

FIRE ASSESSMENT REPORT

FAR 3929 ISSUE 5

FIRE RESISTANCE OF SNAP FIRE SYSTEMS PTY LTD RETROFIT COLLARS WITH A VARIETY OF PIPE SIZES AND MATERIAL TYPES IN PLASTERBOARD WALLS

CLIENT

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ASSESSMENT OBJECTIVE

This assessment report considers the fire resistance of SNAP Retrofit collars through a steel framed plasterboard wall with an established fire resistance level (FRL) of -/120/120 when tested in accordance with AS 1530.4:2014 with reference to AS 4072.1–2005.

CONCLUSION

It is considered that SNAP Fire Systems Retrofit collars protecting pipe penetration systems listed in Table 14 would achieve the FRL given in Table 14 when tested in accordance with AS 1530.4:2014 with reference to AS 4072.1–2005. The following conditions apply.

- Test results were achieved in a 128 mm thick steel framed plasterboard wall consisting of steel studs measuring minimum 64 mm x 0.55 mm and two layers of 16 mm thick fire rated plasterboard at each face, with an established FRL of -/120/120.
- Collar installation with either M6 threaded rod or wall anchor.
- Results can be applied to wall systems with deeper studs than those tested.
- Results can be applied to framed wall systems with thicker plasterboard facings.
- Results may be applied to masonry or concrete wall systems of equal or greater thickness.
- The selected FRL is for a plasterboard lined system with an FRL of either -/120/120 or -/180/180 with the FRL of the penetration system adjusted to match that of the wall system but not greater than the penetration FRL listed below.

LIMITATION

This report is subject to the accuracy and completeness of the information supplied.

BRANZ reserves the right to amend or withdraw this assessment if information becomes available which indicates the stated fire performance may not be achieved.

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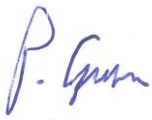

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1. INTRODUCTION

This assessment report considers the fire resistance of SNAP Retrofit collars through a steel framed plasterboard wall with an established fire resistance level (FRL) of -/120/120 when tested in accordance with AS 1530.4:2014 with reference to AS 4072.1–2005.

2. BACKGROUND

2.1 BRANZ Fire Resistance Test FP 4874

In BRANZ pilot fire resistance test FP 4874 nine specimens were reported consisting of a mixture of PVC-U DWV and PE plastic pipes and their sealing systems penetrating a nominal 128 mm thick plasterboard steel framed wall system, were tested in accordance with AS 1530.4 – 2005.

The wall system, with an established fire-resistance level (FRL) of -/120/120, consisted of 64 mm x 0.55 mm thick steel studs with 2 x layers of 16 mm thick Boral Firestop plasterboard sheets at each face.

All of the sealing systems consisted of SNAP Retrofit collars with intumescent wraps on the inner face. The steel collars were secured to the plasterboard with three expanding wall anchors and in one instance, specimen No. 9, with M6 threaded rod through the brackets of the respective collars passing through the cavity thereby sandwiching the wall between the collars.

Table 1: Test Result FP 4874

No.	Collar Designation	Pipe Designation	Integrity (Minutes)	Insulation (Minutes)	FRL
1	110R	100 PVC-U SC DWV* (With Elbow socket in collar)	185NF	162	-/180/120
4	63R	50 PVC-U DWV	185NF	123	-/180/120
5	50R	40 PVC-U DWV (With Elbow socket in collar)	185NF	185NF	-/180/180
6	50R	40 PVC-U DWV	185NF	168	-/180/120
7	110R	100 PVC-U SC DWV*	185NF	185NF	-/180/180
8	110R	110 mm x 4.3 mm PE100 SDR 26	185NF	140	-/180/120
9	65-80R	80 PVC-U DWV	185NF	167	-/180/120
10	84R	65 PVC-U DWV	185NF	176	-/180/120
11	50R	40 mm x 3 mm PE80 S12.5	185NF	185NF	-/180/180

NF = No failure for the duration of the test.

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2.2 CSIRO Fire Resistance Test FSP 1360

In CSIRO fire resistance test FSP 1360 six specimens consisting of Aquatherm Fusiotherm polypropylene fibre pipes and their sealing systems through a nominal 128 mm thick plasterboard steel framed wall system, were tested in accordance with AS 1530.4-2005.

The wall system, with an established fire-resistance level (FRL) of -/120/120, consisted of 64 mm x 0.75 mm thick steel studs with 2 x layers of 16 mm thick CSR Gyprock Fyrchek plasterboard sheets at each face.

All of the sealing systems consisted of SNAP Retrofit collars with intumescent wraps on the inner face. The steel collars were secured to the plasterboard with M6 threaded rod through the brackets of the respective collars passing through the cavity thereby sandwiching the wall between the collars.

Table 2: Test Result FSP 1360

No.	Collar Designation	Pipe Designation	Integrity (Minutes)	Insulation (Minutes)	FRL
1	63R	63 mm OD fazer PPR-80 SDR7.4	181 NF	181 NF	-/180/180
2	32R	20 mm OD fazer PPR-80 SDR7.4	181 NF	181 NF	-/180/180
3	63R	20 mm OD fazer PPR-80 SDR7.4	181 NF	181 NF	-/180/180
4	50R	20 mm OD fazer PPR-80 SDR7.4	181 NF	181 NF	-/180/180
5	32R	32 mm OD fazer PPR-80 SDR7.4	181 NF	181 NF	-/180/180
6	50R	50 mm OD fazer PPR-80 SDR7.4	181 NF	181 NF	-/180/180

2.3 CSIRO Fire Resistance Test FSP 1366

In CSIRO fire resistance test FSP 1366 six specimens consisting of Polyethylene pressure pipes and their sealing systems through a nominal 128 mm thick plasterboard steel framed wall system, were tested in accordance with AS 1530.4-2005.

The wall system, with an established fire-resistance level (FRL) of -/120/120, consisted of 64 mm x 0.75 mm thick steel studs with 2 x layers of 16 mm thick CSR Gyprock Fyrchek plasterboard sheets at each face.

All of the sealing systems consisted of SNAP Retrofit collars with intumescent wraps on the inner face. The steel collars were secured to the plasterboard with M6 threaded rod through the brackets of the respective collars passing through the cavity thereby sandwiching the wall between the collars.

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Table 3: Test Result FSP 1366

No.	Collar Designation	Pipe Designation	Integrity (Minutes)	Insulation (Minutes)	FRL
1	63R	63 mm OD PE SDR7.4	181 NF	181 NF	-/180/180
2	32R	20 mm OD PE SDR7.4	181 NF	181 NF	-/180/180
3	63R	20 mm OD PE SDR7.4	181 NF	181 NF	-/180/180
4	50R	20 mm OD PE SDR7.4	181 NF	181 NF	-/180/180
5	32R	32 mm OD PE SDR7.4	181 NF	181 NF	-/180/180
6	50R	50 mm OD PE SDR7.4	181 NF	181 NF	-/180/180

2.4 CSIRO Fire Resistance Test FSP 1902

In CSIRO fire resistance test FSP 1902 a PVC pipe with PVC coupling, through a nominal 116 mm thick plasterboard steel framed wall system was tested in accordance with AS 1530.4:2014.

The wall system, with an established fire-resistance level (FRL) of -/120/120, consisted of 64 mm x 0.55 mm thick steel studs with 2 x layers of 13 mm thick CSR Gyprock Fyrchek plasterboard sheets at each face.

The penetration sealing system consisted of a SNAP Retrofit collar with intumescent wrap on the inner face within a steel casing. The steel collars were secured to the plasterboard with 10 g x 38 mm laminating screws.

Table 4: Test Result FSP 1902

No.	Collar Designation	Pipe Designation	Integrity (Minutes)	Insulation (Minutes)	FRL
2	50R	50 mm PVC (With coupling in collar)	181 NF	181 NF	-/180/180

3. DISCUSSION

3.1 AS 1530.4-2005 vs 2014

In BRANZ fire resistance test FP 4874 and CSIRO fire resistance tests FSP 1360 and FSP 1366 the specimens were tested in accordance with fire resistance test standard AS 1530.4–2005. A comparison has been made between this version of the test standard and the current AS 1530.4:2014. With respect to the fire resistance testing of penetrations there is no significant difference between the two versions of the test standard and hence the tested specimen would be expected to achieve the same result if tested in accordance with AS 1530.4:2014.

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3.2 SNAP Retrofit Fire Collars

The SNAP Retrofit fire collars are designed to be installed prior to the pipe being passed through or split onsite and fitted around in-situ pipes. They are fitted either side of the wall the pipe passes through. The collars consist of a lipped steel sleeve and contain two or three layers of intumescent with a layer of stainless steel mesh wire measuring 0.15 mm thick with 30 squares per inch sandwiched between the layers. The diameter and size of the intumescent within the collar varies depending on the size of the collar used to seal the pipe.

On exposure to fire the intumescent material activates to close off the fire exposed end of the pipe as it burns back from the exposed face of the wall. The stainless steel mesh forms a lattice that helps to bind the activated intumescent within the steel collar and helps to prevent the intumescent from being consumed and falling away from the penetration prematurely. The exposed collars in the above reported test specimens remained attached to the wall, with the plug of intumescent material within the exposed collars still present at the end of the test.

In the pipe penetrations detailed in the above reports, the holes through the walls were made such that the clearance to the pipe was kept to a minimum with a nominal clearance of between 1-2 mm. The significant factor therefore in initially sealing the pipe is considered to be the ability of the intumescent material to fully seal the cross sectional area of the pipe. For assessment of the performance of pipes and their sealing systems that have not been tested the fill ratio between the cross sectional area of the intumescent seal prior to expansion divided by the cross sectional area of the pipe is compared with tested specimens. Where the fill ratio is greater than a tested specimen this indicates that the seal is required to expand by a lesser relative amount than the seals in the tested specimen.

The Retrofit collars being assessed include a variety of different pipe diameters for each collar type and as such the annular space between the pipe outer wall and the inner face of the collar varies. This has also been considered when determining the likely performance of the sealing systems for specific pipe sizes and materials.

As stated above observations of the tested specimens indicated that the plug of intumescent material and the exposed collar remained in place in all instances. The inclusion of the stainless steel mesh helps to reduce the erosion of the intumescent material and as such minimises the porosity of the seal throughout the test. The spread of data indicates that the SNAP Retrofit collar systems, once activated, remain in situ for the desired duration without contributing to integrity failure for the element in question.

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3.3 PVC-U Pipes and Sealing Systems

Table 5 gives the fill ratio of the SNAP Retrofit collars for specific PVC-U pipes and their SNAP Retrofit sealing systems.

Table 5: PVC-U Pipe with SNAP Collar Fill Ratios

Nominal Size	Fill Ratio: Area of Intumescent to pipe cross sectional area									
	110R		65-80R		84R		63R		50R	
40									2.34*	7.5¥
50							1.65*	6.0¥	1.38**	1.0¥
65			1.34**	12.5¥	1.2*	7.5¥	1.08**	0.0¥		
80			0.95*	6.0¥	0.85**	1.0¥				
90	1.69**	18.50¥	0.78**	2.0¥						
100	1.13*	8.5¥								

* = fill ratio for the tested penetrations from fire resistance test FP 4874.
** = fill ratio for the assessed penetrations.
¥ = width of the annular space (mm) between the collar and the outside of the pipe.

Table 5 shows that the fill ratio for the 65-80R collar and the nominal 65 PVC-U pipe is greater than the tested specimen being the 65-80R collar and nominal 80 mm PVC-U pipe. Although the annular space between the collar and the pipe is larger it is not considered excessive and will close up quickly on activation of the intumescent. The fill ratio is significantly greater than the most onerous of the tested specimens being pipe No. 7 with the 110R collar and nominal 100 mm PVC-U pipe as tested in FP 4874.

The fill ratio for the 90 mm nominal PVC pipe and the 65-80R collar is less than the nearest test specimen being the 80 mm PVC pipe with a fill ratio of 0.95 as opposed to 0.78 for the 90 mm pipe. This is offset by the reduction in the annular space between the pipe and the inner face of the collar.

The 84R collar with the nominal 80 mm PVC-U pipe has a fill ratio of 0.85 as opposed to 1.2 for the 84R and nominal 65 mm PVC-U tested specimen. The annular space for the proposed collar/ pipe system is 1 mm and the fill ratio is consistent with the nominal 80 mm PVC-U and the 65-80R collar tested as specimen No. 9 in FP 4874.

The 63R collar with the nominal 65 mm PVC-U pipe has a fill ratio of 1.08 as opposed to 1.65 for the 63R and nominal 50 mm PVC-U tested specimen. The annular space for the proposed collar/ pipe system is approximately zero and the fill ratio is consistent with the nominal 65 mm PVC-U pipe and the 84R collar tested as specimen No. 10 in FP 4874.

Consistent with the argument in 3.2 it is therefore considered that all of the above assessed pipe penetration systems with the pipe fitting located within the collar would not prejudice the established fire resistance of a steel framed wall with an FRL of -/120/120 or -/180/180 with the FRL of the penetration system adjusted to match that of the wall system but not greater than the penetration FRL given in Table 7.

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Inspection of Table 1 shows that all of the test specimens in FP 4874 achieved insulation above 120 minutes, which is the rating for the wall. In all cases the test specimens achieved 180 minutes integrity. A few insulation anomalies in the results are considered to be due to the influence of the increase in pressure due to the location of the test specimen in the wall.

Specimen 6 consisted of a 40 mm PVC-U DWV in a 50R collar the specimen failed the insulation on the pipe after 168 minutes. The pressure at the centre of the test specimen will have been at least 12.5 Pa greater than the required set pressure at the centre of the penetration. The temperature rise on the pipe briefly spiked over the 180K temperature rise criterion then fell away in a similar style to specimen No. 5 which was the same arrangement except that the pipe included a fitting within the collar assembly. Specimen No 5 was lower in the wall than specimen 6 and the pressure at the centre of the penetration would have been expected to be 10 Pa above the required set pressure, also this arrangement is considered to be more onerous than the straight pipe configuration. It is considered that the brief temperature spike above the 180K limit was due to the much greater pressure in the penetration than the required 15 Pa and therefore the system as tested could be expected to achieve at least the same result as specimen No. 5 in FP 4874 in a framed wall with an FRL of -/120/120 when tested with the pressure at the required 15 Pa at the centre of the test specimen.

3.3.1 PVC-U Pipes with Fitting in the Collar

As noted above in FP 4874 the largest and smallest PVC-U pipe penetration included a pipe fitting within the collar thereby doubling the wall thickness of the pipe at that location. This thickening of the pipe wall would make closing off the pipe at the start of the test more onerous.

Table 6 gives the fill ratio of the SNAP Retrofit collars for specific PVC-U pipe and collar fitting and their SNAP Retrofit sealing systems.

Table 6: PVC-U Pipe with SNAP Collar Fill Ratios (Fitting in Collar)

Nominal Size	Fill Ratio: Area of Intumescent to pipe cross sectional area									
	110R		65-80R		84R		63R		50R	
40									1.22*	5.30¥
50							1.39**	3.50¥		
65			1.13**	9.50¥	1.01**	4.50¥				
80			0.82**	2.90¥						
90	1.49**	15.5¥								
100	1.01*	5.20¥								

* = fill ratio for the tested penetrations from fire resistance test FP 4874.
** = fill ratio for the assessed penetrations.
¥ = width of the annular space (mm) between the collar and the outside of the pipe.

Note: The largest and smallest penetrations tested above were specimen No. 5 with the SNAP 50R and the nominal 40 mm PVC-U pipe and specimen No. 1 with the SNAP 110R with the nominal 100 mm PVC-U pipe, both specimens included an elbow fitting located within the collar essentially doubling the thickness of the pipe at this location. The fill ratio between the area of intumescent and pipe cross sectional area has been adjusted to reflect this situation.

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For the SNAP 65-80R collar and nominal 80 mm PVC-U pipe the relative fill ratio is slightly less than the most onerous tested specimen, this is offset by the reduced annular space between the pipe and the inner face of the collar.

Consistent with the argument in 3.2 it is therefore considered that all of the above assessed pipe penetration systems with the pipe fitting located within the collar would not prejudice the established fire resistance of a steel framed wall with an FRL of -/120/120 or -/180/180 with the FRL of the penetration system adjusted to match that of the wall system but not greater than the penetration FRL given in Table 7.

3.3.2 PVC Pipe Summary

Table 7 gives the test and assessed FRL results for the pipe penetrations in a steel framed plasterboard wall. The test results were achieved in a 128 mm thick steel framed plasterboard wall consisting of steel studs measuring minimum 64 mm x 0.55 mm and two layers of 16 mm thick fire rated plasterboard at each face, with an established FRL of -/120/120. The selected FRL is for a plasterboard lined wall system with an FRL of either -/120/120 or -/180/180 with the FRL of the penetration system adjusted to match that of the wall system but not greater than the penetration FRL given in Table 7.

Table 7: PVC Penetration Summary

Pipe Material	Pipe Diameter	Collar Code	FRL	
			With Fitting	Straight
PVC	100	110R	-/180/120*	-/180/180*
PVC	90	110R	-/180/120**	-/180/120**
PVC	90	65-80R	n/a won't fit	-/180/120**
PVC	80	65-80R	-/180/120**	-/180/120*
PVC	65	65-80R	-/180/120**	-/180/120**
PVC	80	84R	n/a won't fit	-/180/120**
PVC	65	84R	-/180/120**	-/180/120*
PVC	65	63R	n/a won't fit	-/180/120**
PVC	50	63R	-/180/120**	-/180/120*
PVC	50	50R	-/180/180*	-/180/120**
PVC	40	50R	-/180/180*	-/180/180**

(FRL*) = Test result
(FRL**) = Assessed result

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3.4 HDPE PE 80/100 Pipes and Sealing Systems

In FP 4874 two specimens consisted of HDPE polyethylene pipes. One specimen included a PE 80 pipe the other was PE 100. The major difference between the pipe types is the density of the polyethylene with the typical density range for the pipes being as follows.

	PE80	PE100
Density kg/m^3	945-956	957-961

For the purposes of this assessment, it is considered that at the temperatures involved and the tested collar performance there is no significant difference between the pipes for a pipe penetration fire resistance perspective and as such the assessment covers polyethylene pipes of both grade PE 80 and PE 100.

Table 8 gives the fill ratio of the SNAP Retrofit collars for specific HDPE pipes and their SNAP Retrofit sealing systems.

Table 8: HDPE Pipe with SNAP Collar Fill Ratios

Nominal Size	Fill Ratio: Area of Intumescent to pipe cross sectional area									
	110R		65-80R		84R		63R		50R	
40									2.7*	9.5¥
50							2.07**	9.0¥	1.73**	4.0¥
56							1.65**	6.0¥	1.38**	2.0¥
63							1.30**	2.5¥		
75			1.13**	9.5¥	1.01**	4.5¥				
90			0.78**	2.0¥						
110	1.13*	8.5¥								

* = fill ratio for the tested penetrations from fire resistance test FP 4874.

** = fill ratio for the assessed penetrations.

¥ = width of the annular space (mm) between the collar and the outside of the pipe.

The fill ratio for each of the assessed collars and their respective pipe penetrations in the above table is consistent with or significantly greater than the most onerous of the tested systems being the SNAP 110R collar with the nominal 110 mm HDPE PE 100 pipe.

For the SNAP 65-80R collar and nominal 90 mm HDPE pipe and 84R collar and the nominal 63 mm HDPE pipe the fill ratio is slightly less than the most onerous tested specimen, this is offset by the reduced annular space between the pipe and the inner face of the collar in each instance.

Consistent with the argument in 3.2 it is therefore considered that all of the above assessed pipe penetration systems with the pipe fitting located within the collar would not prejudice the established fire resistance of a steel framed wall with an FRL of -/120/120 or -/180/180 with the FRL of the penetration system adjusted to match that of the wall system but not greater than the penetration FRL given in Table 9.

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3.4.1 HDPE Pipe Summary

Table 9 gives the test and assessed FRL results for the pipe penetrations in a steel framed plasterboard wall. The test results were achieved in a 128 mm thick steel framed plasterboard wall consisting of steel studs measuring minimum 64 mm x 0.55 mm and two layers of 16 mm thick fire rated plasterboard at each face, with an established FRL of -/120/120. The selected FRL is for a plasterboard lined wall system with an FRL of either -/120/120 or -/180/180 with the FRL of the penetration system adjusted to match that of the wall system but not greater than the penetration FRL given in Table 9.

Table 9: HDPE Pipe Summary

Pipe Material	Pipe Diameter	Collar Code	FRL	
			With Fitting	Straight
HDPE	100	110R	n/a	-/180/120*
HDPE	90	65-80R	n/a	-/180/120**
HDPE	75	65-80R	n/a	-/180/120**
HDPE	75	84R	n/a	-/180/120**
HDPE	63	63R	n/a	-/180/120**
HDPE	56	63R	n/a	-/180/120**
HDPE	50	63R	n/a	-/180/120**
HDPE	56	50R	n/a	-/180/120**
HDPE	50	50R	n/a	-/180/120**
HDPE	40	50R	n/a	-/180/180*

(FRL*) = Test result
(FRL**) = Assessed result

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3.5 PPR Faser SDR 7.4 Pipes and Sealing Systems

Table 10 gives the fill ratio of the SNAP Retrofit collars for specific PPR Faser SDR 7.4 pipes and their SNAP Retrofit sealing systems.

Table 10: PPR Faser SDR 7.4 Pipe with SNAP Collar Fill Ratios

Nominal Size	Fill Ratio: Area of Intumescent to pipe cross sectional area					
	63R		50R		32R	
20	12.91*	24.0¥	10.80*	19.0¥	6.88*	7.5¥
25	8.26**	21.5¥	6.91**	16.5¥	4.40**	5.0¥
32	5.04**	18.0¥	4.22**	13.0¥	2.69*	1.5¥
40	3.23**	14.0¥	2.70**	9.0¥		
50	2.07**	9.0¥	1.73*	4.0¥		
63	1.30*	2.5¥				

* = fill ratio for the tested penetrations from CSIRO fire resistance test FSP 1360.
** = fill ratio for the assessed penetrations.
¥ = width of the annular space (mm) between the collar and the outside of the pipe.

For each SNAP Retrofit collar system the smallest and largest pipe has been tested and achieved an FRL of -/180/180. The fill ratio for each of the assessed collars and their respective pipe penetrations in the above table is consistent with or significantly greater than the most onerous of the tested collar assemblies in each case being the largest pipe. Also, the smallest pipe has been tested in each penetration having the largest annular space between the pipe and the inner face of the collar.

Consistent with the argument in 3.2 it is therefore considered that all of the above assessed pipe penetration systems with the pipe fitting located within the collar would not prejudice the established fire resistance of a steel framed wall with an FRL of -/120/120 or -/180/180 with the FRL of the penetration system adjusted to match that of the wall system but not greater than the penetration FRL given in Table 11.

3.5.1 PPR Faser SDR 7.4 Pipe Summary

Table 11 gives the test and assessed FRL results for the pipe penetrations in a steel framed plasterboard wall. The test results were achieved in a 128 mm thick steel framed plasterboard wall consisting of steel studs measuring minimum 64 mm x 0.55 mm and two layers of 16 mm thick fire rated plasterboard at each face, with an established FRL of -/120/120. The selected FRL is for a plasterboard lined wall system with an FRL of either -/120/120 or -/180/180 with the FRL of the penetration system adjusted to match that of the wall system but not greater than the penetration FRL given in Table 11.

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Table 11: PPR Faser SDR 7.4 Pipe Summary

Pipe Material	Pipe Diameter	Collar Code	FRL	
			With Fitting	Straight
PPR SDR 7.4	63	63R	n/a	-/180/180*
PPR SDR 7.4	50	63R	n/a	-/180/180**
PPR SDR 7.4	40	63R	n/a	-/180/180**
PPR SDR 7.4	32	63R	n/a	-/180/180**
PPR SDR 7.4	25	63R	n/a	-/180/180**
PPR SDR 7.4	20	63R	n/a	-/180/180*
PPR SDR 7.4	50	50R	n/a	-/180/180*
PPR SDR 7.4	40	50R	n/a	-/180/180**
PPR SDR 7.4	32	50R	n/a	-/180/180**
PPR SDR 7.4	25	50R	n/a	-/180/180**
PPR SDR 7.4	20	50R	n/a	-/180/180*
PPR SDR 7.4	32	32R	n/a	-/180/180*
PPR SDR 7.4	25	32R	n/a	-/180/180**
PPR SDR 7.4	20	32R	n/a	-/180/180*

(FRL*) = Test result
(FRL**) = Assessed result

3.6 PE SDR 7.4 Pipes and Sealing Systems

Table 12 gives the fill ratio of the SNAP Retrofit collars for specific PE SDR 7.4 pipes and their SNAP Retrofit sealing systems.

Table 12: PE SDR 7.4 Pipe with SNAP Collar Fill Ratios

Nominal Size	Fill Ratio: Area of Intumescent to pipe cross sectional area					
	63R		50R		32R	
20	13.44*	24.0¥	11.24*	19.2¥	6.88*	7.7¥
25	8.26**	21.5¥	6.91**	16.5¥	4.40**	5.0¥
32	5.11**	18.1¥	4.27**	13.1¥	2.69*	1.6¥
40	3.40**	14.5¥	2.84**	9.5¥		
50	2.17**	9.6¥	1.81*	4.6¥		
63	1.33*	2.9¥				

* = fill ratio for the tested penetrations from CSIRO fire resistance test FSP 1366.
** = fill ratio for the assessed penetrations.
¥ = width of the annular space (mm) between the collar and the outside of the pipe.

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For each SNAP Retrofit collar system the smallest and largest pipe has been tested and achieved an FRL of -/180/180. The fill ratio for each of the assessed collars and their respective pipe penetrations in the above table is consistent with or significantly greater than the most onerous of the tested collar assemblies in each case being the largest pipe. Also, the smallest pipe has been tested in each penetration having the largest annular space between the pipe and the inner face of the collar.

Consistent with the argument in 3.2 it is therefore considered that all of the above assessed pipe penetration systems with the pipe fitting located within the collar would not prejudice the established fire resistance of a steel framed wall with an FRL of -/120/120 or -/180/180 with the FRL of the penetration system adjusted to match that of the wall system but not greater than the penetration FRL given in Table 13.

3.6.1 PE SDR 7.4 Pipe Summary

Table 13 gives the test and assessed FRL results for the pipe penetrations in a steel framed plasterboard wall. The test results were achieved in a 128 mm thick steel framed plasterboard wall consisting of steel studs measuring minimum 64 mm x 0.55 mm and two layers of 16 mm thick fire rated plasterboard at each face, with an established FRL of -/120/120. The selected FRL is for a plasterboard lined wall system with an FRL of either -/120/120 or -/180/180 with the FRL of the penetration system adjusted to match that of the wall system but not greater than the penetration FRL given in Table 13.

Table 13: PE SDR 7.4 Pipe Summary

Pipe Material	Pipe Diameter	Collar Code	FRL	
			With Fitting	Straight
PE SDR 7.4	63	63R	n/a	-/180/180*
PE SDR 7.4	50	63R	n/a	-/180/180**
PE SDR 7.4	40	63R	n/a	-/180/180**
PE SDR 7.4	32	63R	n/a	-/180/180**
PE SDR 7.4	25	63R	n/a	-/180/180**
PE SDR 7.4	20	63R	n/a	-/180/180*
PE SDR 7.4	50	50R	n/a	-/180/180*
PE SDR 7.4	40	50R	n/a	-/180/180**
PE SDR 7.4	32	50R	n/a	-/180/180**
PE SDR 7.4	25	50R	n/a	-/180/180**
PE SDR 7.4	20	50R	n/a	-/180/180*
PE SDR 7.4	32	32R	n/a	-/180/180*
PE SDR 7.4	25	32R	n/a	-/180/180**
PE SDR 7.4	20	32R	n/a	-/180/180*

(FRL*) = Test result
(FRL**) = Assessed result

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3.7 Collar Fixing

The collar systems described in the test reports in Section 2 include collars that have been secured to the wall with expanding plasterboard wall anchors and with M6 threaded rod passing through the cavity thereby sandwiching the wall between the collars. The largest pipe sizes were tested using the wall anchor method without any signs of damage to the plasterboard or collars falling off on the exposed side of the wall. It is therefore considered that the collars can be secured to the wall with either method without prejudicing the fire resistance of the pipe penetration.

4. CONCLUSION

It is considered that SNAP Fire Systems Retrofit collars protecting pipe penetration systems listed below would achieve the FRL given in Table 14 when tested in accordance with AS 1530.4:2014 with reference to AS 4072.1–2005. The following conditions apply.

- Test results were achieved in a 128 mm thick steel framed plasterboard wall consisting of steel studs measuring minimum 64 mm x 0.55 mm and two layers of 16 mm thick fire rated plasterboard at each face, with an established FRL of -/120/120.
- Collar installation with either M6 threaded rod or wall anchor.
- Results can be applied to wall systems with deeper studs than those tested.
- Results can be applied to framed wall systems with thicker plasterboard facings.
- Results may be applied to masonry or concrete wall systems of equal or greater thickness.
- The selected FRL is for a plasterboard lined system with an FRL of either -/120/120 or -/180/180 with the FRL of the penetration system adjusted to match that of the wall system but not greater than the penetration FRL listed below.

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Table 14: Assessment Summary

Pipe Material	Pipe Diameter	Collar Code	FRL	
			With Fitting	Straight
PVC	100	110R	-/180/120*	-/180/180*
PVC	90	110R	-/180/120**	-/180/120**
PVC	90	65-80R	n/a won't fit	-/180/120**
PVC	80	65-80R	-/180/120**	-/180/120*
PVC	65	65-80R	-/180/120**	-/180/120**
PVC	80	84R	n/a won't fit	-/180/120**
PVC	65	84R	-/180/120**	-/180/120*
PVC	65	63R	n/a won't fit	-/180/120**
PVC	50	63R	-/180/120**	-/180/120*
PVC	50	50R	-/180/180*	-/180/120**
PVC	40	50R	-/180/180*	-/180/180**
HDPE	100	110R	n/a	-/180/120*
HDPE	90	65-80R	n/a	-/180/120**
HDPE	75	65-80R	n/a	-/180/120**
HDPE	75	84R	n/a	-/180/120**
HDPE	63	63R	n/a	-/180/120**
HDPE	56	63R	n/a	-/180/120**
HDPE	50	63R	n/a	-/180/120**
HDPE	56	50R	n/a	-/180/120**
HDPE	50	50R	n/a	-/180/120**
HDPE	40	50R	n/a	-/180/180*
PPR SDR 7.4	63	63R	n/a	-/180/180*
PPR SDR 7.4	50	63R	n/a	-/180/180**
PPR SDR 7.4	40	63R	n/a	-/180/180**
PPR SDR 7.4	32	63R	n/a	-/180/180**
PPR SDR 7.4	25	63R	n/a	-/180/180**
PPR SDR 7.4	20	63R	n/a	-/180/180*
PPR SDR 7.4	50	50R	n/a	-/180/180*
PPR SDR 7.4	40	50R	n/a	-/180/180**
PPR SDR 7.4	32	50R	n/a	-/180/180**
PPR SDR 7.4	25	50R	n/a	-/180/180**
PPR SDR 7.4	20	50R	n/a	-/180/180*
PPR SDR 7.4	32	32R	n/a	-/180/180*

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Pipe Material	Pipe Diameter	Collar Code	FRL	
			With Fitting	Straight
PPR SDR 7.4	25	32R	n/a	-/180/180**
PPR SDR 7.4	20	32R	n/a	-/180/180*
PE SDR 7.4	63	63R	n/a	-/180/180*
PE SDR 7.4	50	63R	n/a	-/180/180**
PE SDR 7.4	40	63R	n/a	-/180/180**
PE SDR 7.4	32	63R	n/a	-/180/180**
PE SDR 7.4	25	63R	n/a	-/180/180**
PE SDR 7.4	20	63R	n/a	-/180/180*
PE SDR 7.4	50	50R	n/a	-/180/180*
PE SDR 7.4	40	50R	n/a	-/180/180**
PE SDR 7.4	32	50R	n/a	-/180/180**
PE SDR 7.4	25	50R	n/a	-/180/180**
PE SDR 7.4	20	50R	n/a	-/180/180*
PE SDR 7.4	32	32R	n/a	-/180/180*
PE SDR 7.4	25	32R	n/a	-/180/180**
PE SDR 7.4	20	32R	n/a	-/180/180*

(FRL*) = Test result

(FRL**) = Assessed result

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