Fire-resistance test on fire collars protecting a concrete floor slab penetrated by services

Test Report

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Client: IG6 Pty Ltd as trustee for the IG6 IP Trust

Commercial-in-confidence

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AUTHOR	REVIEWED BY	AUTHORISED BY
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8 May 2018	8 May 2018	8 May 2018

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Fire-resistance test on fire collars protecting a concrete floor slab penetrated by services

Sponsored Investigation No. FSP 1891

1 Introduction

1.1 Identification of specimen

The sponsor identified the specimen as two (2) cast-in fire collars protecting a 150-mm thick concrete floor slab penetrated by one (1) PE-PUR-PE stack pipe and one (1) Triplus stack pipe.

1.2 Sponsor

IG6 Pty Ltd as trustee for the IG6 IP Trust
3 Skirmish Court
Victoria Point Qld 4165

1.3 Manufacturer

Snap Fire Systems Pty Ltd
Building A, 1343 Wynnum Road
Tingalpa QLD 4173

1.4 Test standard

Australian Standard 1530, Methods for fire tests on building materials, components and structures, Part 4-2014, Fire-resistance tests of elements of construction.

Section 10: Service penetrations and control joints

1.5 Reference standard

Australian Standard 4072, Components for the protection of openings in fire-resistant separating elements, Part 1 - 2005, Service penetrations and control joints.

1.6 Test number

CSIRO Reference test number: FS 4738/4210

1.7 Test date

The fire-resistance test was conducted on 22 February 2018.

2 Description of specimen

2.1 General

The specimen comprised an 1150-mm x 1150-mm reinforced concrete slab penetrated by a total of six (6) stack pipes and a single floor waste. All service penetrations were protected by cast in fire collars.

A single stack pipe (referenced as Penetration 1) penetrating the 150-mm thick section of the concrete slab is the subject of this report.

Documents containing a complete description of each specimen were supplied by the sponsor and are retained on file.

The pipe reported in the test is stated to be manufactured in accordance with:

- EN ISO 15494 Plastic piping systems for industrial applications – polybutene (PB), polyethylene (PE) and polypropylene (PP) – specifications for components and the piping system – metric series

Penetration 1 – H100FWS-RR Cast-in fire collar protecting a 110-mm Stack Pipe

The SNAP H100FWS-RR collar comprised a polypropylene casing with a 128-mm inner diameter and a 213-mm base flange. The 250-mm high collar casing incorporated a layer of 412-mm x 85-mm x 4-mm thick Intumescent material. The closing mechanism comprised three equally spaced 3 steel springs held with nylon fuse links. The springs were fabricated using 304 grade stainless steel wire with a diameter of 3.15-mm, with the springs acting against a layer of 316 grade stainless steel mesh measuring 460 x 83-mm as shown in drawing numbered H100FWS-RR-T dated 29 September 2017, by Snap Fire Systems Pty Ltd.

The penetrating service comprised a +GF+ COOLFIT 2.0 d63/110 insulated chilled water pipe. The COOL-FIT 2.0 PE 100 pipe comprised an inner PE pipe (OD 63-mm) with bore diameter of 51.4-mm. The inner pipe was insulated using 22-mm thick high energy efficient (HE) foam which was protected externally using a 110-mm (OD) PE external pipe.

The +GF+ COOLFIT 2.0 d63/110 pipe was fitted through the collar's sleeve and penetrated the slab through a 177-mm diameter opening and projected vertically 2000-mm above the concrete and 500-mm into the furnace chamber. The annular gap between the unexposed face of the slab and the OD of the pipe was fully sealed using H.B. FULLERS FIRESOUND fire rated mastic to a depth of 10-mm.

The pipe was supported at 500-mm and 1500-mm from the unexposed face of the concrete slab as shown in drawing titled "Specimen #1, +GF+ COOLFIT 2.0 d63/110 Stack & H100FWS", dated 7 March 2018, provided by Snap Fire Systems Pty Ltd. On the exposed end, the pipe was capped with a +GF+ ELGEF PE100 d63 End Cap.

2.2 Dimensions

The overall dimension of the concrete slab was 1150-mm wide x 1150-mm long x 150-mm thick, to suit the opening in the specimen containing frame.

2.3 Orientation

The reinforced concrete slab was placed horizontally on top of the furnace chamber, and subjected to fire exposure from the underside.

2.4 Conditioning

The concrete slab was left to cure for a period longer than 30 days.

3 Documentation

The following documents were supplied or referenced by the sponsor as a complete description of the specimen and should be read in conjunction with this report:

Drawing numbered H100FWS-RR-T dated 29 September 2017, by Snap Fire Systems Pty Ltd.

Drawing titled “Specimen #1, +GF+ COOLFIT 2.0 d63/110 Stack & H100FWS”, dated 7 March 2018, provided by Snap Fire Systems Pty Ltd.

4 Equipment

4.1 Furnace

The furnace had a nominal opening of 1000-mm x 1000-mm for attachment of vertical or horizontal specimens.

The furnace was lined with refractory bricks and materials with the thermal properties as specified in AS 1530.4-2014 and was heated by combustion of a mixture of natural gas and air.

4.2 Temperature

The temperature in the furnace chamber was measured by four type K, 3-mm diameter, and 310 stainless steel Mineral Insulated Metal Sheathed (MIMS) thermocouples. Each thermocouple was housed in high-nickel steel tubes opened at the exposed end.

The temperatures of the specimen were measured by glass-fibre insulated and sheathed K-type thermocouples with a wire diameter of 0.5-mm.

Location of the thermocouples on the unexposed face of the specimen are described in Appendix A.

4.3 Measurement system

The primary measurement system comprised a multiple-channel data logger, scanning at one minute intervals during the test.

5 Ambient temperature

The temperature of the test area was 26°C at the commencement of the test.

6 Departure from standard

There were no departures from the requirements of AS 1530.4-2014.

7 Termination of test

The test was terminated at 241 minutes by the agreement with the sponsor.

8 Test results

8.1 Critical observations

The following observations were made during the fire-resistance test:

Time	Observation
9:30 minutes -	Penetration 1 is fluing smoke.
22 minutes -	Penetration 1 has ceased fluing smoke.
90 minutes -	No apparent change to unexposed face of specimen.
138 minutes -	Mastic is swelling at the base of Penetration 1.
241 minutes -	Test terminated.

8.2 Furnace temperature

Figure 1 shows the standard curves of temperature versus time for heating the furnace chamber and the actual curves of average and maximum temperature versus time recorded during the heating period.

8.3 Furnace severity

Figure 2 shows the curve of furnace severity versus time during the heating period.

8.4 Specimen temperature

Figure 3 shows the curve of maximum temperature versus time associated with Penetration 1.

8.5 Performance

Performance observed in respect of the following AS 1530.4-2014 criteria:

Penetration 1 – H100FWS-RR Cast-in fire collar protecting a 110-mm Stack Pipe

Structural adequacy	-	not applicable
Integrity	-	no failure at 241 minutes
Insulation	-	no failure at 241 minutes

This report details methods of construction, the test conditions and the results obtained when the specific element of construction described herein was tested following the procedure outlined in this standard. Any significant variation with respect to size, constructional details, loads, stresses, edge or end conditions, other than those allowed under the field of direct application in the relevant test method, is not covered by this report.

Because of the nature of fire resistance testing and the consequent difficulty in quantifying the uncertainty of measurement of fire resistance, it is not possible to provide a stated degree of accuracy of the result.

9 Fire-resistance level (FRL)

For the purpose of building regulations in Australia, the FRL's of the test specimens were as follows:

Penetration 1 - -/240/240

For the purposes of AS 1530.4-2014 the results of these fire tests may be used to directly assess fire hazard, but it should be noted that a single test method will not provide a full assessment of fire hazard under all fire conditions.

10 Field of direct application of test results

The results of the fire test contained in this test report are directly applicable, without reference to the testing authority, to similar constructions where one or more changes listed in Clause 10.11 of AS 1530.4-2014, have been made provided no individual component is removed or reduced.

11 Tested by

Chris Wojcik
Testing Officer

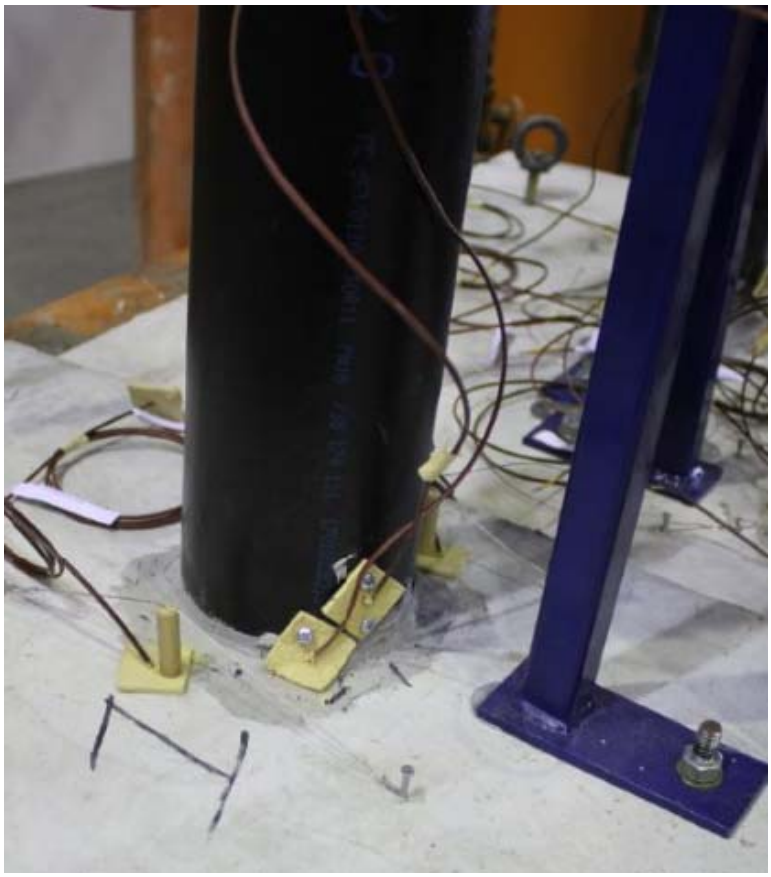
Appendices

Appendix A – Measurement location

Measurement Location		Data Logger Channel Information
Group location **Specimen**	**T/C Position**	**T/C designation**
Penetration 1 – +GF+ COOLFIT 2.0 PE-PUR-PE stack pipe 110-mm OD x 3.7-mm wall thickness	On the slab – 25-mm from mastic	S1
	On the slab – 25-mm from mastic	S2
	On the mastic	S3
	On the mastic	S4
	On the pipe - 25-mm from mastic	S5
	On the pipe - 25-mm from mastic	S6

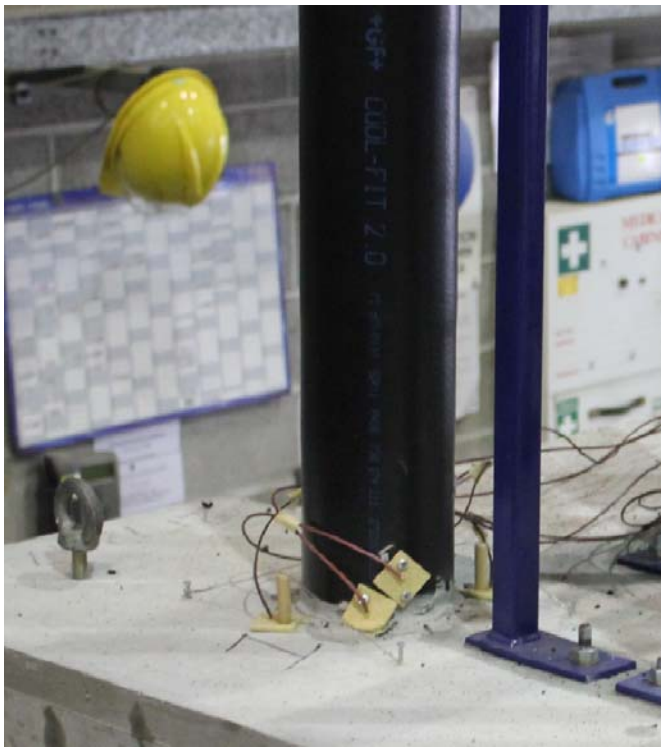
Appendix B – Photographs

PHOTOGRAPH 1 – EXPOSED FACE OF SPECIMEN PRIOR TO TESTING



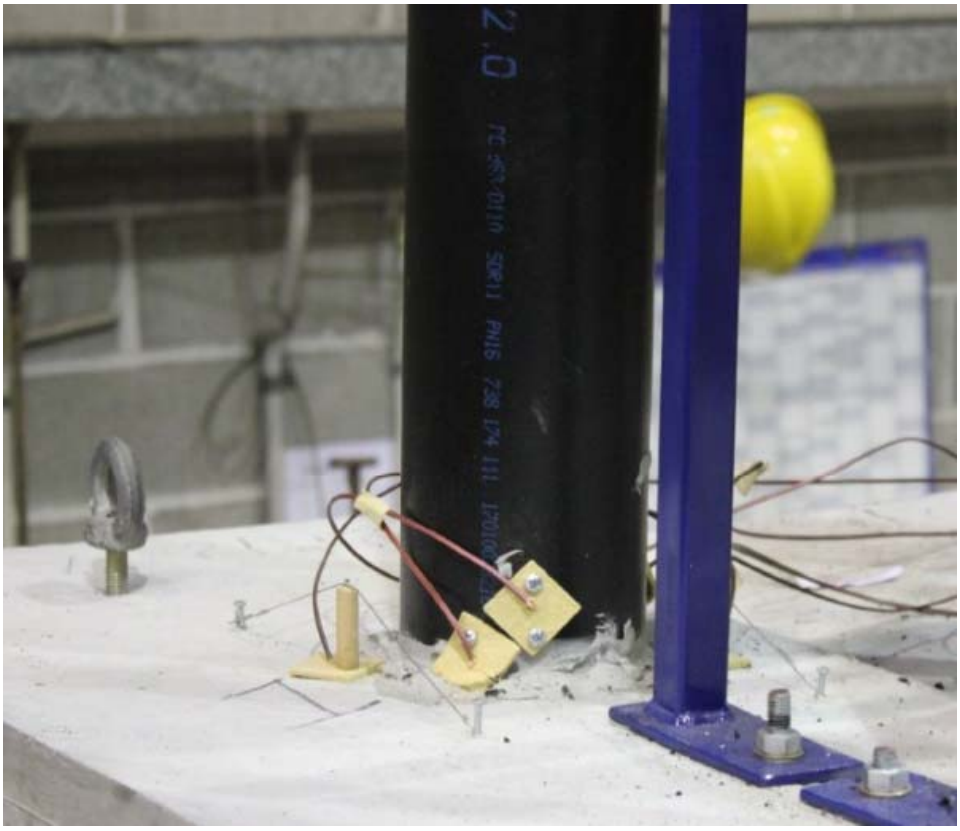
PHOTOGRAPH 2 – UNEXPOSED FACE OF SPECIMEN PRIOR TO TESTING

PHOTOGRAPH 3 – SPECIMENS AFTER 30 MINUTES OF TESTING



PHOTOGRAPH 4 – SPECIMENS AFTER 60 MINUTES OF TESTING

PHOTOGRAPH 5 – SPECIMENS AFTER 120 MINUTES OF TESTING



PHOTOGRAPH 6 – SPECIMENS AFTER 180 MINUTES OF TESTING

PHOTOGRAPH 7 – UNEXPOSED FACED OF SPECIMEN AT CONCLUSION OF TESTING

PHOTOGRAPH 8 – EXPOSED FACE OF SPECIMENS AT CONCLUSION OF TESTING

PHOTOGRAPH 9 – CROSS SECTION OF PIPE AT CONCLUSION OF TESTING

Appendix C – Furnace Temperature

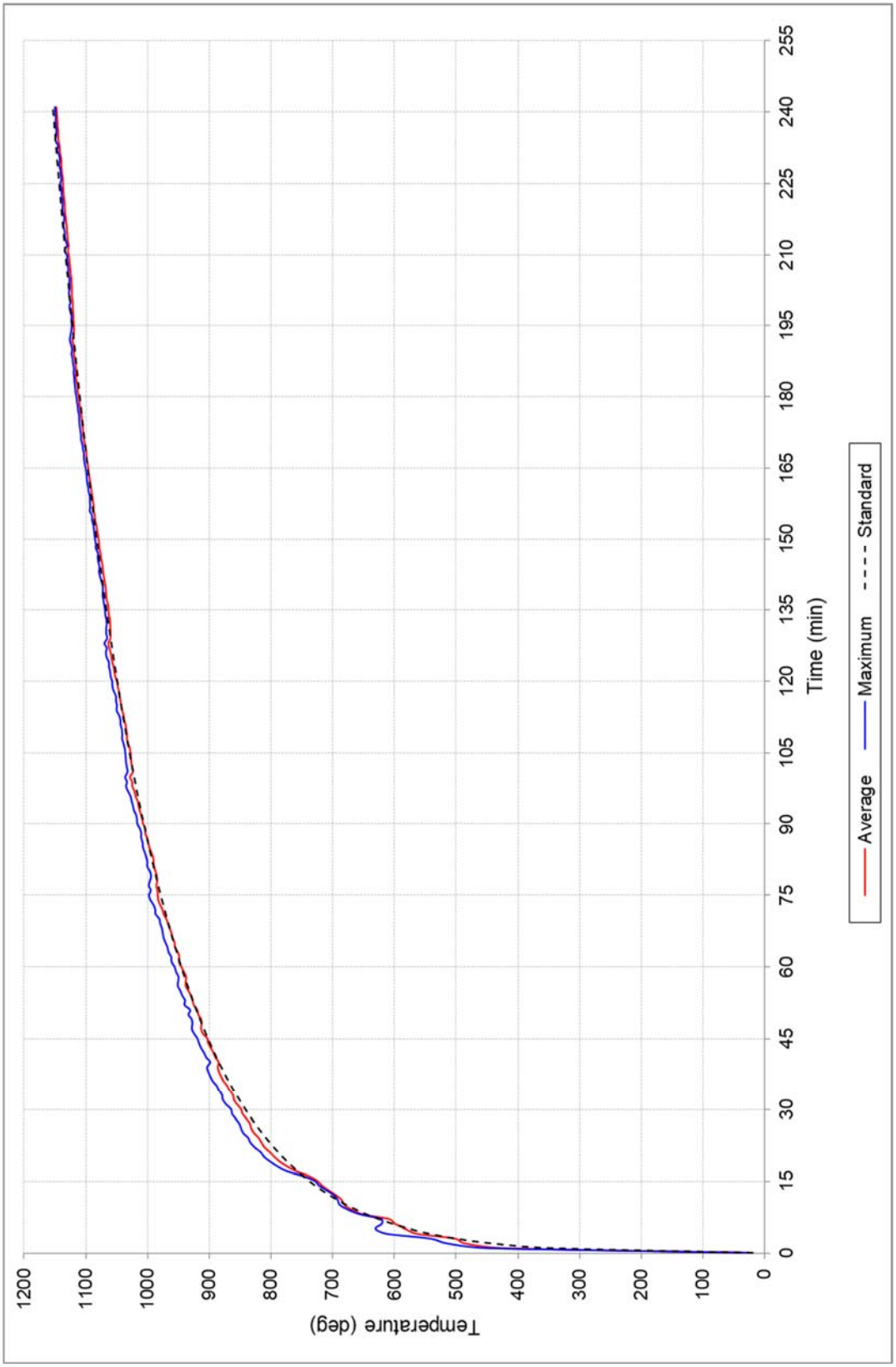


FIGURE 1 – FURNACE TEMPERATURE

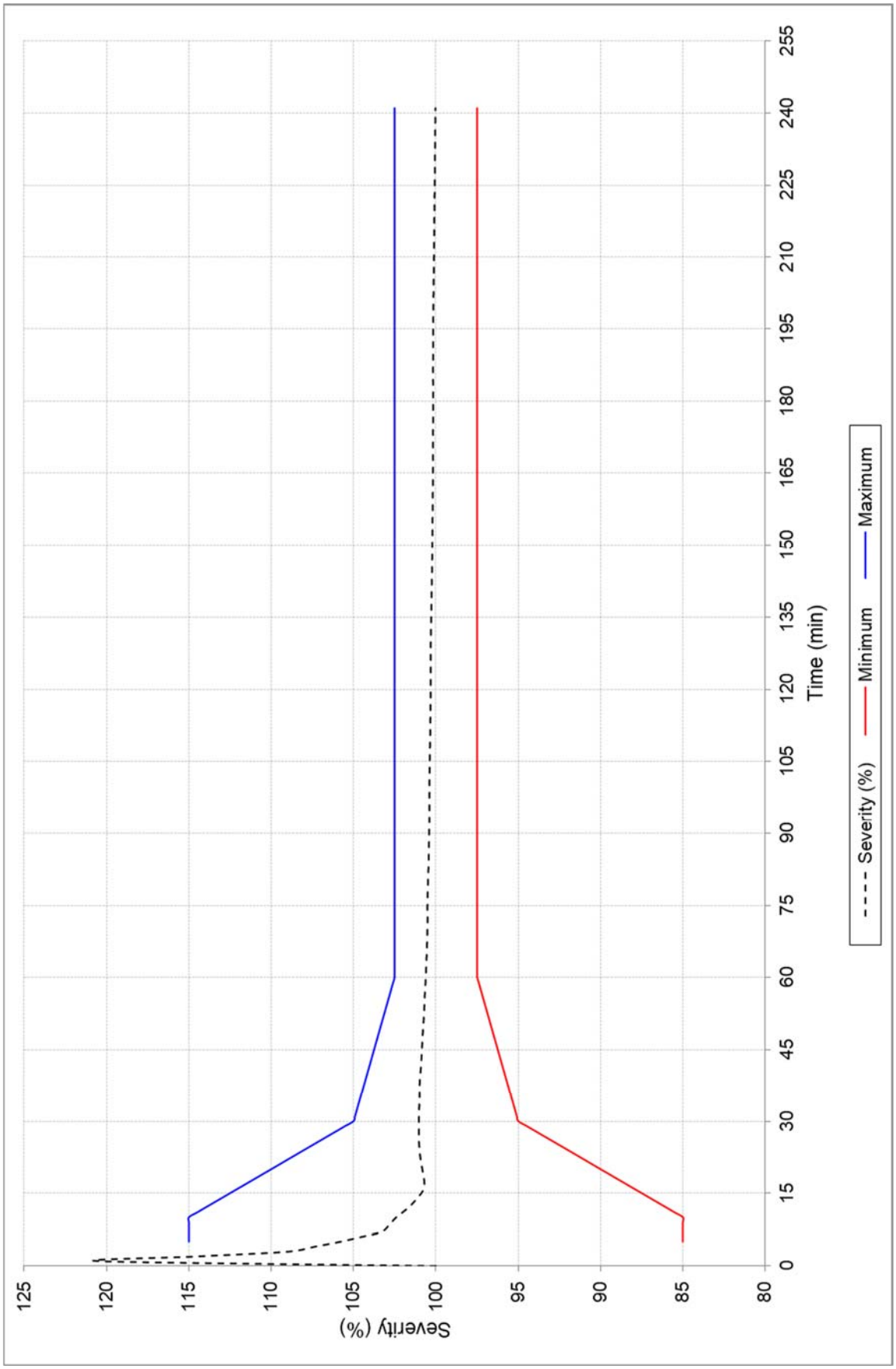


FIGURE 2 – FURNACE SEVERITY

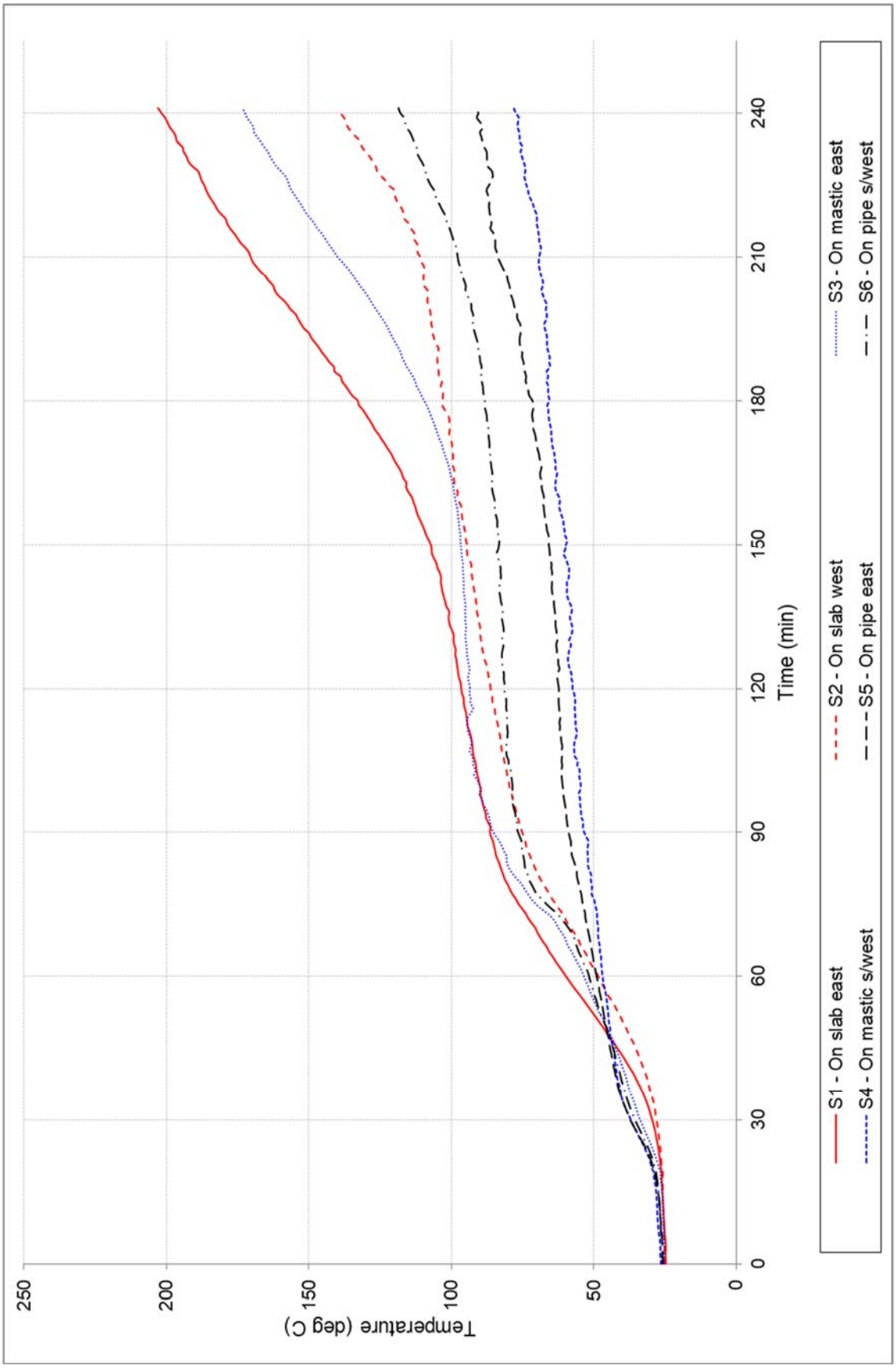
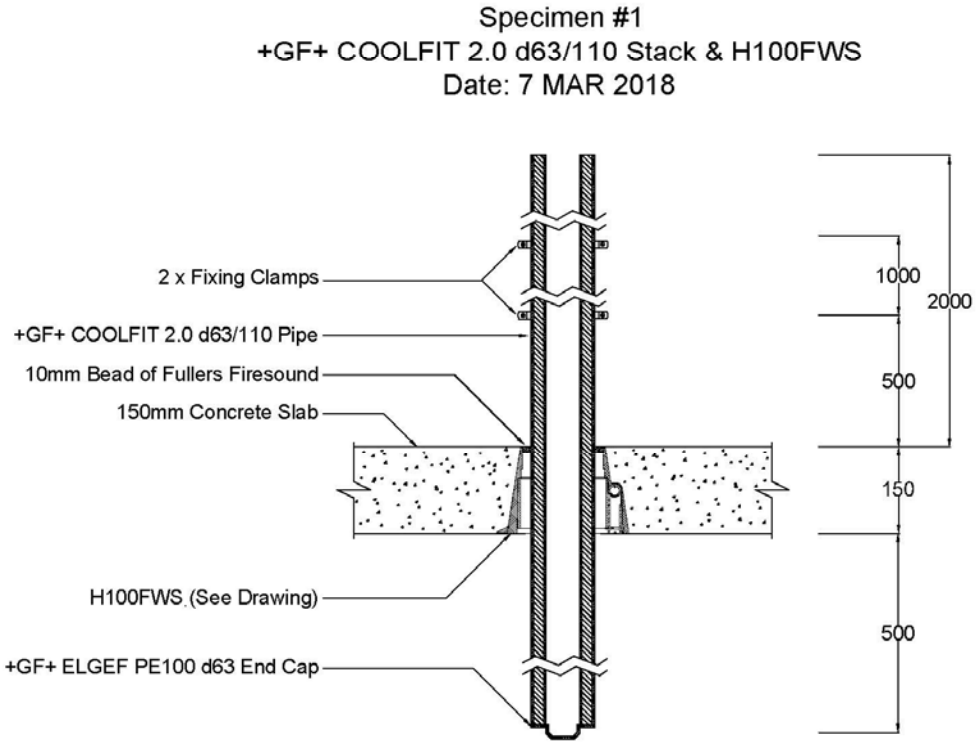


FIGURE 3 – SPECIMEN TEMPERATURE – ASSOCIATED WITH PENETRATION # 1

Appendix D – Installation drawings



DRAWING TITLED "SPECIMEN #1, +GF+ COOLFIT 2.0 D63/110 STACK & H100FWS", DATED 7 MARCH 2018, PROVIDED BY SNAP FIRE SYSTEMS PTY LTD

Appendix E – Specimen Drawings

DRAWING NUMBERED H100FWS-RR-T DATED 29 SEPTEMBER 2017, BY SNAP FIRE SYSTEMS PTY LTD

Appendix F – Certificate(s) of Test

INFRASTRUCTURE TECHNOLOGIES
www.csiro.au

14 Julius Avenue, North Ryde NSW 2113
PO Box 52, North Ryde NSW 1670, Australia
T (02) 9490 5444 • ABN 41 687 119 230

Certificate of Test

No. 3117

This is to certify that the element of construction described below was tested by CSIRO Infrastructure Technologies in accordance with Australian Standard 1530, Methods for fire tests on building materials, components and structures, Part 4 Fire-resistance tests of elements of construction, 2014 on behalf of:

IG6 Pty Ltd as trustee for the IG6 IP Trust
3 Skirmish Court
Victoria Point Qld 4165

A full description of the test specimen and the complete test results are detailed in the Division's Sponsored Investigation report numbered FSP 1891.

Product Name: Penetration 1 – H100FWS-RR Cast-in fire collar protecting a 110-mm Stack Pipe

Description: The SNAP H100FWS-RR collar comprised a polypropylene casing with a 128-mm inner dia. and a 213-mm base flange. The 250-mm high collar casing incorporated a layer of 412 mm x 85 mm x 4-mm thick Intumescent material. The closing mechanism comprised three equally spaced 3 steel springs held with nylon fuse links. Springs were fabricated using 304 grade stainless steel wire with a dia. of 3.15-mm, with springs acting against a layer of 316 grade stainless steel mesh measuring 460 x 83-mm. The penetrating service comprised a +GF+ COOLFIT 2.0 d63/110 insulated chilled water pipe. Pipe comprised an inner PE pipe (OD 63-mm) with bore dia. of 51.4-mm. Inner pipe was insulated using 22-mm thick high energy efficient (HE) foam protected externally using a 110-mm (OD) PE external pipe. The pipe was fitted through the collar's sleeve and penetrated the slab through a 177-mm diameter opening and projected vertically 2000-mm above the concrete and 500 mm into the furnace chamber. The annular gap between unexposed face of slab and OD of pipe was fully sealed using H.B. FULLERS FIRESOUND fire rated mastic to depth of 10-mm. The pipe was supported at 500-mm and 1500 mm from unexposed face of concrete slab. On the exposed end, pipe was capped with a +GF+ ELGEF PE100 d63 End Cap.

Structural Adequacy	not applicable
Integrity	no failure at 241 minutes
Insulation	no failure at 241 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/240/240.

For the purposes of AS 1530.4-2014 the results of these fire tests may be used to directly assess fire hazard, but it should be recognized that a single test method will not provide a full assessment of fire hazard under all fire conditions. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.

Testing Officer: Chris Wojcik Date of Test: 22 February 2018

Issued on the 8th day of May 2018 without alterations or additions.

B. Roddy

Brett Roddy
Manager, Fire Testing and Assessments

This document is issued in accordance with NATA's accreditation requirements.
Accreditation No. 165 – Corporate Site No. 3625
Accredited for compliance with ISO/IEC 17025 - Testing

COPY OF CERTIFICATE OF TEST – NO. 3117

References

The following informative documents are referred to in this Report:

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

-----end of report-----

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