Fire-resistance test on a fire collar protecting a concrete floor slab penetrated by a pipe

Test Report

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Report number: FSP 1924
Date: 3 September 2018

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

Commercial-in-confidence

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Report Status and Revision History:

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Report Authorization:

AUTHOR	REVIEWED BY	AUTHORISED BY
Peter Gordon	Brett Roddy	Brett Roddy
		
3 September 2018	3 September 2018	3 September 2018

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Fire-resistance test on a fire collar protecting a concrete floor slab penetrated by a pipe

Sponsored Investigation No. FSP 1924

1 Introduction

1.1 Identification of specimen

The sponsor identified the specimen as a cast-in fire collar protecting a HDPE pipe penetrating a 150-mm thick concrete floor slab including a 100-mm high x 100-mm wide concrete hob.

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 – 2005 (R2016), 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 4786/4248

1.7 Test date

The fire-resistance test was conducted on 25 July 2018.

2 Description of specimen

2.1 General

The specimen comprised an 1150-mm x 1150-mm x 150-mm thick reinforced concrete slab including a 100-mm high x 100-mm wide concrete hob penetrated by one (1) stack pipe. All service penetrations were protected by fire collars.

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

- AS/NZS 5065 – 2005(R2017) 'Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications'

For the purpose of the test, the specimen is referenced as Penetration 1 as detailed in the table below. Documents containing a complete description of the specimen were supplied by the sponsor and are retained on file.

Specimen No.	Penetration details
1	SNAP 315C Cast-in fire collar protecting a 150-mm concrete slab penetrated by a 315-mm OD HDPE pipe.

Specimen 1 – SNAP 315C Cast-in fire collar protecting a 150-mm concrete slab penetrated by a 315-mm OD HDPE pipe.

SEPARATING ELEMENT	
150-mm thick reinforced concrete slab including a 100-mm high x 100-mm wide concrete hob.	
TYPE AND SIZE OF CONSTRUCTION	
Cast in fire collar	
PENETRATING SERVICE	
Description	315-mm OD PE100 Pipe
Size	A 315-mm OD, HDPE pipe with a wall thickness of 10.45-mm. The pipe extended 2000-mm from the unexposed side and 500-mm from the exposed face.
End conditions	Plugged on the exposed end with a Superwool plug and left open on the unexposed end.
Supports	Approximately 500-mm and 1500-mm away from the wall on the unexposed face.
FIRE STOPPING SYSTEM	
Trade name	SNAP 315C Cast-in fire collar
Manufacturer	SNAP Fire Systems Pty Ltd
Description	The SNAP 315C Cast-in fire collar comprised a plastic casing with a 318-mm inner diameter and a 489-mm external diameter base flange. The 204-mm high collar casing incorporated a layer of Intumescent and a 316 stainless steel mesh, as shown in drawing titled 315C, undated, by Snap Fire Systems Pty Ltd.
Application	The Snap collar was cast face down on exposed face of the slab.
Photograph	  Unexposed face Exposed face
Drawing	Drawing titled ‘Specimen 1 315 HDPE Stack & 315C’ dated 14 June 2018, provided by Snap Fire Systems Pty Ltd.

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 specimen was stored under standard laboratory atmospheric conditions until the test date.

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 titled “Specimen 1 315 HDPE Stack & 315C” dated 14 June 2018, provided by Snap Fire Systems Pty Ltd.

Drawing titled 315C, undated, 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 19°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
4 minutes -	Smoke is being emitted from the furnace flues. A smaller amount of smoke is fluing from the pipe.
7 minutes -	A steady stream of smoke is fluing from the pipe. Smoke is continuing to be emitted from the flue.
12 minutes -	Noises are audible from the specimen.
13 minutes -	Cracking noises are continuing. Red glow in flue visible.
14 minutes -	Furnace gases are fluing straight from the pipe.
15 minutes -	Furnace gases are replaced by smoke. Smoke from flues has ceased.
16 minutes -	Pipe is beginning to distort at the base. Smoke from the pipe is diminishing.
30 minutes -	Smoke levels have diminished considerably. The lower pipe section is heavily distorted. Condensation has formed small puddles on the unexposed face of the slab.
60 minutes -	A small amount of smoke is continuing to flue from the pipe. Water has continued to accumulate on the slab with steam being emitted. The pipe appears to be pushed up by the intumescent material.

90 minutes -	The moisture noted on the slab is beginning to dry off. Steam continuing to be emitted. Minimal fluing is noted from the pipe.
120 minutes -	The pipe has continued to be pushed up from the slab surface.
180 minutes -	The majority of water has been driven from the concrete. Slight bellying of pipe at the concrete junction. A small amount of smoke is continuing to flue from the pipe.
217 minutes -	Insulation failure of Specimen 1 – maximum temperature rise of 180 deg Celsius is exceeded on the concrete hob.
234 minutes -	The base of the pipe has continued to distort and is venting a small amount of smoke. A small amount of smoke is bring emitted from the top of the pipe.
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 Specimen 1.

8.5 Performance

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

Specimen 1 – SNAP 315C Cast-in fire collar protecting a 150-mm concrete slab penetrated by a 315-mm OD HDPE pipe

Structural adequacy	-	not applicable
Integrity	-	no failure at 241 minutes
Insulation	-	217 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 specimen is as follows:

Specimen 2 - -/240/180

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 10.12 of AS 1530.4-2014, have been made provided no individual component is removed or reduced.

11 Tested by

Peter Gordon
Testing Officer

Appendices

Appendix A – Measurement location

Specimen	T/C Position	T/C designation
Specimen 1 – Mueller Pipelines PE100 pipe 315-mm OD	On the slab – 25-mm from Hob East	S1
	On the slab – 25-mm from Hob West	S2
	On the Hob – 25-mm from the pipe East	S3
	On the Hob – 25-mm from the pipe West	S4
	On the Pipe – 25-mm from the Hob	S5
	On the Pipe – 25-mm from the Hob	S6
Rover		S7
Ambient		S8
		S9
		S11

Appendix B – Photographs

PHOTOGRAPH 1 – EXPOSED FACE OF SPECIMEN PRIOR TO TESTING

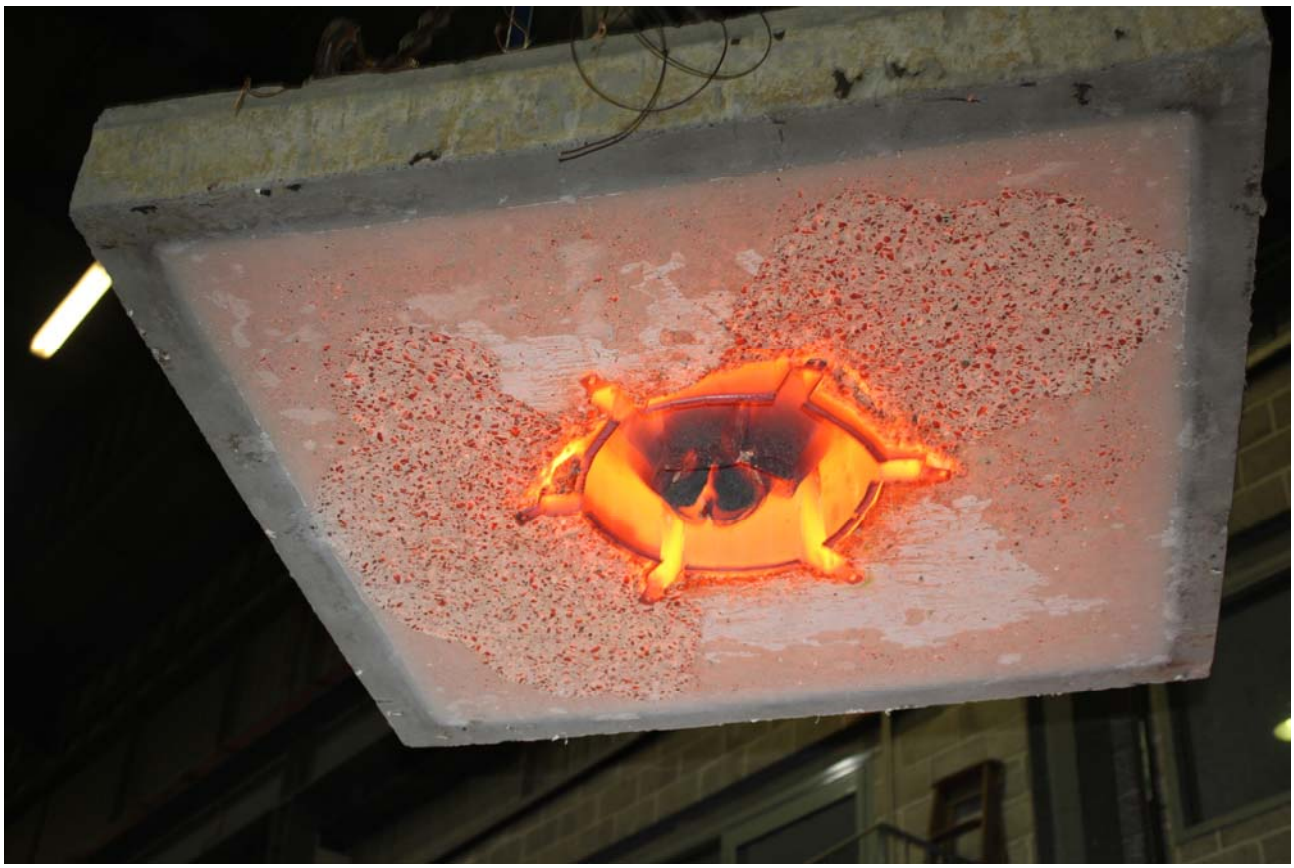
PHOTOGRAPH 2 – UNEXPOSED FACE OF SPECIMEN PRIOR TO TESTING

PHOTOGRAPH 3 – SPECIMEN AFTER 60 MINUTES OF TESTING

PHOTOGRAPH 4 – SPECIMEN AFTER 120 MINUTES OF TESTING

PHOTOGRAPH 5 – SPECIMEN AFTER 180 MINUTES OF TESTING

PHOTOGRAPH 6 – UNEXPOSED FACE OF SPECIMEN AT THE CONCLUSION OF TESTING



PHOTOGRAPH 7 – EXPOSED FACE OF SPECIMEN AT CONCLUSION OF TESTING

Appendix C – Furnace Temperature

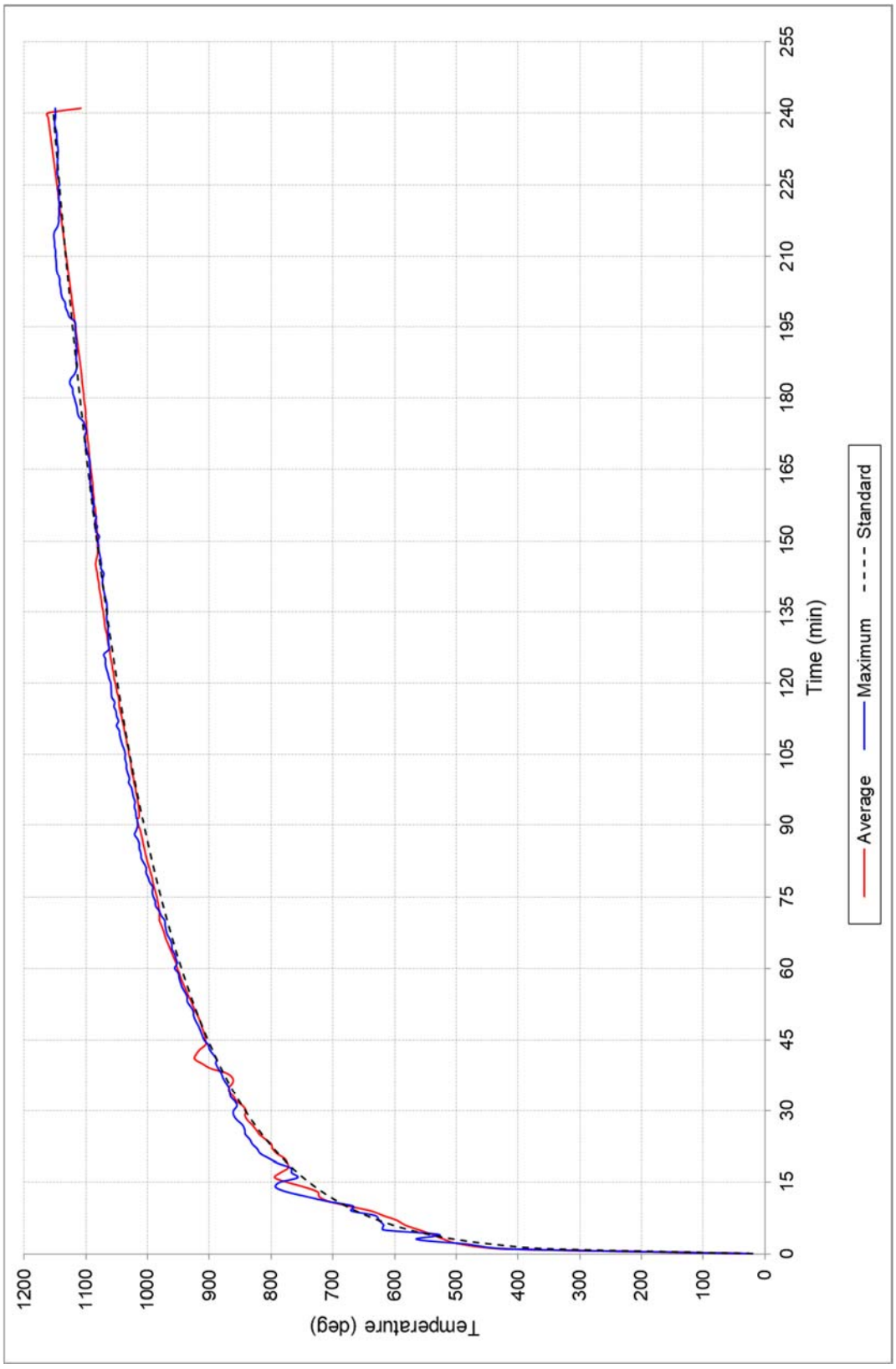


FIGURE 1 – FURNACE TEMPERATURE

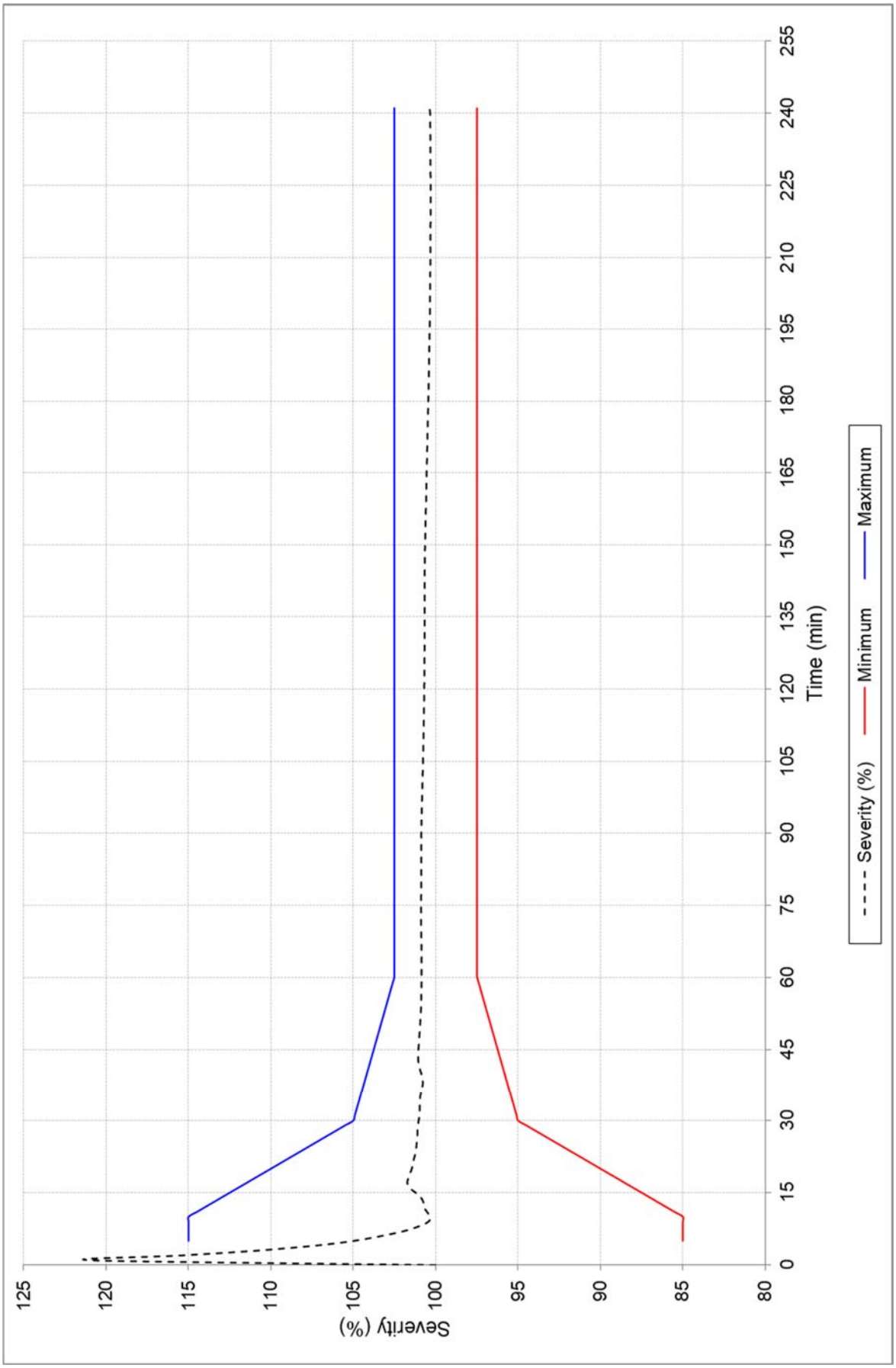


FIGURE 2 – FURNACE SEVERITY

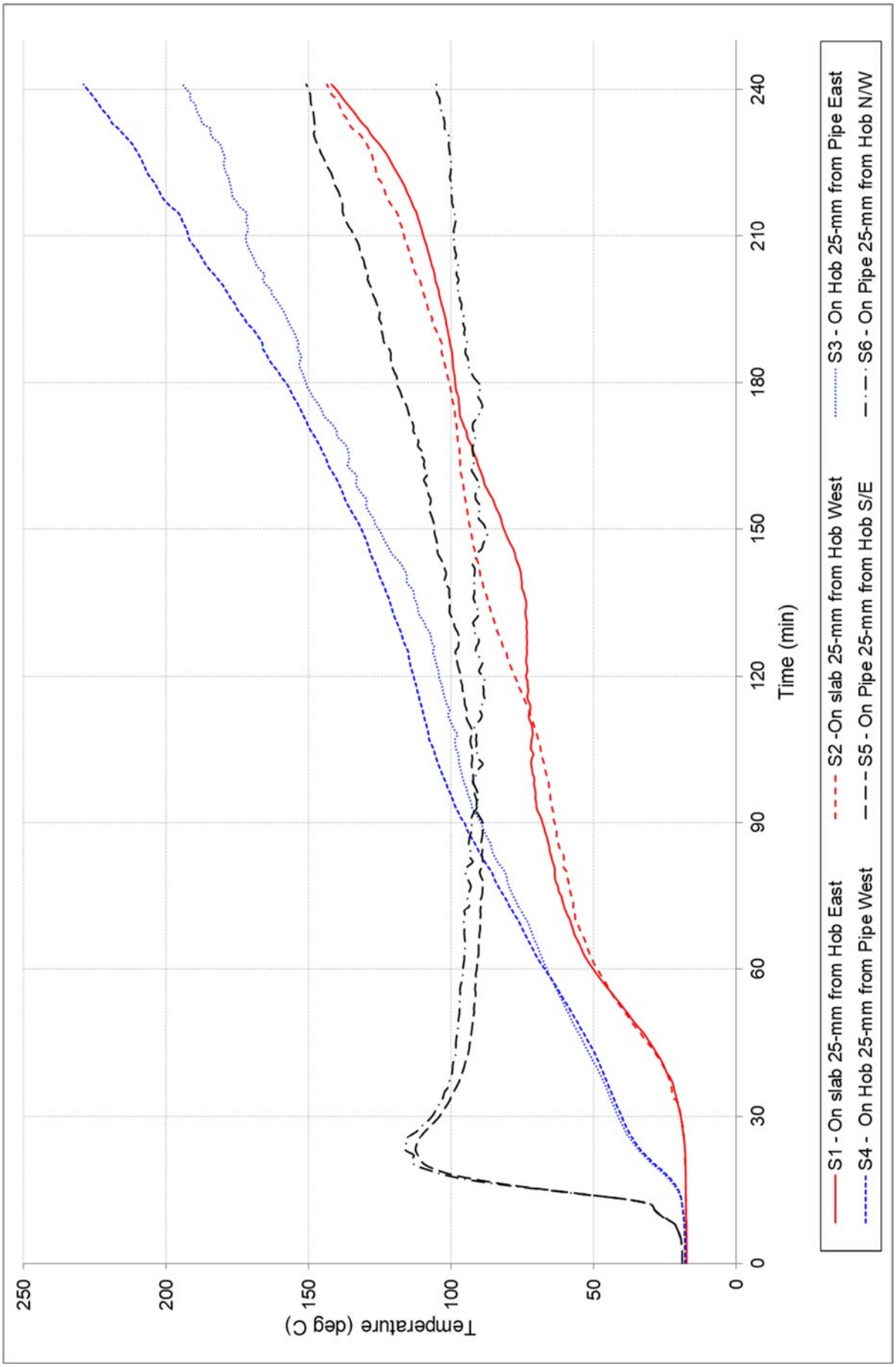
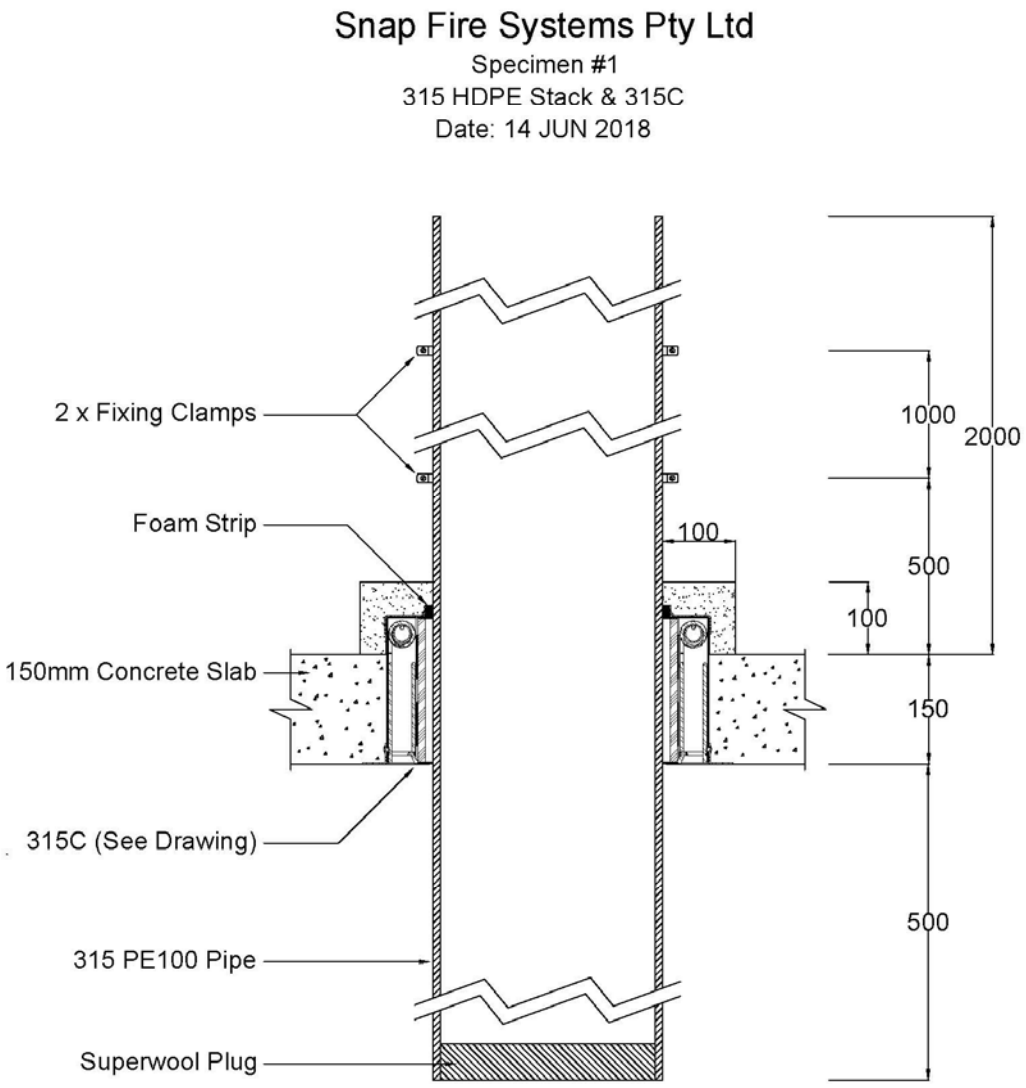


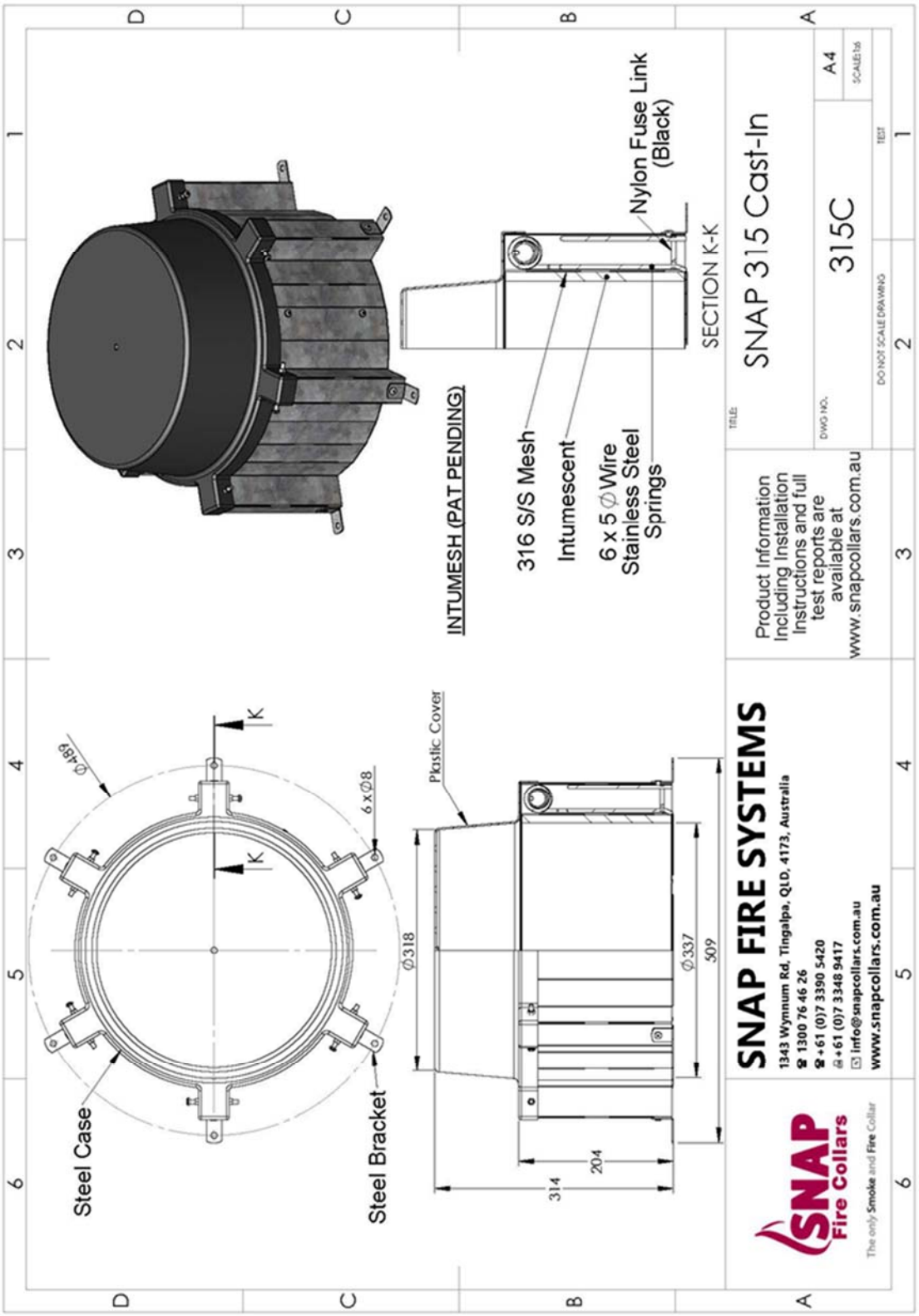
FIGURE 3 SPECIMEN TEMPERATURE – ASSOCIATED WITH PENETRATION # 1

Appendix D –Installation drawing



DRAWING TITLED "SPECIMEN 1 315 HDPE STACK & 315C" DATED 14 JUNE 2018, PROVIDED BY SNAP FIRE SYSTEMS PTY LTD.

Appendix E – Specimen Drawings



DRAWING TITLED 315C, UNDATED, 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. 3135

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 (Section 10, Service penetrations and control joints), 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 1924.

Product Name: SNAP 315C Cast-in fire collar protecting a 150-mm concrete slab penetrated by a 315-mm OD HDPE pipe

Description: Separating Element: 150-mm thick reinforced concrete slab including a 100-mm high x 100-mm wide concrete hob.
Type and size of construction: Cast in fire collar.
Penetrating service: A 315-mm OD, HDPE pipe with a wall thickness of 10.45-mm. The pipe extended 2000-mm from the unexposed side and 500-mm from the exposed face.
End Conditions: Plugged on the exposed end with a Superwool plug and left open on the unexposed end.
Supports: Approximately 500-mm and 1500-mm away from the wall on the unexposed face.
Fire stopping system: SNAP 315C Cast-in fire collar, manufactured by SNAP Fire Systems Pty Ltd is described as SNAP 315C Cast-in fire collar comprised a plastic casing with a 318-mm inner diameter and a 489-mm external diameter base flange. The 204-mm high collar casing incorporated a layer of Intumescent and a 316 stainless steel mesh, as shown in drawing titled 315C, undated, by Snap Fire Systems Pty Ltd. The Snap collar was cast face down on exposed face of the slab. The sponsor supplied drawing titled "Specimen 1 315 HDPE Stack & 315C" dated 14 June 2018, as a complete description of the specimen and should be read in conjunction with the test report.

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

Structural Adequacy	not applicable
Integrity	no failure at 241 minutes
Insulation	217 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/240/180.

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: Peter Gordon Date of Test: 25 July 2018

Issued on the 3rd day of September 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. 3135

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 (R2016)	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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