



BRANZ

1222 Moonshine Road
Judgeford RD1
Porirua 5381
New Zealand
T +64 4 237 1170
F +64 4 237 1171
branz@branz.co.nz
www.branz.co.nz



FIRE ASSESSMENT REPORT

FAR 4019 ISSUE 2

FIRE RESISTANCE OF SNAP FIRE SYSTEMS PTY LTD CAST IN COLLARS WITH
REHAU RAUPIANO PLUS PIPE

CLIENT

Snap Fire Systems Pty Ltd
Unit 2-160 Redlands Bay Rd.
Capalaba,
4157 QLD
Australia

PROJECT NUMBER:	ISSUE DATE:	EXPIRY DATE:	PAGE:
-----------------	-------------	--------------	-------

FC4019	25 March 2013	25 March 2023	1 of 11
---------------	----------------------	----------------------	----------------

THE LEGAL VALIDITY OF THIS REPORT CAN ONLY BE CLAIMED ON PRESENTATION OF THE COMPLETE SIGNED PAPER REPORT. EXTRACTS
OR ABRIDGMENTS OF THIS REPORT SHALL NOT BE PUBLISHED WITHOUT PERMISSION FROM BRANZ LTD.

ASSESSMENT OBJECTIVE

This assessment considers the fire resistance of SNAP H 100 S/-RR, H 50 S/-RR, H 100 FWS and H 50 FWS cast in collars with REHAU RAUPIANO PLUS pipe. The assessment also considers the difference between the high and low profile cast-in collar and any material difference between the use of the rubber ring identified by the suffix RR.

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.

This assessment report may only be quoted or reproduced in full.

TERMS AND CONDITIONS

This report is issued in accordance the Terms and Conditions as detailed and agreed in BRANZ Services Agreement for this work.



REPORT NUMBER:

ISSUE DATE:

EXPIRY DATE:

PAGE:

FAR 4019 Issue 2 25 March 2013 25 March 2023 2 of 11

RWC

A blue ink signature in a box, corresponding to the initials RWC.

ES

A blue ink signature in a box, corresponding to the initials ES.

THE LEGAL VALIDITY OF THIS REPORT CAN ONLY BE CLAIMED ON PRESENTATION OF THE COMPLETE SIGNED PAPER REPORT. EXTRACTS OR ABRIDGMENTS OF THIS REPORT SHALL NOT BE PUBLISHED WITHOUT PERMISSION FROM BRANZ LTD.

CONTENTS

SIGNATORIES	4
DOCUMENT REVISION STATUS	4
1. BACKGROUND	5
1.1 General	5
1.2 CSIRO Fire Resistance Report FSP 1564	5
1.3 CSIRO Fire Resistance Report FSP 1575	5
2. DISCUSSION	6
2.1 Snap Cast-in Collars Description and Method of Operation	6
2.2 Assessment	7
2.2.1 AS 4072.1-2005 Prerequisite Test Data	7
2.2.2 Method	7
2.3 Floorwaste Collars used in Stack Assemblies	8
2.4 REHAU RAUPIANO PLUS Pipes and Sealing Systems	8
2.5 Concrete Thickness	9
3. CONCLUSION	10

TABLES

Table 1: Test Result FSP 1564	5
Table 2: Test Result FSP 1575	6
Table 3: PVC-U Pipes and Snap cast-in Collars	8
Table 4: REHAU RAUPIANO PLUS and Snap cast-in Collars	8
Table 5: Assessment Summary Table	11
Table 6: Concrete Slab FRL and Slab Thickness	11



SIGNATORIES



Author

R. W. Causer
Fire Testing Engineer



Reviewer

E. Soja
Senior Fire Safety Engineer

DOCUMENT REVISION STATUS

ISSUE NO.	DATE ISSUED	DESCRIPTION
1	25 March 2013	Initial Issue
2	25 March 2013	Re issued with expiry date



REPORT NUMBER: FAR 4019 Issue 2 ISSUE DATE: 25 March 2013 EXPIRY DATE: 25 March 2023 PAGE: 4 of 11

THE LEGAL VALIDITY OF THIS REPORT CAN ONLY BE CLAIMED ON PRESENTATION OF THE COMPLETE SIGNED PAPER REPORT. EXTRACTS OR ABRIDGMENTS OF THIS REPORT SHALL NOT BE PUBLISHED WITHOUT PERMISSION FROM BRANZ LTD.

1. BACKGROUND

1.1 General

The following gives the collar designation coding used in this report.

Prefix

- H = High profile
- L = Low profile

Suffix

- S = Used for stack assemblies only
- RR = Rubber ring
- FWS = Use with floorwaste or shower

Where reference is made to “stack” assemblies this relates to the vertical pipe installation through a slab.

1.2 CSIRO Fire Resistance Report FSP 1564

In CSIRO fire resistance test FSP 1564 four specimens consisted of REHAU RAUPIANO PLUS pipes and their sealing systems through a nominal 150 mm thick concrete floor slab. The test was conducted in accordance with AS 1530.4-2005.

Specimen No's 3, 4 and 5 were floor waste assemblies. Table 1 shows the test results for the test specimens. The floor waste specimens included a floor grate and trap and in specimen No. 4 a PVC 90° elbow and REHAU DN 52/50 PVC adaptor on the exposed face. None of the test specimens prejudiced the integrity or insulation criteria for the 241 minute duration of the test.

Table 1: Test Result FSP 1564

No.	Collar Designation	Rehau Raupiano Plus Pipe Size OD	FRL
1	H 50 S	40 mm	-/240/240
2	H 100 S-RR	110 mm	-/240/240
3	H 100 FWS	110 mm	-/240/240
4	H 50 FWS	56 mm OD PVC	-/240/240
5	H 50 FWS	50 mm	-/240/240

1.3 CSIRO Fire Resistance Report FSP 1575

In CSIRO fire resistance test FSP 1575 five specimens consisted of PVC pipes and their sealing systems through a nominal 150 mm thick concrete floor slab. The test was conducted in accordance with AS 1530.4-2005.

Table 2 shows the test results for the test specimens. None of the test specimens prejudiced the integrity or insulation criteria for the 241 minute duration of the test.



Table 2: Test Result FSP 1575

No.	Collar Designation	REHAU RAUPIANO PLUS Pipe Size OD	FRL
1	H 100 S-RR	100 mm	-/240/240
2	H 100 S-RR	80 mm	-/240/240
3	L 65 S	65 mm	-/240/240
4	H 50 S-RR	50 mm	-/240/240
5	L 40 S	40 mm	-/240/240

2. DISCUSSION

2.1 Snap Cast-in Collars Description and Method of Operation

The range of SNAP cast-in collars has a variety of minor variations to the design of the collar. These include the following.

- H = High profile. The high profile refers to the moulded HDPE top fitted to the collar body. This is used where the pipe is not fitted prior to pouring the concrete slab. The plastic top is trimmed afterwards level with the slab surface.
- L = Low profile. The low profile top refers to the moulded LDPE top that has a hole sized for the pipe it is used for. A section of pipe must be fitted prior to pouring the concrete slab. Specimen No. 5 in FSP 1564 included a L 40 S cast in collar and a 40 mm PVC pipe.
- S = Stack assembly only. The moulded plastic cast in collars include three equally spaced springs with thermal triggers to assist with closure of the penetration. The collars used for floor waste applications are identified with the suffix FWS include stainless steel grade 304 springs. Collars used for stack applications identified with the suffix (S) have galvanised steel springs.
- RR = Rubber ring. The rubber ring is an option used where it is necessary to reduce water ingress through the penetration during construction. The H 50 FWS and H 100 FWS floor waste collars tested in FSP 1564 did not include the rubber ring.
- The L 65 S, L 80 S and H 100 S collars are essentially the same collar except for the high profile top used on the later. Similarly the L 40 S and H 50 S is the same collar except for the high profile top section. The L 80 FWS and H 100 FWS are also essentially the same collar except for the top low profile section with the smaller clearance hole in for 80 mm diameter pipes.

The cast in collars includes a HDPE moulded body with a single layer of Intumesh intumescent and a layer of stainless steel mesh measuring 0.15 mm thick with 30 squares per inch sandwiched between the intumescent sleeve and the body of the collar. The height and thickness of the intumescent within the collar varies depending on the collar specification.



REPORT NUMBER:

ISSUE DATE:

EXPIRY DATE:

PAGE:

FAR 4019 Issue 2 25 March 2013 25 March 2023 6 of 11

RWC

ES

THE LEGAL VALIDITY OF THIS REPORT CAN ONLY BE CLAIMED ON PRESENTATION OF THE COMPLETE SIGNED PAPER REPORT. EXTRACTS OR ABRIDGMENTS OF THIS REPORT SHALL NOT BE PUBLISHED WITHOUT PERMISSION FROM BRANZ LTD.

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 collar and helps to prevent the intumescent from being consumed and falling away from the penetration prematurely.

The collars are assisted by the springs to fold the intumescent into the penetration upon activation of the spring thermal link. Activation will occur at about 80°C. All of the collars in the above reported tests maintained the integrity and insulation criteria of the specimens for the 241 minute duration of the tests.

Where the high profile collars were used for the pipe penetrations detailed in the above reports, the gap between the pipe and the floor slab at the unexposed face was sealed with a bead of fire rated sealant or cement mortar.

It is considered that the test results on the SNAP cast in collars indicate that the minor variations of the High and Low profile collars and the inclusion or exclusion of the rubber ring, described above, have no discernible impact on the test result. Accordingly any combination of these configurations may be used without affecting the FRL of the tested and assessed specimens.

2.2 Assessment

2.2.1 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. Where assessing plastic pipes other than PVC it is a requirement that the 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 ($40 \text{ mm} \geq \varnothing \leq 120 \text{ mm}$) must also be tested and have achieved the desired FRL. The intermediate pipe sizes can then be assessed. The test results shown in sections 1.2 and 1.3 of this report give the required prerequisite test data for completing the assessment of the Rehaus Raupiano Plus pipe through a concrete slab.

2.2.2 Method

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. The spring assist collars force the intumescent and stainless mesh to close around the softening plastic pipe material thereby ensuring that the penetration is closed quickly. For the purposes of assessment of the performance of REHAU RAUPIANO PLUS pipes and their spring assisted 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 the tested PVC and REHAU RAUPIANO PLUS 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.



REPORT NUMBER: ISSUE DATE: EXPIRY DATE: PAGE:

FAR 4019 Issue 2 25 March 2013 25 March 2023 7 of 11



THE LEGAL VALIDITY OF THIS REPORT CAN ONLY BE CLAIMED ON PRESENTATION OF THE COMPLETE SIGNED PAPER REPORT. EXTRACTS OR ABRIDGMENTS OF THIS REPORT SHALL NOT BE PUBLISHED WITHOUT PERMISSION FROM BRANZ LTD.

Where smaller diameter pipes are installed in larger collars the annular space between the inner face of the collar and the pipe will not impact on the collars ability to seal the penetration as the ability of the collar to close and maintain the integrity criteria relates to the spring, and the combination of the intumescent and mesh effectiveness. As such the fill ratio as described above is the critical factor in establishing the collars ability to maintain the seal for the desired duration.

2.3 Floorwaste Collars used in Stack Assemblies

The most onerous pipe penetration configuration for fire resistance testing is the floor waste system where the pipe terminates at the unexposed face with a grate located over the pipe end. The method used to close the penetration needs to be quick acting to ensure the thermocouple located on the centre of the grate does not exceed the 180K temperature rise criterion. The H 100 FWS and H 50 FWS floor waste collars were tested in FSP 1564 on the nominal 50 mm PVC and REHAU RAUPIANO PLUS pipe and the nominal 110 mm REHAU RAUPIANO PLUS pipe without failure maintaining the integrity and insulation criteria for 240 minutes. It is therefore considered that the floor waste collar can be used in place of the standard model cast-in collar of the same size for stack pipe assemblies without prejudicing the established fire resistance of the penetration in question.

2.4 REHAU RAUPIANO PLUS Pipes and Sealing Systems

Table 3 gives the fill ratio of the SNAP cast-in collars for specific REHAU RAUPIANO PLUS pipes with their SNAP cast-in sealing systems.

Table 3: PVC-U Pipes and Snap cast-in Collars

Nominal Size	Fill Ratio: Area of intumescent to pipe cross sectional area			
	H 100 S-RR	L 65 S	H 50 S-RR	L 40 S
40				0.66*
50			0.39*	
65		0.44*		
80	0.31*			
100	0.17*			

Table 4: REHAU RAUPIANO PLUS and Snap cast-in Collars

Nominal Size	Fill Ratio: Area of intumescent to pipe cross sectional area			
	H 100 S-RR	L 65 S	H 50 S-RR	L 40 S
40			0.76*	0.76**
50			0.49**	
75	0.37**	0.37**		
90	0.26**			
110	0.17*			

* = fill ratio for the tested penetrations from fire resistance tests FSP 1564 & FSP 1575.

** = fill ratio for the assessed penetrations.



Although the REHAU RAUPIANO PLUS pipes will not fit through the L 40 S and L 65 S collars they have been included in the analysis as it is the ability of the collar body assembly to close and seal the penetration that is being measured. Where a low profile collar is used the pipe is fitted prior to pouring the concrete ensuring that there are no gaps between the pipe and the slab on the unexposed face. Where the high profile collars are fitted, a sealant must be applied around the perimeter of the pipe at the unexposed face. It is therefore considered that provided the low profile top is made to suit the REHAU RAUPIANO PLUS pipe with a small clearance tolerance, the low profile collar will give no less a performance than the high profile collars as tested and assessed.

The fill ratio's for the assessed REHAU RAUPIANO PLUS pipes as shown in Table 4 are greater than the most onerous specimen, being the 110 mm diameter pipe, and commensurate with the tested PVC pipe ratios. The insulation of the specimen will be commensurate with the floor slab thickness FRL, as given in Table 6.

2.5 Concrete Thickness

All of the test specimens reported in CSIRO test reports FSP 1564 and FSP 1575 achieved a fire resistance level of 240 minutes in terms of the Integrity and Insulation criteria set out in AS 1530.4-2005. All of the tests reported above were with the penetrations through a 150 mm thick concrete slab.

As the collars are cast into the floor slab, with the penetration filled with the intumescent material, significant heating of the side of the hole through the floor does not occur unless a hole occurs in the seal. Therefore as no insulation failure occurred for the specimens before 240 minutes, it is expected that the fire resistance of the specimen will be determined by the insulation of the concrete floor slab. As defined in Table 5.5.1 of AS 3600-2001, Concrete Structures, the required thickness of concrete to achieve a required fire resistance level (FRL) is given in Table 6.



REPORT NUMBER: ISSUE DATE: EXPIRY DATE: PAGE:

FAR 4019 Issue 2 25 March 2013 25 March 2023 9 of 11



THE LEGAL VALIDITY OF THIS REPORT CAN ONLY BE CLAIMED ON PRESENTATION OF THE COMPLETE SIGNED PAPER REPORT. EXTRACTS OR ABRIDGMENTS OF THIS REPORT SHALL NOT BE PUBLISHED WITHOUT PERMISSION FROM BRANZ LTD.

3. CONCLUSION

It is considered that the SNAP Fire Systems cast-in collar pipe penetration systems given in Table 5 would achieve a fire resistance in terms of the Integrity and Insulation of 240 minutes in a floor slab with an FRL of 240/240/240 when tested in accordance with AS 1530.4-2005 with reference to AS 4072.1 – 2005.

It is also considered that the floor waste collar (identified by the suffix FWS) can be used in place of the stack cast-in collar identified by the suffix S of the same tested or assessed size for stack pipe assemblies without prejudicing the established fire resistance of the penetration in question.

It is further considered that the minor variations of the high and low profile collar tops and the exclusion or inclusion of the rubber ring identified by the suffix (RR) can be used in any combination without prejudicing the established fire resistance of the collar and penetration in question.

For a different thickness of floor slab with a lower FRL the penetration system FRL is lowered to match the slab FRL. Table 6 gives the required thickness of concrete to achieve a required fire resistance level (FRL).



REPORT NUMBER:

ISSUE DATE:

EXPIRY DATE:

PAGE:

FAR 4019 Issue 2 25 March 2013 25 March 2023 10 of 11

RWC

A blue ink signature in a box, corresponding to the initials RWC.

ES

A blue ink signature in a box, corresponding to the initials ES.

THE LEGAL VALIDITY OF THIS REPORT CAN ONLY BE CLAIMED ON PRESENTATION OF THE COMPLETE SIGNED PAPER REPORT. EXTRACTS OR ABRIDGMENTS OF THIS REPORT SHALL NOT BE PUBLISHED WITHOUT PERMISSION FROM BRANZ LTD.

Table 5: Assessment Summary Table

Pipe Material	Pipe Ø (mm)	Collar Code	Type	Stack	Stack With Fitting	Floorwaste & Shower
Floorwaste and Shower (FWS Range)						
REHAU RAUPIANO PLUS	100	H100FWS or L100FWS	Cast-in	-/240/240**	n/a	-/240/240*
	90	H100FWS or L100FWS	Cast-in	-/240/240**	n/a	n/a
	75	H100FWS or L80FWS	Cast-in	-/240/240**	n/a	n/a
	50	H50FWS	Cast-in	-/240/240**	n/a	-/240/240*
	40	H50FWS	Cast-in	-/240/240**	n/a	n/a
Stack Only (S Range)						
REHAU RAUPIANO PLUS	100	H100S or L100S	Cast-in	-/240/240*	n/a	n/a
	90	H100S or L100S	Cast-in	-/240/240**	n/a	n/a
	75	H100S or L80S	Cast-in	-/240/240**	n/a	n/a
	50	H50S or L50S	Cast-in	-/240/240**	n/a	n/a
	40	H50S, L50S	Cast-in	-/240/240*	n/a	n/a
	40	L40S	Cast-in	-/240/240**	n/a	n/a

* = Test result penetration tested in a 150 mm thick slab

** = Assessed system, insulation rating commensurate with the floor slab thickness FRL, as given in Table 6.

Table 6: Concrete Slab FRL and Slab Thickness

FRL (minutes)	Thickness (mm)
120	120
180	150
240	180

As defined in Table 5.5.1 of AS 3600-2001.



REPORT NUMBER: FAR 4019 Issue 2 ISSUE DATE: 25 March 2013 EXPIRY DATE: 25 March 2023 PAGE: 11 of 11

FAR 4019 Issue 2 25 March 2013 25 March 2023 11 of 11

