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# Fire resistance of SNAP fire collars protecting IPLEX pipe 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

## Inquiries should be addressed to:


| Fire Testing and Assessments | Author | The Client |
|---|---|---|
| NATA Registered Laboratory<br>14 Julius Avenue<br>North Ryde, NSW 2113<br>Telephone +61 2 94905444 | Infrastructure Technologies<br>14 Julius Avenue<br>North Ryde, NSW 2113<br>Telephone +61 2 94905500 | IG6 Pty Ltd<br>Unit 2/160 Redland Bay Road<br>Capalaba QLD<br>Telephone +61 7 3245 2133 |


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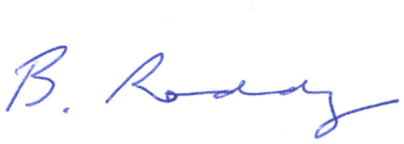
| AUTHOR | REVIEWED BY | AUTHORISED BY |
|---|---|---|
| **Keith Nicholls** | **Jing Xu** | **Brett Roddy** |
|  |  |  |
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# 1 Introduction

This report is an assessment of fire resistance of SNAP fire collars protecting IPLEX pipes 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 evidence of suitability requirements of NCC 2019 Vol 1 Schedule 5 clause 2(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 Section 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 |
|---|---|---|
| FSP 1339 | AS 1530.4 -2005 | Fire resistance test of 7 pipes penetrating through a 150mm thick concrete slab, protected with various retrofitted Snap collars |
| FSP 1340 | AS 1530.4 -2005 | Fire resistance test of 7 pipes penetrating through a 150mm thick concrete slab, protected with various cast-in Snap collars |
| FSP 1341 | AS 1530.4 -2005 | Fire resistance test of 6 pipes penetrating through a 128mm thick plasterboard wall, protected with various retrofitted Snap collars |

The reports FSP 1339, FSP 1340 and FSP 1341 were undertaken by CSIRO North Ryde and sponsored by Snap Fire Systems, who has confirmed that CSIRO can use the above reports for this assessment.

# 3 Proposed Variations

The proposed construction shall be for Snap collars as tested in Table 1 and subject to the following variations;

- Inclusion of IPLEX PE-AL-PE pipe with sizes as shown in Table 2
- Inclusion of minimum 128mm thick Plasterboard as substrate, tested or assessed for a minimum FRL of -/120/120 or 120/120/120.
- Inclusion of minimum 128mm thick Plasterboard as substrate, tested or assessed for a minimum FRL of 180/180/180 or -/180/180
- Inclusion of minimum 150mm thick Concrete/Masonry wall as substrates, tested or assessed for a minimum FRL of 180/180/180
- The pipes shall be a minimum of 40mm apart

**Table 2: Proposed constructions**

| Snap Fire Collar | Support Construction | Collar fitting method | IPLEX PE-AL-PE pipes Nominal pipe size (mm) | | | |
|---|---|---|---|---|---|---|
| SNAP32GAS | Minimum 175mm thick Concrete slab tested or assessed for a minimum FRL of 240/240/240 | Retro-fit | 16 | 20 | 25 | 32 |
| SNAP50GAS | | | 32 | 40 | 50 | |
| SNAP50GAS | | Cast-in | 32 | | | |
| SNAP50GAS | | | | 40 | 50 | |
| SNAP32GAS | Minimum 126mm thick Plasterboard tested or assessed for an FRL of -/120/120 or 120/120/120 | Retro-fit | 16 | | | |
| SNAP32GAS | | | | 20 | 25 | 32 |
| SNAP50GAS | | | 32 | 40 | 50 | |
| SNAP32GAS | Minimum 128mm thick Plasterboard tested or assessed for an FRL of 180/180/180 or -/180/180 | | 16 | | | |
| SNAP32GAS | | | | 20 | 25 | 32 |
| SNAP50GAS | | | 32 | 40 | 50 | |
| SNAP32GAS | Minimum 150mm thick Concrete/Masonry wall tested or assessed for an FRL of 180/180/180 or -/180/180 | | 16 | | | |
| SNAP32GAS | | | | 20 | 25 | 32 |
| SNAP50GAS | | | 32 | 40 | 50 | |

# 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 |

# 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 3 – FRL of Proposed construction**

| Snap Fire Collar | Support Construction | Collar fitting method | IPLEX PE-AL-PE pipes Nominal pipe size (mm) | | | | FRL |
|---|---|---|---|---|---|---|---|
| SNAP32GAS | Minimum 175mm thick Concrete slab tested or assessed for a minimum FRL of 240/240/240 | Retro-fit | 16 | 20 | 25 | 32 | -/240/240 |
| SNAP50GAS | | | | 32 | 40 | 50 | -/240/240 |
| | | Cast-in | | | | 32 | -/240/240 |
| | | | | | 40 | 50 | -/240/0 |
| SNAP32GAS | Minimum 126mm thick Plasterboard tested or assessed for an FRL of 120/120/120 or -/120/120 | Retro-fit | 16 | | | | -/120/120 |
| | | | | 20 | 25 | 32 | -/120/120 |
| SNAP50GAS | | | | 32 | 40 | 50 | -/120/120 |
| SNAP32GAS | Minimum 128mm thick Plasterboard tested or assessed for an FRL of 180/180/180 or -/180/180 | | 16 | | | | -/180/180 |
| | | | | 20 | 25 | 32 | -/180/120 |
| SNAP50GAS | | | | 32 | 40 | 50 | -/180/120 |
| SNAP32GAS | Minimum 150mm thick Concrete/Masonry wall tested or assessed for a minimum FRL of 180/180/180 or -/180/180 | | 16 | | | | -/180/180 |
| | | | | 20 | 25 | 32 | -/180/120 |
| SNAP50GAS | | | | 32 | 40 | 50 | -/180/120 |

# 6 Direct Field of Application of Results

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

# 7 Requirements

It is required that the supporting construction is tested or assessed to achieve the required FRL up to the required FRL based on the assessed design in accordance with AS 1530.4.

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 May 2025. 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. CSIRO test report numbered FSP 1339

On 13 November 2008 CSIRO conducted a full-scale fire-resistance test on a specimen comprising an 1150-mm x 1150-mm x 150-mm thick reinforced concrete slab penetrated by seven gas pipe of various constructions protected by retro-fitted Snap Fire System fire collars. The fire collars were fixed to the underside of the existing reinforced concrete slab by mechanical anchors. For the purpose of the test, the specimens were referenced as Penetrations 1, 2, 3, 4, 5, 6, and 7.

Penetration 1 – Retrofit SNAP32GAS fire collar protecting a nominal 16-mm IPLEX PE-AL-PE gas pipe

The SNAP32GAS, fire collar consisted of a galvanised steel case 54-mm diameter x 63-mm high, with a single spring pocket and a 90-mm diameter base plate screwed to the case. The single spring is pivoted at the top of the spring cavity and restrained by a nylon fusible link with a melting temperature of 75 degrees Celsius. Two soft intumescent wraps lined the internal circumference of the collar. The wraps were 4-mm thick x 57-mm wide x 130-mm long. Between the wraps was a layer 0.15-mm thick x 57-mm wide of stainless steel mesh. The collar was fixed to the underside of the concrete slab with 6-mm diameter mechanical anchors fitted through 6.5-mm diameter holes in three brackets screw fixed to the case of the collar.

The penetrating service comprised a nominally 16-mm IPLEX PE-AL-PE gas pipe penetrating an oversized hole cored through the concrete slab. Once the pipe was fitted through the hole and restrained, the resulting gap around the pipe was backfilled flush with both sides of the concrete slab using quick-drying cement. The pipe projected vertically, approximately 2000-mm above the concrete slab and approximately 500-mm into the furnace chamber. The pipe was supported at nominally 1000-mm from the unexposed face of the concrete slab. The pipe was open at the unexposed end and capped on the exposed end with a ceramic fibre plug.

Penetration 2 – Retrofit SNAP32GAS fire collar protecting a nominal 32-mm PEX-AL-PE gas pipe

The SNAP32GAS, fire collar consisted of a galvanised steel case 54-mm diameter x 63-mm high, with a single spring pocket and a 90-mm diameter base plate screwed to the case. The single spring is pivoted at the top of the spring cavity and restrained by a nylon fusible link with a melting temperature of 75 degrees Celsius. Two soft intumescent wraps lined the internal circumference of the collar. The wraps were 4-mm thick x 57-mm wide x 130-mm long. Between the wraps was a layer 0.15-mm thick x 57-mm wide of stainless steel mesh. The collar was fixed to the underside of the concrete slab with 6-mm diameter mechanical anchors fitted through 6.5-mm diameter holes in three brackets screw fixed to the case of the collar.

The penetrating service comprised a nominally 32-mm PEX-AL-PE gas pipe penetrating an oversized hole cored through the concrete slab. Once the pipe was fitted through the hole and restrained, the resulting gap around the pipe was backfilled flush with both sides of the concrete slab using quick-drying cement. The pipe projected vertically, approximately 2000-mm above the concrete slab and approximately 500-mm into the furnace chamber. The pipe was supported at nominally 1000-mm from the unexposed face of the concrete slab. The pipe was open at the unexposed end and capped on the exposed end with a ceramic fibre plug.

Penetration 3 – Retrofit SNAP50GAS fire collar protecting a nominal 32-mm PEX-AL-PEX gas pipe

The SNAP50GAS, fire collar consisted of a galvanised steel case 82-mm diameter x 90-mm high, with a single spring pocket and a 115-mm diameter base plate screwed to the case. The single spring is pivoted at the top of the spring cavity and restrained by a nylon fusible link with a melting temperature of 75 degrees Celsius Two soft intumescent wraps lined the internal circumference of the collar. The wraps were 4- mm thick x 85- mm wide and 200-mm long. Between the wraps was a layer 0.15-mm thick x 85-mm wide of stainless steel mesh. The collar was fixed to the underside of the concrete slab

with 6-mm diameter mechanical anchors fitted through 8-mm diameter holes in four brackets screw fixed to the case of the collar.

The penetrating service comprised a nominally 32-mm PEX-AL-PEX gas pipe penetrating an oversized hole cored through the concrete slab. Once the pipe was fitted through the hole and restrained, the resulting gap around the pipe was backfilled flush with both sides of the concrete slab using quick-drying cement. The pipe projected vertically, approximately 2000-mm above the concrete slab and approximately 500-mm into the furnace chamber. The pipe was supported at nominally 1000-mm from the unexposed face of the concrete slab. The pipe was open at the unexposed end and capped on the exposed end with a ceramic fibre plug.

Penetration 4 – Retrofit SNAP32GAS fire collar protecting a nominal 32-mm PEX-AL-PEX gas pipe

The SNAP32GAS, fire collar consisted of a galvanised steel case 54-mm diameter x 63-mm high, with a single spring pocket and a 90-mm diameter base plate screwed to the case. The single spring is pivoted at the top of the spring cavity and restrained by a nylon fusible link with a melting temperature of 75 degrees Celsius. Two soft intumescent wraps lined the internal circumference of the collar. The wraps were 4-mm thick x 57-mm wide x 130-mm long. Between the wraps was a layer 0.15-mm thick x 57-mm wide of stainless steel mesh. The collar was fixed to the underside of the concrete slab with 6-mm diameter mechanical anchors fitted through 6.5-mm diameter holes in three brackets screw fixed to the case of the collar.

The penetrating service comprised a nominally 32-mm PEX-AL-PEX gas pipe penetrating an oversized hole cored through the concrete slab. Once the pipe was fitted through the hole and restrained, the resulting gap around the pipe was backfilled flush with both sides of the concrete slab using quick-drying cement. The pipe projected vertically, approximately 2000-mm above the concrete slab and approximately 500-mm into the furnace chamber. The pipe was supported at nominally 1000-mm from the unexposed face of the concrete slab. The pipe was open at the unexposed end and capped on the exposed end with a ceramic fibre plug.

Penetration 5 – Retrofit SNAP32GAS fire collar protecting a nominal 16-mm PEX-AL-PEX gas pipe

The SNAP32GAS, fire collar consisted of a galvanised steel case 54-mm diameter x 63-mm high, with a single spring pocket and a 90-mm diameter base plate screwed to the case. The single spring is pivoted at the top of the spring cavity and restrained by a nylon fusible link with a melting temperature of 75 degrees Celsius. Two soft intumescent wraps lined the internal circumference of the collar. The wraps were 4-mm thick x 57-mm wide x 130-mm long. Between the wraps was a layer 0.15-mm thick x 57-mm wide of stainless steel mesh. The collar was fixed to the underside of the concrete slab with 6-mm diameter mechanical anchors fitted through 6.5-mm diameter holes in three brackets screw fixed to the case of the collar.

The penetrating service comprised a nominally 16-mm PEX-AL-PEX gas pipe penetrating an oversized hole cored through the concrete slab. Once the pipe was fitted through the hole and restrained, the resulting gap around the pipe was backfilled flush with both sides of the concrete slab using quick-drying cement. The pipe projected vertically, approximately 2000-mm above the concrete slab and approximately 500-mm into the furnace chamber. The pipe was supported at nominally 1000-mm from the unexposed face of the concrete slab. The pipe was open at the unexposed end and capped on the exposed end with a ceramic fibre plug.

Penetration 6 – Retrofit SNAP32GAS fire collar protecting a nominal 32-mm IPLEX PE-AL-PE gas pipe

The SNAP32GAS, fire collar consisted of a galvanised steel case 54-mm diameter x 63-mm high, with a single spring pocket and a 90-mm diameter base plate screwed to the case. The single spring is pivoted at the top of the spring cavity and restrained by a nylon fusible link with a melting temperature of 75

degrees Celsius. Two soft intumescent wraps lined the internal circumference of the collar. The wraps were 4-mm thick x 57-mm wide x 130-mm long. Between the wraps was a layer 0.15-mm thick x 57-mm wide of stainless steel mesh. The collar was fixed to the underside of the concrete slab with 6-mm diameter mechanical anchors fitted through 6.5-mm diameter holes in three brackets screw fixed to the case of the collar.

The penetrating service comprised a nominally 32-mm IPLEX PE-AL-PE gas pipe penetrating an oversized hole cored through the concrete slab. Once the pipe was fitted through the hole and restrained, the resulting gap around the pipe was backfilled flush with both sides of the concrete slab using quick-drying cement. The pipe projected vertically, approximately 2000-mm above the concrete slab and approximately 500-mm into the furnace chamber. The pipe was supported at nominally 1000-mm from the unexposed face of the concrete slab. The pipe was open at the unexposed end and capped on the exposed end with a ceramic fibre plug.

Penetration 7 – Retrofit SNAP50GAS fire collar protecting a nominal 50-mm IPLEX PE-AL-PE gas pipe

The SNAP50GAS, fire collar consisted of a galvanised steel case 82-mm diameter x 90-mm high, with a single spring pocket and a 115-mm diameter base plate screwed to the case. The single spring is pivoted at the top of the spring cavity and restrained by a nylon fusible link with a melting temperature of 75 degrees Celsius Two soft intumescent wraps lined the internal circumference of the collar. The wraps were 4-mm thick x 85-mm wide and 200-mm long. Between the wraps was a layer 0.15-mm thick x 85-mm wide of stainless steel mesh. The collar was fixed to the underside of the concrete slab with 6-mm diameter mechanical anchors fitted through 8-mm diameter holes in four brackets screw fixed to the case of the collar.

The penetrating service comprised a nominally 50-mm IPLEX PEX-AL-PEX gas pipe penetrating an oversized hole cored through the concrete slab. Once the pipe was fitted through the hole and restrained, the resulting gap around the pipe was backfilled flush with both sides of the concrete slab using quick-drying cement. The pipe projected vertically, approximately 2000-mm above the concrete slab and approximately 500-mm into the furnace chamber. The pipe was supported at nominally 1000-mm from the unexposed face of the concrete slab. The pipe was open at the unexposed end and capped on the exposed end with a ceramic fibre plug.

All of these systems achieved Fire-Resistance Levels (FRL) of -/240/240.

## A.2. CSIRO test report numbered FSP 1340

On 11 November 2008 CSIRO conducted a full-scale fire-resistance test on a specimen comprising an 1150-mm x 1150-mm x 150-mm thick reinforced concrete slab penetrated by seven gas pipes of various constructions protected by retro-fitted and cast-in Snap Fire System fire collars. The fire collars were fixed to the underside of the existing reinforced concrete slab by mechanical anchors. For the purpose of the test, the specimens were referenced as Penetrations 1, 2, 3, 4, 5, 6, and 7.

Penetration 1 – Cast-in SNAP50GAS fire collar protecting a nominal 40-mm PEX-AL-PE gas pipe

The SNAP50GAS, fire collar consisted of a galvanised steel case 82-mm diameter x 90-mm high, with a single spring pocket and a 115-mm diameter base plate screwed to the case. The single spring is pivoted at the top of the spring cavity and restrained by a nylon fusible link with a melting temperature of 75 degrees Celsius. Two soft intumescent wraps lined the internal circumference of the collar. The wraps were 4-mm thick x 85-mm wide and 200-mm long. Between the wraps was a layer 0.15-mm thick x 85-mm wide of stainless steel mesh. The cast-in collar had a plastic hightop making the overall height of the collar 205-mm high. The collar was cast into the concrete slab with its base flush with the underside.

The penetrating service comprised a nominally 40-mm PEX-AL-PE gas pipe penetrating the concrete slab through the cast-in collar. The pipe projected vertically, approximately 2000-mm above the

concrete slab and approximately 500-mm into the furnace chamber. The pipe was supported at nominally 1000-mm from the unexposed face of the concrete slab. The pipe was open at the unexposed end and capped on the exposed end with a ceramic fibre plug.

Penetration 2 – Retrofit SNAP50GAS fire collar protecting a nominal 40-mm PEX-AL-PE gas pipe

The SNAP50GAS, fire collar consisted of a galvanised steel case 82-mm diameter x 90-mm high, with a single spring. The single spring is pivoted at the top of the spring cavity and restrained by a nylon fusible link with a melting temperature of 75 degrees Celsius. Two soft intumescent wraps lined the internal circumference of the collar. The wraps were 4-mm thick x 85-mm wide and 200-mm long. Between the wraps was a layer 0.15-mm thick x 85-mm wide of stainless steel mesh. The collar was fixed to the underside of the concrete slab with 6-mm diameter mechanical anchors fitted through 8-mm diameter holes in four brackets screw fixed to the case of the collar.

The penetrating service comprised a nominally 40-mm PEX-AL-PE gas pipe penetrating an oversized hole cored through the concrete slab. Once the pipe was fitted through the hole and restrained, the resulting gap around the pipe was backfilled flush with both sides of the concrete slab using quick-drying cement. The pipe projected vertically, approximately 2000-mm above the concrete slab and approximately 500-mm into the furnace chamber. The pipe was supported at nominally 1000-mm from the unexposed face of the concrete slab. The pipe was open at the unexposed end and capped on the exposed end with a ceramic fibre plug.

Penetration 3 – Cast-in SNAP50GAS fire collar protecting a nominal 50-mm IPLEX PE-AL-PE gas pipe

The SNAP50GAS, fire collar consisted of a galvanised steel case 82-mm diameter x 90-mm high, with a single spring pocket and a 115-mm diameter base plate screwed to the case. The single spring is pivoted at the top of the spring cavity and restrained by a nylon fusible link with a melting temperature of 75 degrees Celsius. Two soft intumescent wraps lined the internal circumference of the collar. The wraps were 4-mm thick x 85-mm wide and 200-mm long. Between the wraps was a layer 0.15-mm thick x 85-mm wide of stainless steel mesh. The cast-in collar had a plastic hightop making the overall height of the collar 205-mm high. The collar was cast into the concrete slab with its base flush with the underside.

The penetrating service comprised a nominally 50-mm IPLEX PE-AL-PE gas pipe penetrating the concrete slab through the cast-in collar. The pipe projected vertically, approximately 2000-mm above the concrete slab and approximately 500-mm into the furnace chamber. The pipe was supported at nominally 1000-mm from the unexposed face of the concrete slab. The pipe was open at the unexposed end and capped on the exposed end with a ceramic fibre plug.

Penetration 4 – Cast-in SNAP50GAS fire collar protecting a nominal 32-mm IPLEX PE-AL-PE gas pipe

The SNAP50GAS, fire collar consisted of a galvanised steel case 82-mm diameter x 90-mm high, with a single spring pocket and a 115-mm diameter base plate screwed to the case. The single spring is pivoted at the top of the spring cavity and restrained by a nylon fusible link with a melting temperature of 75 degrees Celsius. Two soft intumescent wraps lined the internal circumference of the collar. The wraps were 4-mm thick x 85-mm wide and 200-mm long. Between the wraps was a layer 0.15-mm thick x 85-mm wide of stainless steel mesh. The cast-in collar had a plastic hightop making the overall height of the collar 205-mm high. The collar was cast into the concrete slab with its base flush with the underside.

The penetrating service comprised a nominally 32-mm IPLEX PE-AL-PE gas pipe penetrating the concrete slab through the cast-in collar. The pipe projected vertically, approximately 2000-mm above the concrete slab and approximately 500-mm into the furnace chamber. The pipe was supported at nominally 1000-mm from the unexposed face of the concrete slab. The pipe was open at the unexposed end and capped on the exposed end with a ceramic fibre plug.

Penetration 5 – Retrofit SNAP63GAS fire collar protecting a nominal 63-mm PEX-AL-PEX gas pipe

The SNAP63GAS, fire collar consisted of a galvanised steel case 95-mm diameter 95-mm high, with a single spring pocket and a 125-mm diameter base plate screwed to the case. The single spring is pivoted at the top of the spring cavity and restrained by a nylon fusible link with a melting temperature of 75 degrees Celsius Three soft intumescent wraps lined the internal circumference of the collar. The wraps were 4-mm thick x 85-mm wide. Between the wraps were two layers of 0.15-mm thick x 85-mm wide Stainless steel mesh. The collar was fixed to the underside of the concrete slab with 6-mm diameter mechanical anchors fitted through 8-mm diameter holes in four brackets screw fixed to the case of the collar.

The penetrating service comprised a nominally 63-mm PEX-AL-PEX gas pipe penetrating an oversized hole cored through the concrete slab. Once the pipe was fitted through the hole and restrained, the resulting gap around the pipe was backfilled flush with both sides of the concrete slab using quick-drying cement. The pipe projected vertically, approximately 2000-mm above the concrete slab and approximately 500-mm into the furnace chamber. The pipe was supported at nominally 1000-mm from the unexposed face of the concrete slab. The pipe was open at the unexposed end and capped on the exposed end with a ceramic fibre plug.

Penetration 6 – Cast-in SNAP50GAS fire collar protecting a nominal 32-mm PEX-AL-PEX gas pipe

The SNAP50GAS, fire collar consisted of a galvanised steel case 82-mm diameter x 90-mm high, with a single spring pocket and a 115-mm diameter base plate screwed to the case. The single spring is pivoted at the top of the spring cavity and restrained by a nylon fusible link with a melting temperature of 75 degrees Celsius. Two soft intumescent wraps lined the internal circumference of the collar. The wraps were 4-mm thick x 85-mm wide and 200-mm long. Between the wraps was a layer 0.15-mm thick x 85-mm wide of stainless steel mesh. The cast-in collar had a plastic hightop making the overall height of the collar 205-mm high. The collar was cast into the concrete slab with its base flush with the underside.

The penetrating service comprised a nominally 32-mm PEX-AL-PEX gas pipe penetrating the concrete slab through the cast-in collar. The pipe projected vertically, approximately 2000-mm above the concrete slab and approximately 500-mm into the furnace chamber. The pipe was supported at nominally 1000-mm from the unexposed face of the concrete slab. The pipe was open at the unexposed end and capped on the exposed end with a ceramic fibre plug.

Penetration 7 – Cast-in SNAP50GAS fire collar protecting a nominal 50-mm PEX-AL-PEX gas pipe

The SNAP50GAS, fire collar consisted of a galvanised steel case 82-mm diameter x 90-mm high, with a single spring pocket and a 115-mm diameter base plate screwed to the case. The single spring is pivoted at the top of the spring cavity and restrained by a nylon fusible link with a melting temperature of 75 degrees Celsius. Two soft intumescent wraps lined the internal circumference of the collar. The wraps were 4-mm thick x 85-mm wide and 200-mm long. Between the wraps was a layer 0.15-mm thick x 85-mm wide of stainless steel mesh. The cast-in collar had a plastic hightop making the overall height of the collar 205-mm high. The collar was cast into the concrete slab with its base flush with the underside.

The penetrating service comprised a nominally 50-mm PEX-AL-PEX gas pipe penetrating the concrete slab through the cast-in collar. The pipe projected vertically, approximately 2000-mm above the concrete slab and approximately 500-mm into the furnace chamber. The pipe was supported at nominally 1000-mm from the unexposed face of the concrete slab. The pipe was open at the unexposed end and capped on the exposed end with a ceramic fibre plug.

Penetrations 2, 4, 5 and 6 achieved FRLs of -/240/240, Penetrations 1 and 7 achieved FRL of -/240/180 and Penetration 3 achieved an FRL of -/240/0.

## A.3. CSIRO test report numbered FSP 1341

On 20 November 2008 CSIRO conducted a full-scale fire-resistance test on a specimen comprising a wall system was constructed in accordance with CSR wall system with an established fire resistance level (FRL) of -/120/120. Construction comprised 64-mm x 0.75-mm steel studs and noggins installed at nominally 600-mm centres, lined on each side with two layers of 16-mm thick CSR Gyprock Fyrchek plasterboard sheets. The plasterboard sheeting was screw fixed to the steel studs using plasterboard screws at nominally 200-mm centres. The wall was penetrated by six gas pipes of various constructions protected by retro-fitted Snap Fire System fire collars. For the purpose of the test, the specimens were referenced as Penetrations 1, 2, 3, 4, 5, and 6.

Penetration 1 – Retrofit SNAP32GAS fire collar protecting a nominal 16-mm PEX-AL-PE gas pipe

The SNAP32GAS, fire collar consisted of a galvanised steel case 54-mm diameter x 63-mm high, with a single spring pocket and a 90-mm diameter base plate screw fixed to the case. The single spring is pivoted at the top of the spring cavity and restrained by a nylon fusible link with a melting temperature of 75 degrees Celsius. Two soft intumescent wraps lined the internal circumference of the collar. The wraps were 4-mm thick x 57-mm wide x 130-mm long. Between the wraps was a layer 0.15-mm thick x 57-mm wide of stainless steel mesh. One collar was fixed to each side of the plasterboard wall in a back-to-back configuration using three 6-mm diameter threaded rods fixed through the wall and the holes in the base plates of the two collars and fastened with nuts.

The penetrating service comprised a nominally 16-mm PEX-AL-PE gas pipe penetrating the plasterboard wall through a cut-out hole closest in size to the size of the pipe. The pipe projected horizontally, approximately 2000-mm away from the unexposed face of the plasterboard wall and approximately 500-mm into the furnace chamber. The pipe was supported at nominally 1000-mm from the unexposed face of the plasterboard wall. The pipe was open at the unexposed end and capped on the exposed end with a ceramic fibre plug.

Penetration 2 – Retrofit SNAP32GAS fire collar protecting a nominal 32-mm IPLEX PE-AL-PE gas pipe

The SNAP32GAS, fire collar consisted of a galvanised steel case 54-mm diameter x 63-mm high, with a single spring pocket and a 90-mm diameter base plate screwed to the case. The single spring is pivoted at the top of the spring cavity and restrained by a nylon fusible link with a melting temperature of 75 degrees Celsius. Two soft intumescent wraps lined the internal circumference of the collar. The wraps were 4-mm thick x 57-mm wide x 130-mm long. Between the wraps was a layer 0.15-mm thick x 57-mm wide of stainless steel mesh. One collar was fixed to each side of the plasterboard wall in a back-to-back configuration using three 6-mm diameter threaded rods fixed through the wall and the holes in the base plates of the two collars and fastened with nuts.

The penetrating service comprised a nominally 32-mm IPLEX PE-AL-PE gas pipe penetrating the plasterboard wall through a cut-out hole closest to the size of the pipe. The pipe projected horizontally, approximately 2000-mm above the plasterboard and approximately 500-mm into the furnace chamber. The pipe was supported at nominally 1000-mm from the unexposed face of the plasterboard wall. The pipe was open at the unexposed end and capped on the exposed end with a ceramic fibre plug.

Penetration 3 – Retrofit SNAP50GAS fire collar protecting a nominal 40-mm PEX-AL-PE gas pipe

The SNAP50GAS, fire collar consisted of a galvanised steel case 82-mm diameter x 90-mm high, with a single spring pocket. The single spring is pivoted at the top of the spring cavity and restrained by a nylon fusible link with a melting temperature of 75 degrees Celsius. Two soft intumescent wraps lined the internal circumference of the collar. The wraps were 4-mm thick x 85-mm wide and 200-mm long. Between the wraps was a layer 0.15-mm thick x 85-mm wide of stainless steel mesh. One collar was fixed to each side of the plasterboard wall in a back-to-back configuration using four 6-mm diameter threaded rods fixed through the wall and the holes in the base plate (collar on the unexposed face) and brackets (collar on the exposed face) of the two collars and fastened with nuts.

The penetrating service comprised a nominally 40-mm PEX-AL-PE gas pipe penetrating the plasterboard wall through a cut-out hole closest to the size of the pipe. The pipe projected horizontally, approximately 2000-mm above the plasterboard and approximately 500-mm into the furnace chamber. The pipe was supported at nominally 1000-mm from the unexposed face of the plasterboard. The pipe was open at the unexposed end and capped on the exposed end with a ceramic fibre plug.

Penetration 4 – Retrofit SNAP50GAS fire collar protecting a nominal 50-mm IPLEX PE-AL-PE gas pipe

The SNAP50GAS, fire collar consisted of a galvanised steel case 82-mm diameter x 90-mm high, with a single spring pocket and a 115-mm diameter base plate screwed to the case. The single spring is pivoted at the top of the spring cavity and restrained by a nylon fusible link with a melting temperature of 75 degrees Celsius. Two soft intumescent wraps lined the internal circumference of the collar. The wraps were 4-mm thick x 85-mm wide and 200-mm long. Between the wraps was a layer 0.15-mm thick x 85-mm wide of stainless steel mesh. One collar was fixed to each side of the plasterboard wall in a back-to-back configuration using four 6-mm diameter threaded rods fixed through the wall and the holes in the base plates of the two collars and fastened with nuts.

The penetrating service comprised a nominally 50-mm IPLEX PE-AL-PE gas pipe penetrating the plasterboard wall through a cut-out hole closest to the size of the pipe. The pipe projected horizontally, approximately 2000-mm above the plasterboard and approximately 500-mm into the furnace chamber. The pipe was supported at nominally 1000-mm from the unexposed face of the plasterboard. The pipe was open at the unexposed end and capped on the exposed end with a ceramic fibre plug.

Penetration 5 – Retrofit SNAP50GAS fire collar protecting a nominal 32-mm PEX-AL-PEX gas pipe

The SNAP50GAS, fire collar consisted of a galvanised steel case 82-mm diameter x 90-mm high with a single spring pocket and a 115-mm diameter base plate screwed to the case. The single spring is pivoted at the top of the spring cavity and restrained by a nylon fusible link with a melting temperature of 75 degrees Celsius. Two soft intumescent wraps lined the internal circumference of the collar. The wraps were 4-mm thick x 85-mm wide and 200-mm long. Between the wraps was a layer 0.15-mm thick x 85-mm wide of stainless steel mesh. One collar was fixed to each side of the plasterboard wall in a back-to-back configuration using four 6-mm diameter threaded rods fixed through the wall and the holes in the base plates of the two collars and fastened with nuts.

The penetrating service comprised a nominally 32-mm PEX-AL-PEX gas pipe penetrating the plasterboard wall through a cut-out hole closest to the size of the pipe. The pipe projected horizontally, approximately 2000-mm above the plasterboard and approximately 500-mm into the furnace chamber. The pipe was supported at nominally 1000-mm from the unexposed face of the plasterboard. The pipe was open at the unexposed end and capped on the exposed end with a ceramic fibre plug.

Penetration 6 – Retrofit SNAP32GAS fire collar protecting a nominal 16-mm IPLEX PE-AL-PE gas pipe

The SNAP32GAS, fire collar consisted of a galvanised steel case 54-mm diameter x 63-mm high, with a single spring pocket. The single spring is pivoted at the top of the spring cavity and restrained by a nylon fusible link with a melting temperature of 75 degrees Celsius. Two soft intumescent wraps lined the internal circumference of the collar. The wraps were 4-mm thick x 57-mm wide x 130-mm long. Between the wraps was a layer 0.15-mm thick x 57-mm wide of Stainless steel mesh. One collar was fixed to each side of the plasterboard wall in a back-to-back configuration using three 6-mm diameter threaded rods fixed through the wall and the holes in the base plate (collar on the unexposed face) and brackets (collar on the exposed face) of the two collars and fastened with nuts.

The penetrating service comprised a nominally 16-mm IPLEX PE-AL-PE gas pipe penetrating the plasterboard wall through a cut-out hole closest to the size of the pipe. The pipe projected horizontally, approximately 2000-mm above the plasterboard and approximately 500-mm into the furnace chamber. The pipe was supported at nominally 1000-mm from the unexposed face of the plasterboard. The pipe was open at the unexposed end and capped on the exposed end with a ceramic fibre plug.

All of the tested systems achieved fire-resistance levels (FRL) of -/120/120.

## A.4. Summary of CSIRO Test Reports

**Table A1**

| Report | Substrate | Specimen # | Snap Collar | Collar Fitting | Pipe | Integrity (minutes) | Insulation (minutes) |
|---|---|---|---|---|---|---|---|
| FSP 1339 | 150mm slab | 1 | SNAP32GAS | Retrofit | 16-mm IPLEX PE-AL-PE | 241NF | 241NF |
| FSP 1339 | 150mm slab | 2 | SNAP32GAS | Retrofit | 32-mm REHAU PEX-AL-PE | 241NF | 241NF |
| FSP 1339 | 150mm slab | 3 | SNAP50GAS | Retrofit | 32-mm GASPEX PEX-AL-PEX | 241NF | 241NF |
| FSP 1339 | 150mm slab | 4 | SNAP32GAS | Retrofit | 32-mm GASPEX PEX-AL-PEX | 241NF | 241NF |
| FSP 1339 | 150mm slab | 5 | SNAP32GAS | Retrofit | 16-mm GASPEX PEX-AL-PEX | 241NF | 241NF |
| FSP 1339 | 150mm slab | 6 | SNAP32GAS | Retrofit | 32-mm IPLEX PE-AL-PE | 241NF | 241NF |
| FSP 1339 | 150mm slab | 7 | SNAP50GAS | Retrofit | 50-mm IPLEX PE-AL-PE | 241NF | 241NF |
| FSP 1340 | 150mm slab | 1 | SNAP50GAS | Cast in | 40-mm REHAU PEX-AL-PE | 241NF | 212 |
| FSP 1340 | 150mm slab | 2 | SNAP50GAS | Cast in | 40-mm REHAU PEX-AL-PE | 241NF | 241NF |
| FSP 1340 | 150mm slab | 3 | SNAP50GAS | Cast in | 50-mm IPLEX PE-AL-PE | 241NF | 17 |
| FSP 1340 | 150mm slab | 4 | SNAP50GAS | Cast in | 32-mm IPLEX PE-AL-PE | 241NF | 241NF |
| FSP 1340 | 150mm slab | 5 | SNAP63GAS | Cast in | 63-mm GASPEX PEX-AL-PEX | 241NF | 241NF |
| FSP 1340 | 150mm slab | 6 | SNAP50GAS | Cast in | 32-mm GASPEX PEX-AL-PEX | 241NF | 241NF |
| FSP 1340 | 150mm slab | 7 | SNAP50GAS | Cast in | 50-mm GASPEX PEX-AL-PEX | 241NF | 230 |
| FSP 1341 | 2x16mm FR plasterboard wall total thickness 128mm | 1 | SNAP32GAS | Retrofit | 16-mm REHAU PEX-AL-PE | 181NF | 181NF |
| FSP 1341 | 2x16mm FR plasterboard wall total thickness 128mm | 2 | SNAP32GAS | Retrofit | 32-mm IPLEX PE-AL-PE | 181NF | 172 (Collar) |
| FSP 1341 | 2x16mm FR plasterboard wall total thickness 128mm | 3 | SNAP50GAS | Retrofit | 40-mm REHAU PEX-AL-PE | 181NF | 181NF |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| FSP 1341 | 2x16mm FR plasterboard wall total thickness 128mm | 4 | SNAP50GAS | Retrofit | 50-mm IPLEX PE-AL-PE | 181NF | 177 (Collar) |
| FSP 1341 | 2x16mm FR plasterboard wall total thickness 128mm | 5 | SNAP50GAS | Retrofit | 32-mm GASPEX PEX-AL-PEX | 181NF | 181NF |
| FSP 1341 | 2x16mm FR plasterboard wall total thickness 128mm | 6 | SNAP32GAS | Retrofit | 16-mm IPLEX PE-AL-PE | 181NF | 181NF |

## A.5. The relevance of referenced test data to AS 1530.4-2014

The referenced fire resistance tests FSP 1339, FSP 1340 and FSP 1341 were conducted in accordance with AS 1530.4– 2005, which differs slightly from AS 1530.4–2014. These variations and their potential effect on the fire resistance performance of the referenced test specimen are discussed below.

*Temperature Regime*

The furnace heating regime in fire resistance tests conducted in accordance with AS 1530.4- 2014 follows a similar trend to that in AS 1530.4-2005. The specified specimen heating rate in AS 1530.4-2005 is given by:

$$T_t - T_0 = 345_{log}(8t+1) + 20$$

Where;

$T_t$ = Furnace temperature at time t, in degrees Celsius.

$T_o$ = Initial furnace temperature, in degrees Celsius, such that.

t = Time into the test, measured from the ignition of the furnace, in minutes.

The parameters outlining the accuracy of control of the furnace temperature in AS 1530.4– 2005 and AS 1530.4–2014 are not appreciably different.

*Furnace Pressure*

The furnace pressure conditions for single and multiple penetrations sealing systems in AS 1530.4-2005 and AS 1530.4-2014 are not appreciably different. The parameters outlining the accuracy of control of the furnace pressure in AS 1530.4-2014 and AS 1530.4-2005 are not appreciably different.

*Performance Criteria*

AS 1530.4-2014 specifies the following performance criteria for building materials and structures:

- Structural Adequacy – (Not relevant to the referenced test)
- Integrity
- Insulation

*Integrity*

AS 1530.4-2014 Section 2 includes slightly different requirements for the termination of cotton pad based on temperature. In section 10 the cotton applies for the whole integrity period so this change will have an effect on the performance of service penetrations.

*Insulation*

The positions of thermocouples and failure criteria for insulation in AS 1530.4-2014 and AS 1530.4-2005 are not appreciably different.

*Application of Test Data to AS 1530.4-2014*

Based on the above discussion it is considered that the results of tests FSP 1339, FSP 1340 and FSP 1341 would not have been appreciably different if they were undertaken in accordance with AS 1530.4-2014.

# Appendix B Analysis of Variations

## B.1 Variation pipe size and the supporting substrate

proposed construction shall be for pipes as tested in Table 1 and subject to the following variations;

- Inclusion of IPLEX PE-AL-PE pipe sizes as shown in Table 2
- Inclusion of minimum 126mm thick Plasterboard as substrate, tested or assessed for a minimum FRL of -/120/120 or 120/120/120
- Inclusion of minimum 128mm thick Plasterboard as substrate, tested or assessed for a minimum FRL of -/180/180 or 180/180/180
- Inclusion of minimum 150mm thick Concrete/Masonry wall as substrates, tested or assessed for a minimum FRL of -/180/180 or 180/180/180
- The pipes shall be a minimum of 40mm apart

The variations considered in this assessment are undertaken in accordance with Australian Standard AS 4072.1-2005 Components for the protection of openings in fire-resistant separating elements, Part 1: Service penetrations and control joints. This standard sets out the minimum requirements for the construction, installation and application of fire-resistance tests to sealing systems for service penetrations required to have a fire-resistance level. AS 4072.1, clause 4.6 provides guidance on the application of the AS 1530.4 fire-resistance test data relating to plastic pipe penetrations.

This assessment makes reference to the requirements of this clause for the assessed of pipes between 16mm and 50mm for pipes made from IPLEX PE-AL-PE.

*Retrofit collars in a slab*

With reference to test data from FSP 1339, when penetrating a 150mm slab, the IPEX PE-AL-PE pipes were able to achieve the following performance.

| Snap Collar | Collar Fitting | Pipe | Integrity (minutes) | Insulation (minutes) |
|---|---|---|---|---|
| SNAP32GAS | Retrofit | 16-mm IPLEX PE-AL-PE | 241NF | 241NF |
| SNAP32GAS | Retrofit | 32-mm IPLEX PE-AL-PE | 241NF | 241NF |
| SNAP50GAS | Retrofit | 50-mm IPLEX PE-AL-PE | 241NF | 241NF |

Based on the above test data, the SNAP32GAS collar, when fitting to pipe size between 16mm and 32mm, will also be able to maintain integrity and insulation for up to 240 minutes when tested in accordance AS 1530.4-2014 and assessed in accordance with AS 4072.1-2005.

Based on the above test data, the SNAP50GAS collar, when fitting to pipe size under 50mm, will also be able to maintain integrity and insulation for up to 240 minutes when tested in accordance AS 1530.4-2014 and assessed in accordance with AS 4072.1-2005.

The proposed variation includes the increase of slab thickness from the tested 150mm to 175mm. It is expected that this will increase the heat sink effect of the substrate, and thus allows less heat to travel to the unexposed side. Subsequently, the integrity and insulation performance of the specimens are expected to improve.

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

It is confirmed that all the specimens in FSP 1339 were all located at more than 40mm away from each other and thus complies with 4072.1- 2005 Clause 4.9.3.

Based on the above, it is expected that the proposed construction, when penetrating a 175mm thick concrete slab, will not detrimentally affect the integrity and insulation of the tested specimens in the referenced test for up to 240 minutes when tested in accordance AS 1530.4-2014 and assessed in accordance with AS 4072.1-2005.

*Castin collars in a slab*

With reference to test data from FSP 1340, when penetrating a 150mm slab, the IPEX PE-AL-PE pipes were able to achieve the following performance.

| Snap Collar | Collar Fitting | Pipe | Integrity (minutes) | Insulation (minutes) |
|---|---|---|---|---|
| SNAP50GAS | Cast in | 50-mm IPLEX PE-AL-PE | 241NF | 17 |
| SNAP50GAS | Cast in | 32-mm IPLEX PE-AL-PE | 241NF | 241NF |

Based on the above test data, the SNAP50GAS collar, when fitting to pipes between 40mm and 50mm, will also be able to maintain integrity for up to 240 minutes when tested in accordance AS 1530.4-2014 and assessed in accordance with AS 4072.1-2005

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

It is confirmed that all the specimens in FSP 1340 were all located at more than 40mm away from each other and thus complies with 4072.1- 2005 Clause 4.9.3.

Based on the above, it is expected that the proposed construction, when penetrating a 175mm thick concrete slab, will not detrimentally affect the integrity and insulation of the tested specimens in the referenced test for up to 240 minutes when tested in accordance AS 1530.4-2014 and assessed in accordance with AS 4072.1-2005.

*Retrofit collars in a plasterboard wall*

With reference to test data from FSP 1341, when penetrating a 128mm thick plasterboard, the IPEX PE-AL-PE pipes were able to achieve the following performance.

| Snap Collar | Collar Fitting | Pipe | Integrity (minutes) | Insulation (minutes) |
|---|---|---|---|---|
| SNAP32GAS | Retrofit | 32-mm IPLEX PE-AL-PE | 181NF | 172 |
| SNAP50GAS | Retrofit | 50-mm IPLEX PE-AL-PE | 181NF | 177 |
| SNAP32GAS | Retrofit | 16-mm IPLEX PE-AL-PE | 181NF | 181NF |

Based on the above test data, the SNAP32GAS collar, when fitting to pipe size between 20mm and 32mm, will also be able to maintain integrity and insulation for up to 180 minutes when tested in accordance AS 1530.4-2014 and assessed in accordance with AS 4072.1-2005.

Based on the above test data, the SNAP50GAS collar, when fitting to pipes between 32mm and 50mm, will also be able to maintain integrity for up to 180 minutes and insulation of 120 minutes when tested in accordance AS 1530.4-2014 and assessed in accordance with AS 4072.1-2005.

With reference to AS 4072.1 -2005 Clause 4.3.1.2 regarding framed walls:

> *Results obtained with a steel or timber stud-framed wall using a proprietary board may be used to assess the performance of alternative proprietary brands provided that a registered testing authority is satisfied that the products behave in a similar manner.*

The proposed reduction in wall thickness to a minimum of 126mm will result in a shorter conductive path for the aluminium cored pipe as well as a possible reduction in the depth of sealant to a minimum of 26mm instead of 32mm as tested in FSP 1341. This will result in earlier integrity and insulation

failure. However, the 60 minutes margin is expected to more than compensate for this reduction in wall thickness.

It is confirmed that all the specimens in FSP 1341 were all located at more than 40mm away from each other and thus complies with 4072.1- 2005 Clause 4.9.3.

Based on the above, it is expected that the proposed construction, when penetrating a 126mm thick and a 128mm thick plasterboard wall, will not detrimentally affect the integrity and insulation of the tested specimens in the referenced tests for up to 120 minutes and 180 minutes respectively when tested in accordance AS 1530.4-2014 and assessed in accordance with AS 4072.1-2005.

*Retrofit collars in a Masonry and concrete construction*

The proposed variation comprises an increase in the thickness of the penetration element from the 128mm plasterboard wall to a minimum 150mm thick masonry and concrete wall.

The ability for the collar and sealant to maintain integrity in a concrete substrate is already demonstrated in FSP 1340.

The change from a hollow plasterboard wall to a thicker masonry or concrete wall will result in a heat sink effect whereby the masonry or concrete wall will absorb furnace heat that would have otherwise heated up the aluminium cored pipes, and thus allows less heat to travel to the unexposed side. Subsequently, the integrity and insulation performance of the specimens are expected to improve.

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

Confidence in the ability of masonry wall's to perform for the required FRL is offered by reference to AS 3700-2018 clause 6.5, where the required wall thicknesses by that standard are the same as those proposed for the given FRL.

Based on the above, it is expected that the proposed construction, when penetrating a minimum 150mm thick masonry and concrete wall, will not detrimentally affect the integrity and insulation of the tested specimens in the referenced test for up to 180 minutes when tested in accordance AS 1530.4-2014 and assessed in accordance with AS 4072.1-2005.

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
Senior Consultant Assessments Engineer
**t** +61 2 94905450
**e** keith.nicholls @csiro.au
**w** https://research.csiro.au/infratech/fire-safety/fire-testing/

Brett Roddy
Manager, Fire Testing and Assessments
**t** +61 2 94905449
**e** brett.roddy@csiro.au
**w** https://research.csiro.au/infratech/fire-safety/fire-testing/