



FIRE ASSESSMENT REPORT

FC12804-001

ASSESSMENT OF THE FIRE RESISTANCE OF SNAP METAL RETRO-FIT COLLARS APPLIED TO PROTECTING PIPE PENETRATIONS THROUGH A CONCRETE FLOOR SLAB

CLIENT

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ASSESSMENT OBJECTIVE

To assess the fire resistance of SNAP metal retro-fit collars protecting PVC and Raupiano pipe penetrations through a 150 mm thick concrete floor slab.

CONCLUSION

It is considered that the SNAP metal retro-fit collars fitted to the underside of a 150 mm thick concrete floor slab protecting 40 mm to 150 mm diameter PVC pipes and 40 mm to 110 mm diameter Raupiano pipes, including variants as listed which may also include termination to floor-waste and shower (F W & S) grates and fittings within the collar, would achieve the FRL's as specified in the following table, if tested in accordance with AS 1530.4-2014 and AS 4072.1-2005.

Pipe Material	Pipe Dia. (mm)	Collar Code	Straight	With fitting	F W & S	F W & S With Fitting
PVC	150	HP150R			-/240/180	-/240/180
PVC	100	LP100R-B	-/240/180	-/240/180	-/240/180	-/240/180
PVC	100	LP100R	-/240/240		-/240/240	
PVC	80	LP100R-D	-/240/240	-/240/240	-/240/240	-/240/240
PVC	80	LP80R			-/240/240	
PVC	65	LP65R-SS	-/240/240	-/240/240	-/240/240	-/240/240
PVC	50	LP65R-SS	-180/180	-180/180	-180/180	-180/180
PVC	50	LP50R	-/240/240	-/240/240	-/240/240	-/240/240
PVC	40	LP65R-SS	-180/180	-180/180	-180/180	-180/180
PVC	40	LP50R	-/240/120	-/240/120	-/240/120	-/240/120
Raupiano	50	LP50R			-/240/240	-/240/240
Raupiano	110	LP100R-B	-/240/240	-/240/240		
Raupiano	90	LP100R-B	-/240/240	-/240/240		
Raupiano	75	LP100R-B	-/240/240	-/240/240		
Raupiano	50	LP50R	-/240/240	-/240/240		
Raupiano	40	LP50R	-/240/240	-/240/240		

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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The results reported here relate only to the item/s described in this report.



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1. INTRODUCTION

This report gives BRANZ's assessment on the fire resistance of a range of SNAP metal retro-fit collars protecting a range of PVC and Raupiano pipe penetrations passing through a 150 mm thick concrete floor slab.

2. BACKGROUND

This assessment is considered on the basis of the fire resistance performance of SNAP metal retrofit collars coded HP and LP installed below a 150 mm thick concrete floor slab protecting a range of PVC and Raupiano pipe penetrations passing through a 150 mm thick concrete floor slab as established in BRANZ and CSIRO fire resistance tests and assessments as summarised in Table 1.

Table 1: Summary of supporting test results of SNAP metal retrofit collars protecting PVC and Raupiano pipes in a concrete floor slab

Test/Assessment Report	Pen. #	Product	Pipe diameter (mm)	Pipe type	Arrangement	FRL
FSP 1781	4	HP150R	150	PVC	F W & S with fitting	-/240/180
FSP 1713	1	LP100R-B	100	PVC	F W & S with fitting	-/240/180
FP 4428	2	LP100R	100	PVC	F W & S	-/240/240
FAR 3933		LP100R	100	PVC	Stack only	-/240/240
FSP 1789	6	LP100R-D	80	PVC	F W & S with fitting	-/240/240
FSP 1781	1	LP100R-D	80	PVC	F W & S	-/240/240
FSP 1592	2	LP80R	80	PVC	F W & S	-/240/240
FSP 1789	4	LP65R-SS	65	PVC	F W & S with fitting	-/240/240
FSP 1641	4	LP65R-SS	50	PVC	F W & S with fitting	-/180/180
FSP 1700	4	LP50R	50	PVC	F W & S with fitting	-/240/240
FP 4640	7	LP50R	50	PVC	F W & S	-/240/240
FAR 3933		LP50R	50	PVC	With fitting	-/240/240
FAR 3933		LP50R	50	PVC	Stack only	-/240/240
FSP 1641	1	LP65R-SS	40	PVC	F W & S with fitting	-/180/180
FR 5670	27	LP50R	40	PVC	F W & S with fitting	-/240/120
FSP 1713	4	LP100R-B	110	Raupiano	With fitting	-/240/240
FSP 1713	5	LP50R	40	Raupiano	With fitting	-/240/240
FSP 1713	3	LP50R	50	Raupiano	F W & S with fitting	-/240/240

Note:

- F W & S = floor-waste and shower grate cast into the floor slab
- FP & FR = BRANZ fire resistance tests
- FSP = CSIRO fire resistance tests
- FAR = BRANZ assessment reports

Fittings are considered as a double thickness of pipe such as where a coupling or an elbow, fixed with a solvent based adhesive, is fitted to a straight pipe and it happens that the joint is within the collar.



3. DISCUSSION

3.1 SNAP Metal Retro-fit Fire Collars

The SNAP Metal Retro-fit fire collars are designed to be installed prior to the pipe being installed or split onsite and fitted around in-situ pipes. They are fitted to the soffit of the concrete floor slab that the pipe passes through.

There are two types of Retro-fit collars used for floor penetrations. One type is identified with the prefix LP or HP meaning low profile and high profile followed by the nominal size of the collar and suffix R. These collars include three or four equally spaced spring pockets around the perimeter of the collar with stainless steel springs located inside. The springs are held closed by nylon thermal links.

Both types of collars consist of a lipped steel sleeve and contain one, 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 where there are multiple layers of intumescent, or where only one layer of intumescent is used between the intumescent sleeve and the body of the collar. The thickness, width and number of layers of intumescent within the collar vary depending on the collar specification.

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 slab. 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 closure of the collars are assisted by the springs to crush and fold the intumescent into the penetration upon release of the spring thermal link. Therefore, the significant factor 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. Activation will be within the first three minutes of the fire exposure.

The exposed collars in the above reported tests remained attached to the slab, with the plug of intumescent material within the exposed collars still providing a plug and maintaining integrity of the penetration for the duration of the test.

For the pipe penetrations detailed in the above reports, the holes through the floor slab were made such that the clearance to the pipe was kept to a minimum. The annular gap between the pipe and the floor slab at the unexposed face was sealed with a bead of fire rated sealant.

The Retro-fit 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 metal Retro-fit collar systems, once activated, remain in situ for the desired duration without contributing to integrity failure for the element in question.

The test results in Table 1 are considered in assessing the FRL of:

1. Six PVC pipes protecting floor waste and shower grates but without fittings.
2. Six PVC pipe sizes ranging from 40 mm to 100 mm with fittings.
3. Six PVC pipe sizes ranging from 40 mm to 100 mm without fittings, i.e. stack only.

3.2 AS 4072.1-2005 Prerequisite Test Data

AS 4072.1-2005 Section 4 sets out the prerequisite test data required for assessing the variations to the tested specimen. When assessing plastic pipes other than PVC it is a requirement that the nominal 40 mm, 50 mm, 65 mm, 80 mm and 100 mm PVC pipe sizes have been tested in the collar assembly under consideration and have achieved the desired FRL. For the plastic pipe under consideration the maximum and minimum pipe size where the diameter \varnothing is ($40 \text{ mm} \leq \varnothing \leq 120 \text{ mm}$) must also be tested and have achieved the desired FRL. The intermediate pipe sizes can then be assessed. The test and assessment results shown in Appendix A of this report give the required prerequisite test data for completing the assessment of PVC, HDPE and Raupiano pipes through a 150 mm thick concrete slab.

3.3 Assessments of PVC pipes with F W & S grates without fittings

In the pipes with fittings the premise is that it may make it more difficult for the intumescent in the collar to close the double thickness of pipe. It therefore follows that for the same pipe size and collar combinations the time of closure of the collars on the pipes, without fittings, will likely be similar or earlier and thus maintain the FRL as tested.

Table 2 shows the six required assessments. These are supported by the tested systems in Table 1 and fit in between the pipe sizes 40 and 150 mm that were tested. For the pipe sizes listed these have been tested with fittings included in the collars and successfully sealed off the pipes to achieve the stated FRL. It is therefore considered that the same combination of pipe and collar will similarly be closed and achieve the required FRL when the fittings are not included.

Table 2: Assessment with F W & S grates without fittings

Test Report	Pen. #	Product	Pipe diameter (mm)	Pipe type	FRL
FSP 1781	4	HP150R	150	PVC	-/240/180
FSP 1713	1	LP100R-B	100	PVC	-/240/180
FSP 1789	4	LP65R-SS	65	PVC	-/240/240
FSP 1641	4	LP65R-SS	50	PVC	-/180/180
FSP 1641	1	LP65R-SS	40	PVC	-/180/180
FR 5670	27	LP50R	40	PVC	-/240/120

3.4 Assessment of PVC pipes with fittings

For collars closing pipes terminating at a F W & S grate in the floor slab it is generally accepted that this is a more severe arrangement than if the pipe continued through and above the floor. This is because when the floor grate is tested there is a greater likely hood that any gases

passing through the pipe, before the collar closes and seals, will heat the grate beyond the insulation criteria whereas when a pipe only is fitted any hot gases passing through will require to heat the pipe wall before insulation failure occurs. This is expected to delay insulation failure. Hence where an FRL has been achieved with a collar closing a pipe terminating at a floor grate as shown in Table 1 it is expected that a collar closing a pipe continuing through the floor slab will achieve an FRL of at least the same as tested as shown in Table 3.

Table 3: Assessment with fittings but without floor grate as supported by the tested systems

Test Report	Pen. #	Product	Pipe diameter (mm)	Pipe type	FRL
FSP 1713	1	LP100R-B	100	PVC	-/240/180
FSP 1789	6	LP100R-B	80	PVC	-/240/240
FSP 1789	4	LP65R-SS	65	PVC	-/240/240
FSP 1641	4	LP65R-SS	50	PVC	-/180/180
FSP 1641	1	LP65R-SS	40	PVC	-/180/180
FR 5670	27	LP50R	40	PVC	-/240/120

3.5 Assessment of PVC pipes without fittings (stack pipe)

Given that the presence of fittings is likely to reduce the rate of compression and closure of PVC pipes under the action of the SNAP collars as tested and assessed in section 3.3 above it follows that the absence of the fittings in the pipes and a consequent reduced resistance to closure is unlikely to prejudice the respective FRL's already tested or assessed.

To conclude it is likely that the FRL's as shown in Table 4 will be achieved for the straight PVC pipes ranging in diameter from 40 to 100 mm when protected with the listed SNAP collars fixed to the underside of a concrete floor slab.

Table 4: Assessment without fittings as supported by the tested and assessed systems

Test Report	Pen. #	Product	Pipe diameter (mm)	Pipe type	FRL
FSP 1713	1	LP100R-B	100	PVC	-/240/180
FSP 1789	6	LP100R-B	80	PVC	-/240/240
FSP 1789	4	LP65R-SS	65	PVC	-/240/240
FSP 1641	4	LP65R-SS	50	PVC	-/180/180
FSP 1641	1	LP65R-SS	40	PVC	-/180/180
FR 5670	27	LP50R	40	PVC	-/240/120

3.6 Assessment of Raupiano pipes with F W & S without fittings

In the pipes with fittings the premise is that it may make it more difficult for the intumescent in the collar to close the double thickness of pipe. It therefore follows that for the same pipe size and collar combinations the time of closure of the collars on the pipes, without fittings, will likely be similar or earlier and thus maintain the FRL as tested.

In fire resistance test FSP 1713 Specimen 3 was a 50 mm diameter Raupiano pipe fitted to a floor, waste and shower grate and included a fitting. This specimen achieved an FRL of at



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least -/240/240 in the fire resistance test. Based on the same discussion as included in Clause 3.2 above it is therefore considered that the same combination of pipe and collar will similarly be closed and achieve the required FRL when the fittings are not included. It is therefore expected that the LP50R collar fitted to a 50 mm diameter Raupiano pipe fitted to an F W & S grate without a double wall thickness due to a pipe fitting will also achieve an FRL of -/240/240.

3.7 Assessment of Raupiano pipes with and without fittings

In the pipes with fittings the premise is that it may make it more difficult for the intumescent in the collar to close the double thickness of pipe. It therefore follows that for the same pipe size and collar combinations the time of closure of the collars on the pipes, without fittings, will likely be similar or earlier and thus maintain the FRL as tested.

Table 5 shows the additional eight required assessments. These are supported by the tested systems in Table 1 and fit in between the pipe sizes 40 and 110 mm that were tested. For the pipe sizes listed these have been tested with fittings included in the collars and successfully sealed off the pipes to achieve the stated FRL. It is therefore considered that the same combination of pipe and collar with or without fittings will similarly be closed and achieve the required FRL.

Table 5: Assessment of Raupiano pipes with and without fittings as supported by the tested and assessed systems

Test Report	Pen. #	Product	Pipe diameter (mm)	Pipe type	FRL Stack	FRL With fitting
FSP 1713	4	LP100R-B	110	Raupiano	-/240/240	-/240/240
		LP100R-B	90	Raupiano	-/240/240	-/240/240
		LP100R-B	75	Raupiano	-/240/240	-/240/240
		LP50R	50	Raupiano	-/240/240	-/240/240
FSP 1713	5	LP50R	40	Raupiano	-/240/240	-/240/240

4. CONCLUSION

It is considered that the SNAP metal retro-fit collars fitted to the underside of a 150 mm thick concrete floor slab protecting 40 mm to 150 mm diameter PVC pipes and 40 mm to 110 mm diameter Raupiano pipes, including variants as listed which may also include termination to floor, waste and shower (F W & S) grates and fittings within the collar, would achieve the FRL's as specified in Table 6, if tested in accordance with AS 1530.4–2014 and AS 4072.1-2005.

Table 6: Summary Table for SNAP Collars – to the underside of 150 mm thick concrete floor slab

Pipe Material	Pipe Dia. (mm)	Collar Code	Straight	With fitting	F W & S	F W & S With Fitting
PVC	150	HP150R			-/240/180	-/240/180
PVC	100	LP100R-B	-/240/180	-/240/180	-/240/180	-/240/180
PVC	100	LP100R	-/240/240		-/240/240	
PVC	80	LP100R-D	-/240/240	-/240/240	-/240/240	-/240/240
PVC	80	LP80R			-/240/240	
PVC	65	LP65R-SS	-/240/240	-/240/240	-/240/240	-/240/240
PVC	50	LP65R-SS	-180/180	-180/180	-180/180	-180/180
PVC	50	LP50R	-/240/240	-/240/240	-/240/240	-/240/240
PVC	40	LP65R-SS	-180/180	-180/180	-180/180	-180/180
PVC	40	LP50R	-/240/120	-/240/120	-/240/120	-/240/120
Raupiano	50	LP50R			-/240/240	-/240/240
Raupiano	110	LP100R-B	-/240/240	-/240/240		
Raupiano	90	LP100R-B	-/240/240	-/240/240		
Raupiano	75	LP100R-B	-/240/240	-/240/240		
Raupiano	50	LP50R	-/240/240	-/240/240		
Raupiano	40	LP50R	-/240/240	-/240/240		