min. 16mm FR	2 x min. 13mm FR
40	No	Utility 40	Figures 1, 2, 10 Table 2, 6, 9, 9a, 11, 13	-/60/60	-/90/90	-/120/120
50	No	Utility 50		-/60/60	-/90/90	-/120/120
75	No	Utility 65+		-/60/60	-/90/90	-/120/120
90	No	Utility 80+		-/60/60	-/90/90	-/120/120
110	No	Utility 100		-/60/60	-/90/90	-/120/120
160	No	2 x Utility 150		-/60/60	-/90/90	-/120/120

Table 33: Rehau Raupiano Polypropylene pipe in 78mm Speedpanel wall

Nominal diameter (mm)	With Fitting Inside Collar	Collar	Construction Details	FRL		
				Plasterboard patching each side of wall		
				1 x min. 13mm FR	1 x min. 16mm FR	2 x min. 13mm FR
40	No	Utility 40	Figures 1, 2, 10	-/60/60	-/90/90	-/120/120
50	No	Utility 50		-/60/60	-/90/90	-/120/120
75	No	Utility 65+	Table 2, 6, 9, 9a, 11, 13	-/60/60	-/90/90	-/120/120
110	No	Utility 100		-/60/60	-/90/90	-/120/120
160	No	2 x Utility 150		-/60/60	-/90/90	-/120/120

6 Direct Field of Application of Results

The results of this report are applicable to floors when exposed to fire from below and to walls when exposed to fire from either side.

7 Requirements

Where concrete slabs, Bondek formwork slab, Hebel wall, Speedpanel wall, AFS Logic wall, AFS Rediwall, Dintel wall or plasterboard lined steel stud walls are specified in this report, it is required that they be designed, tested or assessed as a separating element for the required FRL when including the service penetration specified in Section 5.

Any variations concerning size, constructional details, loads, stresses, edge or end conditions that are other than those identified in this report, may invalidate the conclusions drawn in this report.

8 Term of Validity

This assessment report will lapse on 31st August 2028. Should you wish us to re-examine this report with a view to the possible extension of its term of validity, would you please apply to us three to four months before the date of expiry. This Division reserves the right at any time to amend or withdraw this assessment in the light of new knowledge.

9 Limitations

The conclusions of this assessment report may be used to directly assess the fire resistance performance under such conditions, but it should be recognised that a single test method will not provide a full assessment of the fire hazard under all fire conditions.

Because of the nature of fire resistance 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.

This assessment report does not provide an endorsement by CSIRO of the actual products supplied to industry. The referenced assessment can therefore only relate to the actual prototype test specimens,

testing conditions and methodology described in the supporting data, and does not imply any performance abilities of construction 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 is reviewed on or, before, the stated expiry date.

The information contained in this assessment 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.

Appendix A Supporting Test Data

A.1. FSP 2320

On 31 October 2022, CSIRO North Ryde conducted a fire-resistance test in accordance with AS 1530.4 – 2014 on a 116mm thick plasterboard wall penetrated by pipes protected by Snap Fire Systems fire collars. The relevant specimens are summarised and discussed in Appendix B.

A.2. FSP 2333

On 1 Dec 2022, CSIRO North Ryde conducted a fire-resistance test in accordance with AS 1530.4 – 2014 on a 120-mm thick concrete slab penetrated by pipes protected by Snap Fire Systems fire collars. The relevant specimens are summarised and discussed in Appendix B.

A.3. FSP 2336

On 3 Jan 2023, CSIRO North Ryde conducted a fire-resistance test in accordance with AS 1530.4 – 2014 on a 75mm thick Hebel wall penetrated by pipes protected by Snap Fire Systems fire collars. The relevant specimens are summarised and discussed in Appendix B.

A.4. FSP 2337

On 5 Jan 2023, CSIRO North Ryde conducted a fire-resistance test in accordance with AS 1530.4 – 2014 on a 90mm thick plasterboard wall penetrated by pipes protected by Snap Fire Systems fire collars. The relevant specimens are summarised and discussed in Appendix B.

A.5. FSP 2338

On 9 Jan 2023, CSIRO North Ryde conducted a fire-resistance test in accordance with AS 1530.4 – 2014 on a 150-mm thick concrete slab penetrated by pipes protected by Snap Fire Systems fire collars. The relevant specimens are summarised and discussed in Appendix B.

A.6. FSP 2345

On 6 Feb 2023, CSIRO North Ryde conducted a fire-resistance test in accordance with AS 1530.4 – 2014 on a 116mm thick plasterboard wall penetrated by pipes protected by Snap Fire Systems fire collars. The relevant specimens are summarised and discussed in Appendix B.

A.7. FSP 2347

On 16 Feb 2023, CSIRO North Ryde conducted a fire-resistance test in accordance with AS 1530.4 – 2014 on a 120-mm thick concrete slab penetrated by pipes protected by Snap Fire Systems fire collars. The relevant specimens are summarised and discussed in Appendix B.

A.8. FSP 2354

On 8 March 2023, CSIRO North Ryde conducted a fire-resistance test in accordance with AS 1530.4 – 2014 on a 90mm thick plasterboard wall penetrated by pipes protected by Snap Fire Systems fire collars. The relevant specimens are summarised and discussed in Appendix B.

A.9. FSP 2358

On 20 March 2023, CSIRO North Ryde conducted a fire-resistance test in accordance with AS 1530.4 – 2014 on a 120-mm thick concrete slab penetrated by pipes protected by Snap Fire Systems fire collars. The relevant specimens are summarised and discussed in Appendix B.

A.10. FSP 2361

On 3 April 2023, CSIRO North Ryde conducted a fire-resistance test in accordance with AS 1530.4 – 2014 on a 116mm thick plasterboard wall penetrated by pipes protected by Snap Fire Systems fire collars. The relevant specimens are summarised and discussed in Appendix B.

A.11. FSP 2362

On 5 April 2023, CSIRO North Ryde conducted a fire-resistance test in accordance with AS 1530.4 – 2014 on a 90mm thick plasterboard wall penetrated by pipes protected by Snap Fire Systems fire collars. The relevant specimens are summarised and discussed in Appendix B.

A.12. FSP 2366

On 20 April 2023, CSIRO North Ryde conducted a fire-resistance test in accordance with AS 1530.4 – 2014 on a 150mm thick slab penetrated by pipes protected by Snap Fire Systems fire collars. The relevant specimens are summarised and discussed in Appendix B.

A.13. FSP 2367

On 26 April 2023, CSIRO North Ryde conducted a fire-resistance test in accordance with AS 1530.4 – 2014 on a 75mm thick Hebel wall penetrated by pipes protected by Snap Fire Systems fire collars. The relevant specimens are summarised and discussed in Appendix B.

A.14. FSP 2368

On 1 May 2023, CSIRO North Ryde conducted a fire-resistance test in accordance with AS 1530.4 – 2014 on a 116mm thick plasterboard wall penetrated by pipes protected by Snap Fire Systems fire collars. The relevant specimens are summarised and discussed in Appendix B.

A.15. FSP 2369

On 3 May 2023, CSIRO North Ryde conducted a fire-resistance test in accordance with AS 1530.4 – 2014 on a 75mm thick Hebel wall penetrated by pipes protected by Snap Fire Systems fire collars. The relevant specimens are summarised and discussed in Appendix B.

A.16. FSP 2370

On 8 May 2023, CSIRO North Ryde conducted a fire-resistance test in accordance with AS 1530.4 – 2014 on a 75mm thick Hebel wall penetrated by pipes protected by Snap Fire Systems fire collars. The relevant specimens are summarised and discussed in Appendix B.

A.17. FSP 2371

On 15 May 2023, CSIRO North Ryde conducted a fire-resistance test in accordance with AS 1530.4 – 2014 on a 120-mm thick concrete slab penetrated by pipes protected by Snap Fire Systems fire collars. The relevant specimens are summarised and discussed in Appendix B.

A.18. FSP 2374

On 22 May 2023, CSIRO North Ryde conducted a fire-resistance test in accordance with AS 1530.4 – 2014 on a 90mm thick plasterboard wall penetrated by pipes protected by Snap Fire Systems fire collars. The relevant specimens are summarised and discussed in Appendix B.

A.19. FSP 2375

On 22 August 2023, CSIRO North Ryde conducted a fire-resistance test in accordance with AS 1530.4 – 2014 on a 90mm thick plasterboard wall penetrated by pipes protected by Snap Fire Systems fire collars. The relevant specimens are summarised and discussed in Appendix B.

A.20. FSP 2405

On 9 November 2023, CSIRO North Ryde conducted a fire-resistance test in accordance with AS 1530.4 – 2014 on a 90mm thick plasterboard wall penetrated by pipes protected by Snap Fire Systems fire collars. The relevant specimens are summarised and discussed in Appendix B.

A.21. FSP 2407

On 21 November 2023, CSIRO North Ryde conducted a fire-resistance test in accordance with AS 1530.4 – 2014 on a 116mm thick plasterboard wall penetrated by pipes protected by Snap Fire Systems fire collars. The relevant specimens are summarised and discussed in Appendix B.

A.22. Supplementary test data FSP 1953

On 15 Nov 2018, CSIRO North Ryde conducted a fire-resistance test in accordance with AS 1530.4 – 2014 on a 120-mm thick Bondek concrete slab penetrated by pipes protected by Snap Fire Systems fire collars. The relevant specimens are summarised and discussed in Appendix B.

Appendix B Analysis of Variations

B.1 Variation to pipe size and material in various support constructions

The proposed construction shall be Snap Utility collars tested in Table 1 and as shown in Figures 1 and 2 and Table 2 subject to the following variations:

- The inclusion of plastic pipes as shown in Tables 3 - 8
- The inclusion of pipe coupling as same wall thickness as pipe, for pipes, as shown in Table 3 -8
- The inclusion of concrete slab as a separating element
 - Inclusion of min. 120mm, 150mm and 175mm thick slab in accordance with AS3600-2018
 - For stack pipes, the pipework is to be vertically supported above the slab as tested
- The inclusion of the following walls as a separating element
 - Inclusion of 90mm thick plasterboard lined steel stud walls with glasswool in cavity, tested or tested or assess for an FRL of at least -/60/60. The wall shall be symmetrically lined on each side.
 - Inclusion of 116mm thick plasterboard lined steel stud walls, tested or tested or assessed for an FRL of at least -/120/120. The wall shall be symmetrically lined on each side.
 - Inclusion of 75mm single cage and double caged Hebel walls tested or tested or assessed for an FRL of at least -/90/90 and -/120/120 respectively
 - Pipework is to be supported on each side of the wall as tested

B1.1 PVC pipes in slabs

Table B1.01: PVC pipes in slab

Test Report Number	Pen. #	Test Element	Collar	Pipe Type	Pipe Dia. (Nom.) (mm)	Pipe wall thickness (mm)	Coupling (mm)	Annular Gap (mm)	Sealant	Test Result
FSP2347	3	120mm Concrete Slab	Utility 40	PVC	40	2.2	0	4	10mm bead of Fullers Firesound	-/241/208 (slab)
FSP2358	3	120mm Concrete Slab	Utility 50	PVC	50	2.5	0	10	10mm bead of Fullers Firesound	-/241/235 (slab)
FSP2358	1	120mm Concrete Slab	Utility 65	PVC	65	2.9	0	6	10mm bead of Fullers Firesound	-/241/232 (slab)
FSP2358	2	120mm Concrete Slab	Utility 80	PVC	80	3.2	0	10	10mm bead of Fullers Firesound	-/241/221 (slab)
FSP2333	3	120mm Concrete Slab	Utility 100	PVC (SC)	100	3.21	0	2	None	-/241/219 (slab)
FSP2333	5	120mm Concrete Slab	Utility 40+	PVC	40	2.1	2	5	10mm bead of Fullers Firesound	-/241/230 (slab)

Test Report Number	Pen. #	Test Element	Collar	Pipe Type	Pipe Dia. (Nom.) (mm)	Pipe wall thickness (mm)	Coupling (mm)	Annular Gap (mm)	Sealant	Test Result
FSP2333	1	120mm Concrete Slab	Utility 100+	PVC (SC)	100	3.21	3.1	0	None	-/241/226 (slab)
FSP 2371	1	120mm Concrete Slab	Utility 100+	PVC (SC)	100	3.21	3.1	5	10mm bead of Fullers Firesound	-/241/241
FSP2338	4	150mm Concrete Slab	2 x Utility 150	PVC (SC)	150	4.4	0	2	None	-/241/241

PVC stack pipes without coupling

The proposed construction comprises a Snap Utility collar protecting 40mm to 90mm PVC, 100mm and 150mm PVC (SC) stack pipes penetrating through 120, 150 and 175mm thick slabs.

With reference to test data summarised in Table B1.01, various sizes and thicknesses of plastic pipes made from AUS PVC, Sandwich Core PVC, penetrated 120mm and 150mm thick concrete slabs and were protected with Utility collar.

It is observed that these specimens all were able to maintain integrity for up to 240 minutes without failure. When the specimen failed insulation, it was due to the failure of the supporting construction. The pipe was able to maintain insulation for up to 240 minutes.

The PVC pipe sizes that were tested in the 120mm thick slabs were 40mm, 50mm, 65mm, 80mm and 100mm(SC). The PVC pipe that was tested in the 150mm thick slab was 150mm PVC(SC).

The proposed construction comprises the 40mm, 50mm, 65mm, 80mm and 100mm(SC) specimens from installed in 120mm thick slab to 150mm and 175mm. The proposed construction also comprises the 150mm PVC(SC) specimen from installed in 150mm thick slab to 175mm.

It is expected that with the increase in slab thickness, the thermal mass of the system will be increased resulting in a greater heat sink effect and thus leading to a lesser increase in pipe temperature throughout the test. It is therefore expected that the pipes installed in a 150mm and 175mm thick slab will be able to maintain insulation for up to 180 and 240 minutes respectively.

Confidence in the ability of the concrete slab to perform for the required FRL is offered by reference to AS 3600-2018 clause 5.5, where the required floor thicknesses by that standard are the same as those proposed for the given FRL.

Based on the above, it can be seen that the prequalification testing of the uPVC pipe sizes between 40 to 80mm and 100mm PVC SC have been met, and these pipes will be able to maintain integrity and insulation performance of up to 120 minutes in 120mm slabs, 180minutes in 150mm thick slabs and 240 minutes in 175mm thick slabs.

The proposed 90mm PVC pipe when protected with a Utility 80+ collar would result in an annular gap between the pipe and the inner diameter of the collar of 7.3mm, which is 2.8mm more than that in FSP2333 specimen 3. This difference in annular gap may affect the closure speed of the intumescent in the collar on the pipe which may lead to insulation failure of the pipe in the early stage of the test.

With reference to FSP2347 specimen 3 which comprised a 40mm PVC pipe protected with a Utility 40 and FSP2333 specimen 5 which comprised a 40mm PVC pipe with fitting was protected with a Utility 40+ collar. The annular gap difference between the two specimens was 2.7mm. Both specimens were able to maintain integrity for 240 minutes, and insulation on the pipe for 240 minutes.

The significance of this comparison demonstrates that a difference in annular gap of 2.7mm did not affect the closure of the PVC pipe.

Therefore, it is expected the proposed 90mm PVC pipe protected with a Utility 80+ collar, with a similar annular gap difference to the 100mm PVC pipe specimen in FSP2333 specimen 3, will be able to maintain integrity and insulation performance of up to 120 minutes in 120mm slabs, 180 minutes in 150mm thick slabs and 240 minutes in 175mm thick slabs.

Based on the above, it can be expected the proposed construction will be able to maintain integrity and insulation for up to 120, 180 and 240 minutes based on the design if tested in accordance with AS 1530.4-2014 and assessed in accordance with AS 4072.1-2005.

PVC stack pipes with coupling

The proposed construction comprises a Snap Utility collar protecting 40mm to 90mm PVC and 100mm PVC (SC) stack pipes with pipe coupling penetrating through 120, 150 and 175mm thick slabs.

The proposed variation to include a coupling inside the Utility collar may affect and or delay collar closure.

With reference to Table B1.01, the 40mm and 100mm pipes were tested with coupling inside the Utility collar. Both specimens were able to maintain integrity for up to 240 minutes and insulation on the pipe for up to 240 minutes. The difference in annular gap between the collar and these pipes compared to the collar and the 40mm and 100mm without coupling ranged from 1.8mm to 2.7mm.

With reference to Table B1.01, the 50mm, 65mm, 80mm pipe with their respective collars were tested and were able to maintain integrity for up to 240 minutes and insulation on the pipe for up to 240 minutes.

Compared to these tested pipes without couplings, the proposed 50mm, 65mm, 80mm pipe with couplings would have a difference in annular gap that is within the 1.8mm to 2.7mm range.

The proposed 90mm pipe with coupling inside a Utility 90+ collar would have an annular gap between the collar and the pipe that is similar to the 100mm pipes were tested with coupling inside the Utility collar 100+ collar.

Given the similarity in distance of collar intumescent to proposed pipe to that of the tested pipes, and the absence of any impending failure observed in the reference tests for up to 240 minutes, it is expected that the proposed construction will be able to maintain integrity and insulation for up to 120, 180 and 240 minutes based on the design if tested in accordance with AS 1530.4-2014 and assessed in accordance with AS 4072.1-2005.

B1.2 PVC pipes in plasterboard walls

Table B1.21: PVC pipes in plasterboard walls

Test Report Number	Pen. #	Test Element	Collar	Pipe Type	Pipe Dia. (Nom.) (mm)	Pipe wall thickness (mm)	Coupling (mm)	Annular Gap (mm)	Sealant	Test Result
FSP2354	4	90mm Plasterboard Wall (64mm stud, 13mm board either side, glasswool in cavity)	Utility 40	PVC	40	2.4	0	1	None	-/91/63(wall)
FSP2337	4		Utility 40+	PVC	40	2.4	2.4	0	None	-/64/64
FSP2362	4		Utility 50	PVC	50	2.4	0	9	10mm bead of Fullers Firesound	-/71/71
FSP2362	5		Utility 65	PVC	65	3.2	0	7		-/71/71
FSP2362	2		Utility 80	PVC	80	3.1	0	9		-/71/71
FSP2337	2		Utility 100	PVC(SC)	100	3.1	0	2	None	-/64/64
FSP2337	5		Utility 100+	PVC(SC)	100	3.1	3.1	0	None	-/64/64
FSP2337	1		2 x Utility 150	PVC(SC)	150	4.2	0	4	10mm bead of Fullers Firesound	-/64/61(wall)
FSP 2405	2		Utility 40+	PVC	40	2.15	2.47	0	None	-/91NF/71(wall)
FSP 2405	1		Utility 100+	PVC(SC)	100	3.22	3.15	0	None	-/91NF/76(wall)
FSP2345	3		116mm Plasterboard Wall (64mm stud, 2 x 13mm board either side)	Utility 40	PVC	40	2.2	0	0.3	None
FSP2368	5	Utility 50		PVC	50	2.56	0	8.5	10mm bead of Fullers Firesound	-/181/ 181
FSP2361	5	Utility 65		PVC	65	3	0	8.9	10mm bead of Fullers Firesound	-/181/ 181
FSP2345	5	Utility 80		PVC	80	3.2	0	9.45	10mm bead of Fullers Firesound	-/180/ 180
FSP2320	4	Utility 100		PVC(SC)	100	3.1	0	1.8	None	-/181/159(wall)
FSP2368	4	Utility 40+		PVC	40	2.34	2.5	5.5	10mm bead of Fullers Firesound	-/181/ 181
FSP2320	2	Utility 100+		PVC(SC)	100	3.1	3.1	10.2	10mm bead of Fullers Firesound	-/181/124(pipe)

Test Report Number	Pen. #	Test Element	Collar	Pipe Type	Pipe Dia. (Nom.) (mm)	Pipe wall thickness (mm)	Coupling (mm)	Annular Gap (mm)	Sealant	Test Result
FSP2320	3		Utility 100+	PVC(SC)	100	3.1	3.1	0	None	-/181/146(wall)
FSP2320	1		2 x Utility 150	PVC(SC)	150	4.45	0	3.5	10mm bead of Fullers Firesound	-/181/126(collar)

PVC stack pipes without coupling

The proposed construction comprises a Snap Utility collar protecting 40mm to 90mm PVC, 100mm and 150mm PVC (SC) stack pipes penetrating through 90mm thick and 116mm thick plasterboard wall.

With reference to test data summarised in Table B1.21, various size and thickness of plastic pipes made from AUS PVC, Sandwich Core PVC, penetrated 90mm thick and 116mm thick plasterboard walls and were protected with Utility collar.

With reference to the discussion in section B1.1 of this report for the 90mm PVC pipe protected with Utility 80+ in a slab The proposed 90mm pipe with coupling inside a Utility 90+ collar would have an annular gap between the collar and the pipe that is similar to the 100mm pipes were tested with coupling inside the Utility collar 100+ collar when tested in slabs. Based on the available evidence for slabs for this minor variation, it is considered reasonable and conservative that 90mm PVC pipe protected with Utility 80+ will also work satisfactorily in a plasterboard line wall.

Based on the above, it can be expected the proposed construction will be able to maintain integrity and insulation for up to 60 and 120 minutes based on the design if tested in accordance with AS 1530.4-2014 and assessed in accordance with AS 4072.1-2005.

PVC stack pipes with coupling in collar

The proposed construction comprises a Snap Utility collar protecting 40mm to 90mm PVC and 100mm PVC (SC) stack pipes with pipe coupling within the collar, penetrating through 90mm thick and 116mm thick plasterboard wall.

The reference test data in Table B1.21 where the specimen contained couplings all had the coupling installed within the collar on the fire side. The proposed construction comprises the installation of coupling on each side of the wall.

The proposed variation to include a coupling inside the Utility collar on the non-fire side may affect and or delay collar closure.

However, the comparison between the specimens with 100mm pipe with and without coupling on the fire side of a 116mm thick wall only saw one minute difference in the closure time of the collar. Therefore, it is considered based on the low softening temperature of PVC, that if couplings were also installed on non-fire side wall, the Utility collar would have been able to close it as well.

The above discussion in section B1.1 for the proposed 50mm, 65mm, 80mm pipe with couplings and their respective collars in a slab also applies to these pipes in a plasterboard walls.

Based on the above, it can be expected the proposed construction will be able to maintain integrity and insulation for up to 60 and 120 minutes based on the design if tested in accordance with AS 1530.4-2014 and assessed in accordance with AS 4072.1-2005.

B1.3 PVC pipes in Hebel walls

Table B1.31: PVC pipes in Hebel walls

Test Report Number	Pen. #	Test Element	Collar	Pipe Type	Pipe Dia. (Nom.) (mm)	Pipe wall thickness (mm)	Coupling (mm)	Annular Gap (mm)	Sealant	Test Result
FSP2336	3	75mm Hebel Wall (90 min)	Utility 40	PVC	40	2.4	0	0	None	-/121/111 (wall)
FSP2369	4	75mm Hebel Wall (120 min)	Utility 50	PVC	50	2.35	0	9	10mm bead of Fullers Firesound	-/121/121
FSP2370	3		Utility 65	PVC	65	2.9	0	9		-/121/121
FSP2369	5		Utility 80	PVC	80	3.1	0	8		-/121/121
FSP2336	5	75mm Hebel Wall (90 min)	Utility 100	PVC (SC)	100	3.4	0	2	None	-/121/121 (wall)
FSP2336	4		Utility 40+	PVC	40	2.4	2.3	6	10mm bead of Fullers Firesound	-/121/115 (wall)
FSP2336	2		Utility 100+	PVC (SC)	100	3.4	3.1	5		-/121/117 (wall)
FSP2336	1		2 x Utility 150	PVC (SC)	150	4.4	0	3		-/121/99 (collar, wall 105)
FSP2367	1	75mm Hebel Wall (120 min)	2 x Utility 150	PVC	150	4.9	0	4		10mm bead of Fullers Firesound

PVC stack pipes without coupling

The proposed construction comprises a Snap Utility collar protecting 40mm to 90mm PVC, 100mm and 150mm PVC (SC) stack pipes penetrating through 75mm thick Hebel walls with a tested or assessed FRL of -/90/90 and -/120/120.

With reference to test data summarised in Table B1.31, it is observed that the main failure of these specimens was instigated by the insulation performance of the supporting Hebel wall rather than the performance of the penetrating service. When tested, all installation maintains integrity and insulation for up to 120 minutes, it is reasonable to evaluate the result of the pipes tested in the two types of 75mm Hebel panel walls together.

Based on the above, it can be seen that the prequalification testing of the uPVC pipe sizes between 40 to 80mm and 100mm PVC SC have been met in concrete slabs.

The discussion in section B1.1 for the 90mm PVC pipe protected with Utility 80+ in a slab also applies to 90mm PVC pipe protected with Utility 80+ in a Hebel walls.

Based on the above, it can be expected the proposed construction will be able to maintain integrity and insulation for up to 90 and 120 minutes based on the design if tested in accordance with AS 1530.4-2014 and assessed in accordance with AS 4072.1-2005.

PVC stack pipes with coupling

The proposed construction comprises a Snap Utility collar protecting 40mm to 90mm PVC and 100mm PVC (SC) stack pipes with pipe coupling penetrating through 75mm thick Hebel walls with a tested or assessed FRL of -/90/90 and -/120/120.

The reference test data in Table B1.31 where the specimen contained couplings all had the coupling installed within the collar on the fire side. The proposed construction comprises the installation of coupling on each side of the wall.

The above discussion in section B1.2 for the proposed 50mm, 65mm, 80mm pipe with couplings and their respective collars in a plasterboard wall also applies to these pipes in a Hebel wall.

Based on the above, it can be expected the proposed construction will be able to maintain integrity and insulation for up to 90 and 120 minutes based on the design if tested in accordance with AS 1530.4-2014 and assessed in accordance with AS 4072.1-2005.

B1.4 Various other pipe material in slabs

Table B1.41: HDPE, Raupiano, Triplus pipes in slab

Test Report Number	Pen. #	Test Element	Collar	Pipe Type	Pipe Dia. (Nom.) (mm)	Pipe wall thickness (mm)	Annular Gap (mm)	Sealant	Test Result	Fixing
FSP2347	4	120mm Concrete Slab	Utility 40	HDPE (PE80)	40	3.38	0.85	None	- /241NF/ 209 (slab)	5x30mm Concrete Screw Bolts
FSP2347	1	120mm Concrete Slab	Utility 100	HDPE (PE100)	110	4.6	2	None	- /241NF/ 199 (slab)	
FSP2366	1	150mm Concrete Slab	Utility 150	HDPE (PE100)	160	7.1	1.5	None	- /241NF/ 241NF	6.5x40mm Steel Sleeve Anchor
FSP2347	5	120mm Concrete Slab	Utility 40	Raupiano	40	2.1	8.4	10mm bead of Fullers Firesound	- /241NF/ 200 (slab)	
FSP2347	2	120mm Concrete Slab	Utility 100	Raupiano	110	3.1	2	None	- /241NF/ 203 (slab)	6x40mm Steel Wedge Anchor
FSP2366	3	150mm Concrete Slab	Utility 150	Raupiano	160	4.4	1.5	None	- /241NF/ 241NF	5x35mm Mushroom Head Spikes
FSP2358	5	150mm Concrete Slab	Utility 40	Triplus	40	2.1	8.35	10mm bead of Fullers Firesound	- /241NF/ 241NF	5x30mm Concrete Screw Bolts
FSP2333	4	120mm Concrete Slab	Utility 100	Triplus	110	3.97	2	None	- /241NF/ 241NF	6x40mm Steel Wedge Anchor
FSP2366	2	150mm Concrete Slab	Utility 150	Triplus	160	5.8	1	None	- /241NF/ 241NF	

HDPE, Raupiano and Triplus stack pipes in slab

The proposed construction comprises a Snap Utility collar protecting 40mm to 110mm and 160mm HDPE, Raupiano and Triplus stack pipes penetrating through 120mm, 150mm and 175mm thick slabs designed in accordance with AS3600-2018.

With reference to test data summarised in Table B1.41, 40mm, 110mm and 160mm HDPE, Raupiano and Triplus pipes, penetrated 120mm and 150mm thick concrete slabs and were protected with Utility collar.

It is observed that these specimens all were able to maintain integrity for up to 240 minutes without failure. When the specimen failed insulation, it was due to the failure of the supporting construction. The pipe was able to maintain insulation for up to 240 minutes.

The proposed construction comprises 50mm to 90mm HDPE pipe protected with various Utility sizes of collars. The annular gap between the proposed collar and the proposed pipe that is similar to the 40mm and 110mm HDPE pipes protected with Utility 40 and Utility collar 100 collar respectively.

The proposed construction comprises 50mm to 75mm Raupiano pipe protected with various Utility sizes of collars. The annular gap between the proposed collar and the proposed pipe that is similar to the 40mm and 110mm HDPE pipes protected with Utility 40 and Utility collar 100 collar respectively.

The proposed construction comprises 50mm to 90mm Triplus pipe protected with various Utility sizes of collars. The annular gap between the proposed collar and the proposed pipe that is similar to the 40mm and 110mm HDPE pipes protected with Utility 40 and Utility collar 100 collar respectively.

Given the similarity in distance of collar intumescent to proposed pipe to that of the tested pipes, and the absence of any impending failure observed in the reference tests for up to 240 minutes, it is expected that the proposed construction will be able to maintain integrity and insulation for up to 120, 180 and 240 minutes based on the design if tested in accordance with AS 1530.4-2014 and assessed in accordance with AS 4072.1-2005.

B1.5 Various other pipe material in plasterboard walls

Table B1.51: HDPE, Raupiano, Triplus pipes in 90mm plasterboard walls

Test Report Number	Pen. #	Test Element	Collar	Pipe Type	Pipe Dia. (Nom.) (mm)	Pipe wall thickness (mm)	Annular Gap (mm)	Sealant	Test Result	Fixing
FSP 2362	3	90mm Plasterboard Wall	Utility 40	HDPE	40	3.34	8.14	10mm bead of Fullers Firesound	-/71NF/69(wall)	3 x 10G x 38mm Coarse Thread Laminating Screws
FSP 2378	1		Utility 100	HDPE (PE100)	110	4.9	8.4		-/65NF/65NF	3 x M4 Expandable Metal Anchors (Steel)
FSP 2354	5		Utility 40	Raupiano	40	2.1	8.5	10mm bead of Fullers Firesound	-/91NF/82(wall)	M4 x 3-16 Expandable Steel Anchors with stainless steel washer
FSP 2354	1		Utility 100	Raupiano	110	3.1	8.35		-/91NF/82(wall)	10G x 38mm Coarse Thread Laminating Screws
FSP 2375	2		2 x Utility 150	Raupiano	160	4.23	4.2		-/91NF/72(wall)	M4 x 16-23mm Expandable Steel Anchors with stainless steel washer
FSP 2354	3		Utility 40	Triplus	40	2	2		None	-/91NF/61(pipe)
FSP 2354	2		Utility 100	Triplus	110	4.1	1.85	None	-/91NF/83(wall)	
FSP 2375	1		2 x Utility 150	Triplus	160	4.95	3.85	10mm bead of Fullers Firesound	-/91NF/71(wall)	

HDPE, Raupiano and Triplus stack pipes in 90mm thick plasterboard wall

The proposed construction comprises a Snap Utility collar protecting 40mm to 110mm and 160mm HDPE, Raupiano and Triplus stack pipes penetrating through 90mm thick plasterboard wall with a tested or assessed FRL of at least -/60/60.

With reference to test data summarised in Table B1.51, 40mm, 110mm and 160mm HDPE, Raupiano and Triplus pipes, penetrated 90mm thick plasterboard walls and were protected with Utility collar.

It is observed that these specimens all were able to maintain integrity and insulation for up to at least 60 minutes.

The proposed construction comprises 50mm to 90mm HDPE pipe protected with various Utility sizes of collars. The annular gap between the proposed collar and the proposed pipe that is similar to the 40mm and 110mm HDPE pipes protected with Utility 40 and Utility collar 100 collar respectively.

The proposed construction comprises 50mm to 75mm Raupiano pipe protected with various Utility sizes of collars. The annular gap between the proposed collar and the proposed pipe that is similar to the 40mm and 110mm HDPE pipes protected with Utility 40 and Utility collar 100 collar respectively.

The proposed construction comprises 50mm to 90mm Triplus pipe protected with various Utility sizes of collars. The annular gap between the proposed collar and the proposed pipe that is similar to the 40mm and 110mm HDPE pipes protected with Utility 40 and Utility collar 100 collar respectively.

Given the similarity in distance of collar intumescent to proposed pipe to that of the tested pipes, and the absence of any impending integrity or insulation failure observed in the reference tests for at least 60 minutes, it is expected that the proposed construction will be able to maintain integrity and insulation for up to 60 minutes if tested in accordance with AS 1530.4-2014 and assessed in accordance with AS 4072.1-2005.

Table B1.52: HDPE, Raupiano, Triplus pipes in 116mm plasterboard wall

Test Report Number	Pen. #	Test Element	Collar	Pipe Type	Pipe Dia. (Nom.) (mm)	Pipe wall thickness (mm)	Annular Gap (mm)	Sealant	Test Result	Fixing
FSP 2368	3	116mm Plasterboard Wall	Utility 40	HDPE	40	3.35	8.2	10mm bead of Fullers Firesound	-/181NF/166 (wall)	3 x M4 Expandable Metal Anchors (Steel)
FSP 2407	6		Utility 40	HDPE (PE80)	40	3.25	2	0	-/181NF/181NF	3 X 10G x 38mm Coarse Thread Laminating Screws
FSP 2345	1		Utility 100	HDPE (PE100)	110	4.6	1.85	None	-/181NF/158 (wall)	3 X 10G x 38mm Coarse Thread Laminating Screws
FSP 2368	1		2 x Utility 150	HDPE (PE100)	160	6.68	3.7	10mm bead of Fullers Firesound	-/181NF/118 (collar)	4 x M4 Expandable Metal Anchors (Steel)
FSP 2381	1		2 x Utility 150	HDPE (PE100)	160	6.68	3.7		-/151NF/109 (collar)	5 x M4 Expandable Metal Anchors (Steel)
FSP 2361	3		Utility 40	Raupiano	40	2.1	8.5		-/181/165 (wall)	10G x 38mm Coarse Thread Laminating Screws
FSP 2345	4		Utility 100	Raupiano	110	3.09	8.5		-/181NF/181NF	M4 x 16-23mm Expandable Steel Anchors with stainless steel washer
FSP 2361	2		2 x Utility 150	Raupiano	160	4.28	3.75		-/181NF/181NF	10G x 38mm Coarse Thread Laminating Screws
FSP 2361	4		Utility 40	Triplus	40	2.1	8.5		-/181/145(pipe)	10G x 38mm Coarse Thread Laminating Screws
FSP 2345	2		Utility 100	Triplus	110	3.9	1.8		None	-/180NF/171 (wall)

Test Report Number	Pen. #	Test Element	Collar	Pipe Type	Pipe Dia. (Nom.) (mm)	Pipe wall thickness (mm)	Annular Gap (mm)	Sealant	Test Result	Fixing
FSP 2368	2		2 x Utility 150	Triplus	160	5.1	3.9	10mm bead of Fullers Firesound	-/181NF/144 (collar)	Anchors with stainless steel washer

HDPE, Raupiano and Triplus stack pipes in 116mm thick plasterboard wall

The proposed construction comprises a Snap Utility collar protecting 40mm to 110mm and 160mm HDPE, Raupiano and Triplus stack pipes penetrating through 116mm thick plasterboard wall with a tested or assessed FRL of at least -/120/120.

With reference to test data summarised in Table B1.52, 40mm, 110mm and 160mm HDPE, Raupiano and Triplus pipes, penetrated 116mm thick plasterboard walls and were protected with Utility collar.

It is observed that these specimens all were able to maintain integrity and insulation for up to at least 120 minutes.

The proposed construction comprises 50mm to 90mm HDPE pipe protected with various Utility sizes of collars. The annular gap between the proposed collar and the proposed pipe that is similar to the 40mm and 110mm HDPE pipes protected with Utility 40 and Utility collar 100 collar respectively.

The proposed construction comprises 50mm to 75mm Raupiano pipe protected with various Utility sizes of collars. The annular gap between the proposed collar and the proposed pipe that is similar to the 40mm and 110mm HDPE pipes protected with Utility 40 and Utility collar 100 collar respectively.

The proposed construction comprises 50mm to 90mm Triplus pipe protected with various Utility sizes of collars. The annular gap between the proposed collar and the proposed pipe that is similar to the 40mm and 110mm HDPE pipes protected with Utility 40 and Utility collar 100 collar respectively.

Given the similarity in distance of collar intumescent to proposed pipe to that of the tested pipes, and the absence of any impending integrity or insulation failure observed in the reference tests for at least 120 minutes, it is expected that the proposed construction will be able to maintain integrity and insulation for up to 120 minutes if tested in accordance with AS 1530.4-2014 and assessed in accordance with AS 4072.1-2005.

Alternative fixings for collar protecting PVC, Raupiano and Triplus pipes in 90mm thick plasterboard wall

The proposed construction comprises the inclusion of laminating screws instead Expandable Anchor for fixing collars protecting 40-100mm PVC(with and without fitting), Triplus and Raupiano pipes to 60 and 120 minutes plasterboard walls.

With reference to FSP 2405 specimen 1 and 2, where 40mm and 100mm PVC pipes were protected with Utility collars that were fixed to a single layered 60 minutes plasterboard wall system with 3 of 10G x 38mm Coarse Thread Laminating Screw. Both specimens were able to maintain integrity and insulation for at least 60 minutes.

Similarly, in FSP 2320 specimens 2, a 100mm PVC pipe was protected with Utility collars that were fixed to a double layered 120 minutes plasterboard wall system with 3 of 10G x 38mm Coarse Thread Laminating Screw. The specimen was able to maintain integrity and insulation for at least 120 minutes.

Therefore, it is reasonable to concluded that 3 of 10G x 38mm Coarse Thread Laminating Screw is sufficient to allow collars protecting up to 100mm PVC pipe with or without coupling in the collar such that the specimens can achieve up to 60 and 120 minutes performance in plasterboard walls based on design.

Based on the observation of the behaviour of the PVC pipes with coupling vs the Raupiano and Triplus pipes in the referenced tests, it is also reasonable to apply the result of the more onerous PVC pipes with coupling test specimens to that for piano and Triplus pipes for up to 60 and 120 minutes performance in plasterboard walls based on design.

Based on the above, it is expected that the proposed construction will be able to maintain integrity and insulation for up to 60 and 120 minutes based on design if tested in accordance with AS 1530.4-2014 and assessed in accordance with AS 4072.1-2005.

B1.6 Various other pipe material in Hebel walls

Table B1.61: HDPE, Raupiano, Triplus pipes in 75mm Hebel walls

Test Report Number	Pen. #	Test Element	Collar	Pipe Type	Pipe Dia. (Nom.) (mm)	Pipe wall thickness (mm)	Annular Gap (mm)	Sealant	Test Result
FSP 2367	3	75mm Hebel Powerpanel Wall (120 min)	Utility 40	HDPE (PE80)	40	3.2	8.5	10mm bead of Fullers Firesound	-/121/121
FSP 2370	4	75mm Hebel Powerpanel Wall (120 min)	Utility 100	HDPE	110	4.68	8.5	10mm bead of Fullers Firesound	-/121/121
FSP 2367	2	75mm Hebel Powerpanel Wall (120 min)	2 x Utility 150	HDPE (PE100)	160	7.2	4	10mm bead of Fullers Firesound	-/121/96 (collar, wall at 113)
FSP 2369	3	75mm Hebel Powerpanel Wall (120 min)	Utility 40	Raupiano	40	2.1	8.5	10mm bead of Fullers Firesound	-/121/121
FSP 2369	2	75mm Hebel Powerpanel Wall (120 min)	Utility 100	Raupiano	110	3	8.4	10mm bead of Fullers Firesound	-/121/121
FSP 2369	1	75mm Hebel Powerpanel Wall (120 min)	Utility 150	Raupiano	160	4	4	10mm bead of Fullers Firesound	-/121/121
FSP 2367	4	75mm Hebel Powerpanel Wall (120 min)	Utility 40	Triplus	40	2.2	8.5	10mm bead of Fullers Firesound	-/121/121
FSP 2370	2	75mm Hebel Powerpanel Wall (120 min)	Utility 100	Triplus	110	3.68	8.1	10mm bead of Fullers Firesound	-/121/121
FSP 2370	1	75mm Hebel Powerpanel Wall (120 min)	Utility 150	Triplus	160	5.15	3.85	10mm bead of Fullers Firesound	-/121/121

HDPE, Raupiano and Triplus stack pipes in Hebel walls

The proposed construction comprises a Snap Utility collar protecting 40mm to 110mm and 160mm HDPE, Raupiano and Triplus stack pipes penetrating through 75mm thick Hebel walls with a tested or assessed FRL of at least -/120/120.

With reference to test data summarised in Table B1.61, 40mm, 110mm and 160mm HDPE, Raupiano and Triplus pipes, penetrated 75mm thick Hebel walls with a tested or assessed FRL of at least -/120/120. and were protected with Utility collar.

It is observed that these specimens all were able to maintain integrity for up to 121 minutes without failure. When the specimen failed insulation, it was due to the failure of the supporting construction and collar. The pipe was able to maintain insulation for up to 120 minutes.

The proposed construction comprises 50mm to 90mm HDPE pipe protected with various Utility sizes of collars. The annular gap between the proposed collar and the proposed pipe that is similar to the 40mm and 110mm HDPE pipes protected with Utility 40 and Utility collar 100 collar respectively.

The proposed construction comprises 50mm to 75mm Raupiano pipe protected with various Utility sizes of collars. The annular gap between the proposed collar and the proposed pipe that is similar to the 40mm and 110mm HDPE pipes protected with Utility 40 and Utility collar 100 collar respectively.

The proposed construction comprises 50mm to 90mm Triplus pipe protected with various Utility sizes of collars. The annular gap between the proposed collar and the proposed pipe that is similar to the 40mm and 110mm HDPE pipes protected with Utility 40 and Utility collar 100 collar respectively.

Given the similarity in distance of collar intumescent to proposed pipe to that of the tested pipes, and the absence of any impending failure observed in the reference tests for up to 120 minutes, it is expected that the proposed construction will be able to maintain integrity and insulation for up to 120 minutes based on the design if tested in accordance with AS 1530.4-2014 and assessed in accordance with AS 4072.1-2005.

The proposed construction comprises a Snap Utility collar protecting 40mm to 110mm and 160mm HDPE, Raupiano and Triplus stack pipes penetrating through 75mm thick Hebel walls with a tested or assessed FRL of at least -/90/90.

With reference to Table B1.31, the 150mm PVC pipe tested in 75mm thick Hebel walls with a tested or assessed FRL of at least -/90/90 vs 75mm thick Hebel walls with a tested or assessed FRL of at least -/120/120 showed that the formal wall resulted in the earlier failure of the collar.

Similar behaviour early heating of the collars is expected for the proposed pipes and collars in the 75mm thick Hebel walls with a tested or assessed FRL of at least -/90/90.

With 30 minutes margin in insulation, it is expected that the proposed construction will be able to maintain integrity for up to 90 minutes and insulation for up to 60 and 90 minutes based on the design if tested in accordance with AS 1530.4-2014 and assessed in accordance with AS 4072.1-2005.

B1.7 PVC, HDPE, Raupiano and Triplus stack pipes in Speedpanel walls

The proposed construction comprises a Snap Utility collar protecting 40mm to 110mm and 160mm PVC, HDPE, Raupiano and Triplus stack pipes penetrating through 78mm thick Speedpanel wall without lining or framing on each side, tested or assess. The wall shall be lined with additional patching as per Table 9a.

The proposed configuration with two layers of 13mm patching each side of the 78mm Speedpanel wall is similar to a 116mm stud wall in that the 78mm Speedpanel act as a frame separator for the two layers of 13mm fire rated plasterboard on each side of the wall.

Therefore, it is expected that the proposed configuration will allow the collar to remain fixed to the wall and close the pipe in the same manner as when the two layers of 13mm fire rated plasterboard

lining each side of stud lined wall without introducing a weakness between the wall construction and the collar.

As the Speedpanel undergoes heating, there will be evaporation of free water in the Speedpanel concrete core during the first 60 minutes of the test which will result in a relatively lower temperature of the fire collar on the unexposed side compared to when collars on a plasterboard wall, which may delay the activation of the non-fire side collar leading to early specimen failure.

It is observed that the 75mm Hebel panel also undergoes similar evaporation of free water during the first 60 minutes of the test, and with reference to the tests of 40-150/160mm pipes in Hebel walls in Tables B1.31 and B1.61, the unexposed side collar were not activated. However, the collar on the fire side was sufficient to close off the pipe such that the non-fire side collar, were not required to activate for the duration of the test to allow the pipe to maintain insulation performance for up to 120 minutes.

Therefore, this behaviour can also be applied to Speedpanel, such that a reduced temperature of the non-fire side collar will not detrimentally affect the performance of the specimen for up to 120 minutes.

The proposed configuration also comprises Fuller Firesound sealant sealing off the gap between the Speedpanel and the plasterboard patch. This will stop the fluing of furnace gas leaking through the gap between the plasterboard patch and the Speedpanel wall profile, allowing the wall to maintain insulation at the location of the patch for at least 120 minutes.

The proposed single layer of 16mm or single layer of 13mm as patching will reduce the conduction length of the heat patch through the wall, and as such will increase the temperature of the wall, collar and pipe at the penetration location. With 30 and 60 minutes margin on performance, it is expected that these configurations will not detrimentally affect the performance of the proposed specimen for up to 90 minutes and 60 minutes respectively.

Based on the above, it is expected that the proposed construction will maintain integrity and insulation for up to 60, 90 and 120 minutes based on design when tested in accordance with AS 1530.4-2014 and assessed in accordance with AS 4072.1 -2005.

B1.8 PVC, HDPE, Raupiano and Triplus stack pipes in Dintel, AFS Rediwall and AFS Logic wall

The proposed construction comprises a Snap Utility collar protecting 40mm to 110mm and 160mm PVC, HDPE, Raupiano and Triplus stack pipes penetrating through 110mm Dintel, AFS Rediwall and AFS Logic wall without lining or framing on each side.

With reference to Tables B1.21 and B1.51, the 40-150/160mm pipes of various materials were tested in plasterboard lined stud walls. The specimens referenced in these tables demonstrated that the Utility collars were able to close off the pipes without coupling in the collar and 40mm pipe with coupling in the collar for up to 180 minutes, such that the pipe and collar temperature remained collar by the end of the 180 minutes tests. The specimens referenced in these tables demonstrated that the Utility collars were able to close off the pipes with coupling in the collar for up to 120 minutes, such that the pipe and collar temperature remained collar by the end of the 120 minutes tests.

Therefore, it is expected that the insulation performance of the pipe to collar combination in plasterboard walls for up to 180 minutes can be applied to the same specimens in the proposed solid walls.

The proposed wall constructions are also similar to the tested 75mm Hebel panel in terms of being a solid wall filled with concrete. Since the proposed wall systems are all filled with concrete that would act to absorb heat, it is expected the wall on the unexposed side would be able to maintain insulation performance in a similar manner to when it is not penetrated with plastic pipes.

Based on the above, it is expected that the proposed construction will maintain integrity and insulation for up to 90, 120 and 180 minutes based on design when tested in accordance with AS 1530.4-2014 and assessed in accordance with AS 4072.1 -2005.

B.2 Variation to support construction for Utility collars

The proposed construction in Section 3.1 of this report may include the following variations in isolation or combination:

- The inclusion of all the pipes and collars listed in Tables 3-8 and discussions in Section B1
- The inclusion of concrete slab as a separating element
 - Inclusion of min. 120mm, 150mm and 175mm thick Bondek steel formwork slab tested or assess for an FRL of at least 120/120/120, 180/180/180 and 240/240/240 respectively and the channel next to collar to be fully filled with Fuller Firesound sealant as per Figure 2
 - For stack pipes, the pipework is to be vertically supported above the slab
- Variation to gap treatment as per Table 9
- Fixings for each support construction type shall be as per Table 10-12
- Number of collar brackets shall be as per Table 13
- Variations Installation methods
 - Paint on collar body, though no paint is allowed on the active area of the collar
 - Collars can be installed in a minimum spacing of 40mm from outer edge of collar to outer edge of collar

B2.1 Inclusion of Bondek permanent formwork slab

The proposed construction comprises the inclusion of concrete with Bondek permanent formwork with an effective thickness of 120, 150 and 175mm as a support construction in place of concrete slabs.

In the referenced to the supplementary test report FSP 1953, various retrofit collars were installed on the underside of a 120mm thick Bondek slab. Where the collar intersects the channels in the Bondek profile, the channel was fully filled with Fuller Firesound sealant,

It is observed that when pipes were able to maintain integrity for up to 241 minutes without failure. With the stack pipes in concrete with Bondek permanent formwork, the points of insulation failure were on the slabs after 180 minutes.

Although the tested retrofit collars in FSP 1953 are of a different design to the Utility collar, the supplementary test report FSP 1953 gives confidence that the Bondek permanent formwork would not interfere with collar closure nor fail insulation on the slab before the designed insulation performance for each slab thickness.

Based on the above, it is expected that the proposed construction will be able to maintain integrity and insulation for up to 120, 180 and 240 minutes based on design when tested in accordance with AS 1530.4-2014 and assessed in accordance with AS 4072.1 -2005.

B2.2 Variation to gap treatment

The proposed variation comprises Snap collars as discussed in Section B1 have its annular gap treated as per Table 9.

With reference to the test data in Section B1, it is observed that when gaps were 2mm and under between the pipe and the support construction opening, no sealant were applied. When gaps were between 2mm to 10mm, 10mm bead of Fuller Firesound sealant was applied. It was observed that these gap treatment methods did not contribute to the failure of the specimen.

Based on the above, it is expected that the proposed variation will not detrimentally affect the integrity and insulation performance of the proposed construction for up to 240 minutes based on design when tested in accordance with AS 1530.4-2014 and assessed in accordance with AS 4072.1 -2005.

B2.3 Minor “onsite” modifications to Snap collars and features

Paint of collar flange

By observation, the painting of the collars is limited to the metal sections of the collar where no intumescent material is held.

It is expected that the paint applied to the collar flange will not have a significant effect on the temperature of the collar body and thus will not affect the function of the intumescent material in the collar whilst the collar maintains insulation performance.

B2.3 Separation between collars

It is proposed that services are separated by at least 40mm and located within the support construction by at least 40mm. AS 4072. 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 AS 4072. 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".

In light of the above, it is considered that AS 4072.1-2005, clause 4.9.3 applies to services that achieve the required insulation performance for the required integrity period and are separated by at least 40mm.

CONTACT US

t 1300 363 400
+61 3 9545 2176
e enquiries@csiro.au
w www.csiro.au

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FOR FURTHER INFORMATION

Infrastructure Technologies

Keith Nicholls
Group Leader, Fire Testing and Assessments
t +61 2 94905450
e keith.nicholls@csiro.au
w <https://research.csiro.au/infratech/fire-safety/fire-testing/>

Infrastructure Technologies

Jing Xu
Senior Consultant, Fire Assessments
t +61 2 9490 8041
e jing.xu@csiro.au
w <https://research.csiro.au/infratech/fire-safety/fire-testing/>