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

Test Report

Author: Peter Gordon
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Date: 29 November 2019

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

Commercial-in-confidence

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29 November 2019	29 November 2019	29 November 2019

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

Sponsored Investigation No. FSP 2050

1 Introduction

1.1 Identification of specimen

The sponsor identified the specimen as five (5) cast-in fire collars protecting a 150-mm thick concrete floor slab penetrated by five (5) stack pipes.

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 4920/4418

1.7 Test date

The fire-resistance test was conducted on 2 October 2019.

2 Description of specimen

2.1 General

The specimen comprised an 1150-mm x 1150-mm x 150-mm thick concrete slab penetrated by five (5) stack pipes protected by five Snap Fire Systems Cast-in fire collars.

The penetrated slab comprised a 150-mm thick concrete slab reinforced with a single layer of steel reinforcement providing a Fire Resistance Period (FRP) for insulation of 180 minutes in accordance with Table 5.5.1 of AS 3600:2018 - Concrete Structures.

The pipes used in the test are stated to be manufactured in accordance with:

- AS/NZS 1260 'PVC-U pipes and fittings for drain, waste and vent application'; and
- AS/NZS 4401 Plastics piping systems for soil and waste discharge (low and high temperature) inside buildings - Polyethylene (PE).

For the purpose of the test, the five penetrations were referenced as Specimens 1, 2, 3, 4, and 5.

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

Specimen 1 – SNAP H110S Cast-in fire collar protecting a nominal 100-mm polyvinyl chloride sandwich construction (PVC-SC) stack pipe.

The SNAP Cast-in H110S fire collar comprised a 1.6-mm thick polypropylene casing with a 140-mm inner diameter and a 194-mm x 184-mm base flange. The 87-mm high collar casing incorporated a layer of 451-mm long x 85-mm wide x 4-mm thick Intumescent material. The closing mechanism comprised four equally spaced steel springs held with nylon fuse links. The springs were fabricated using SPR-SS315-82 grade stainless steel wire having a diameter of 3.15-mm, with the springs acting against a layer of 316 grade stainless steel mesh measuring 503-mm x 83-mm as shown in drawing number H110S, dated 15 February 2019, by Snap Fire Systems Pty Ltd.

The penetrating service comprised a 110.8-mm outside diameter Iplex polyvinyl chloride sandwich construction pipe with a wall thickness of 3.51-mm fitted through the collar's sleeve. The annular gap between the pipe and the inside collar was left unprotected as shown in drawing titled "Specimen #1, 100 PVC Stack & H110S", dated 15 August 2019, provided by Snap Fire Systems Pty Ltd. The pipe projected vertically, 2000-mm above from the unexposed face of the concrete slab and 500-mm into the furnace chamber. The pipe was supported at nominally 500-mm and 1500-mm from the unexposed face of the slab. The pipe was open at the unexposed end and closed with a PVC end cap on the exposed end.

Specimen 2 – SNAP H110S Cast-in fire collar protecting a nominal 110-mm HDPE (PE100) stack pipe.

The SNAP Cast-in H110S fire collar comprised a 1.6-mm thick polypropylene casing with a 140-mm inner diameter and a 194-mm x 184-mm base flange. The 87-mm high collar casing incorporated a layer of 451-mm long x 85-mm wide x 4-mm thick Intumescent material. The closing mechanism comprised four equally spaced steel springs held with nylon fuse links. The springs were fabricated using SPR-SS315-82 grade stainless steel wire having a diameter of 3.15-mm, with the springs acting against a layer of 316 grade stainless steel mesh measuring 503-mm long x 83-mm wide as shown in drawing number H110S, dated 15 February 2019, by Snap Fire Systems Pty Ltd.

The penetrating service comprised a 111.28-mm outside diameter Vinidex PE100 HDPE pipe with a wall thickness of 4.56-mm fitted through the collar's sleeve. The annular gap between the pipe and the inside collar was left unprotected as shown in drawing titled "Specimen #2, 110 HDPE Stack & H110S", dated 15 August 2019, provided by Snap Fire Systems Pty Ltd. The pipe projected vertically, 2000-mm above from the unexposed face of the concrete slab and 500-mm into the furnace chamber. The pipe was supported at nominally 500-mm and 1500-mm from the unexposed face of the slab. The pipe was open at the unexposed end and closed with a PVC end cap.

Specimen 3 – SNAP H110S Cast-in fire collar protecting a nominal 40-mm polyvinyl chloride (PVC) stack pipe.

The SNAP Cast-in H110S fire collar comprised a 1.6-mm thick polypropylene casing with a 140-mm inner diameter and a 194-mm x 184-mm base flange. The 87-mm high collar casing incorporated a layer of 451-mm long x 85-mm wide x 4-mm thick Intumescent material. The closing mechanism comprised four equally spaced steel springs held with nylon fuse links. The springs were fabricated using SPR-SS315-82 grade stainless steel wire having a diameter of 3.15-mm, with the springs acting against a layer of 316 grade stainless steel mesh measuring 503-mm long x 83-mm wide as shown in drawing number H110S, dated 15 February 2019, by Snap Fire Systems Pty Ltd.

The penetrating service comprised a 42.8-mm outside diameter polyvinyl chloride pipe with a wall thickness of 2.1-mm fitted through the collar's sleeve. The annular gap between the pipe and the inside collar was protected with a cardboard gasket then back filled with grout flush to a depth of 60-mm and finished flush with the slab as shown in drawing titled "Specimen #3, 40 PVC Stack & H110S", dated 1 October 2019, provided by Snap Fire Systems Pty Ltd. The pipe projected vertically, 2000-mm above from the unexposed face of the concrete slab and 500-mm into the furnace chamber. The pipe was supported at nominally 500-mm and 1500-mm from the unexposed face of the slab. The pipe was open at the unexposed end and closed with a PVC end cap on the exposed end.

Specimen 4 – SNAP H110S Cast-in fire collar protecting a nominal 65-mm polyvinyl chloride (PVC) stack pipe.

The SNAP Cast-in H110S fire collar comprised a 1.6-mm thick polypropylene casing with a 140-mm inner diameter and a 194-mm x 184-mm base flange. The 87-mm high collar casing incorporated a layer of 451-mm long x 85-mm wide x 4-mm thick Intumescent material. The closing mechanism comprised four equally spaced steel springs held with nylon fuse links. The springs were fabricated using SPR-SS315-82 grade stainless steel wire having a diameter of 3.15-mm, with the springs acting against a layer of 316 grade stainless steel mesh measuring 503-mm x 83-mm as shown in drawing number H110S, dated 15 February 2019, by Snap Fire Systems Pty Ltd.

The penetrating service comprised a 68.54-mm outside diameter polyvinyl chloride pipe with a wall thickness of 3-mm through the collar's sleeve. The annular gap between the pipe and the inside collar was protected with a cardboard gasket then back filled with grout flush to a depth of 60-mm and finished flush with the slab as shown in drawing titled "Specimen #4, 65 PVC Stack & H110S", dated 1 October 2019, provided by Snap Fire Systems Pty Ltd. The pipe projected vertically, 2000-mm above from the unexposed face of the concrete slab and 500-mm into the furnace chamber. The pipe was supported at nominally 500-mm and 1500-mm from the unexposed face of the slab. The pipe was open at the unexposed end and closed with a PVC end cap on the exposed end.

Specimen 5 – SNAP H110S Cast-in collar protecting a nominal 80-mm polyvinyl chloride (PVC) stack pipe.

The SNAP Cast-in H110S fire collar comprised a 1.6-mm thick polypropylene casing with a 140-mm inner diameter and a 194-mm x 184-mm base flange. The 87-mm high collar casing incorporated a layer of 451-mm long x 85-mm wide x 4-mm thick Intumescent material. The closing mechanism comprised four equally spaced steel springs held with nylon fuse links. The springs were fabricated using SPR-SS315-82 grade stainless steel wire having a diameter of 3.15-mm, with the springs acting against a layer of 316 grade stainless steel mesh measuring 503-mm long x 83-mm wide as shown in drawing number H110S, dated 15 February 2019, by Snap Fire Systems Pty Ltd.

The penetrating service comprised an 81.87-mm outside diameter polyvinyl chloride pipe with a wall thickness of 3.1-mm through the collar's sleeve. The annular gap between the pipe and the inside collar was protected with a cardboard gasket then back filled with grout to a depth of 60-mm and finished flush with the slab as shown in drawing titled "Specimen #5, 80 PVC Stack & H110S", dated 1 October 2019, provided by Snap Fire Systems Pty Ltd. The pipe projected vertically, 2000-mm above from the unexposed face of the concrete slab and 500-mm into the furnace chamber. The pipe was supported at nominally 500-mm and 1500-mm from the unexposed face of the slab. The pipe was open at the unexposed end and closed with a PVC end cap on the exposed end.

2.2 Dimensions

The specimen comprised an 1150-mm x 1150-mm x 150-mm thick concrete slab 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.

2.5 Selection, construction and installation of the specimen and the supporting construction

The supporting wall construction and specimen installation was organised by the sponsor. CSIRO was not involved in the selection of the materials.

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 “Test Slab S-19-G Layout”, dated 8 May 2019 provided by Snap Fire Systems Pty Ltd.

Drawing titled “Specimen #1, 100 PVC Stack & H110S”, dated 15 August 2019, provided by Snap Fire Systems Pty Ltd.

Drawing titled “Specimen #2, 110 HDPE Stack & H110S”, dated 15 August 2019, provided by Snap Fire Systems Pty Ltd.

Drawing titled “Specimen #3, 40 PVC Stack & H110S”, dated 1 October 2019, provided by Snap Fire Systems Pty Ltd.

Drawing titled “Specimen #4, 65 PVC Stack & H110S”, dated 1 October 2019, provided by Snap Fire Systems Pty Ltd.

Drawing titled “Specimen #5, 80 PVC Stack & H110S”, dated 1 October 2019, provided by Snap Fire Systems Pty Ltd.

Drawing number H110S, dated 15 February 2019, 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 23°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
2 minutes -	Smoke is fluing from the end of the pipe of Specimen 4.
3 minutes -	Smoke is fluing from the end of the pipe of Specimen 5. Smoke has ceased fluing from the end of the pipe of Specimen 4.
4 minutes -	Light smoke is fluing from the end of the pipe of Specimens 1 and 5.
5 minutes -	Smoke is fluing from the end of the pipe of Specimen 2
6 minutes -	Smoke fluing from Specimen 2 has reduced.
8 minutes -	Smoke is fluing from the end of the pipe of Specimen 2.
30 minutes -	Smoke has ceased fluing from the ends of all specimens.
42 minutes -	Moisture is present on the concrete at the base of Specimens 2 and 3.
60 minutes -	Moisture is present on the concrete at the base of all specimens.
90 minutes -	Moisture on the concrete at the base of all specimens is no longer visible.
212 minutes -	A small quantity of smoke has resumed fluing from Specimen 2.
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 temperature versus time associated with Specimen 1.

Figure 4 shows the curve of temperature versus time associated with Specimen 2.

Figure 5 shows the curve of temperature versus time associated with Specimen 3.

Figure 6 shows the curve of temperature versus time associated with Specimen 4.

Figure 7 shows the curve of temperature versus time associated with Specimen 5.

8.5 Performance

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

Specimen 1 – SNAP H110S Cast-in fire collar protecting a nominal 100-mm polyvinyl chloride sandwich construction (PVC-SC) stack pipe.

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

Specimen 2 – SNAP H110FWS-RR Cast-in fire collar protecting a nominal 110-mm HDPE (PE100) stack pipe.

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

Specimen 3 – SNAP H110S Cast-in fire collar protecting a nominal 40-mm polyvinyl chloride (PVC) stack pipe.

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

Specimen 4 – SNAP H110S Cast-in fire collar protecting a nominal 65-mm polyvinyl chloride (PVC) stack pipe.

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

Specimen 5 – SNAP H110S Cast-in collar protecting a nominal 80-mm polyvinyl chloride (PVC) 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:

Specimen 1 - -/180/180

Specimen 2 - -/180/180

Specimen 3 - -/180/180

Specimen 4 - -/180/180

Specimen 5 - -/180/180

The fire-resistance level of the specimen is applicable when the system is exposed to fire from the same direction as tested.

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

Peter Gordon
Testing Officer

Appendices

Appendix A – Measurement location

SPECIMEN	THERMOCOUPLE POSITION	DESIGNATION
Specimen 1 - Ipex PVC-SC 110.8-mm OD x 3.51-mm wall thickness stack pipe protected with a H110S-RR Cast-in fire collar.	On slab – 25-mm from collar North	S1
	On slab – 25-mm from collar East	S2
	On pipe 25-mm above collar N/East	S3
	On pipe 25-mm above collar S/West	S4
Specimen 2 – Vinidex PE 100 111.28-mm OD x 4.56-mm wall thickness stack pipe protected with a H110S-RR Cast-in fire collar.	On slab – 25-mm from collar North	S5
	On slab – 25-mm from collar West	S6
	On pipe 25-mm above collar West	S7
	On pipe 25-mm above collar East	S8
Specimen 3 Ipex PVC 42.8-mm OD x 2.1-mm wall thickness stack pipe protected with a H110S-RR Cast-in fire collar. The annular gap around the pipe on the exposed side was backfilled with grout.	On slab – 25-mm from grout West	S9
	On slab – 25-mm from grout East	S10
	On grout – 25-mm from pipe West	S11
	On grout – 25-mm from pipe East	S12
	On pipe 25-mm above grout North	S13
	On pipe 25-mm above grout West	S14
Specimen 4 – Ipex PVC 68.54-mm OD x 3-mm wall thickness stack pipe protected with a H110S-RR Cast-in fire collar. The annular gap around the pipe on the exposed side was backfilled with grout.	On slab – 25-mm from grout North	S15
	On slab – 25-mm from grout South	S16
	On grout – 25-mm from pipe North	S17
	On grout – 25-mm from pipe South	S18
	On pipe 25-mm above grout N/West	S19
	On pipe 25-mm above grout S/East	S20
Specimen 5 – Ipex PVC 81.87-mm OD x 3.1-mm wall thickness stack pipe protected with a H110S-RR Cast-in fire collar. The annular gap around the pipe on the exposed side was backfilled with grout.	On slab – 25-mm from grout North	S21
	On slab – 25-mm from grout South	S22
	On grout – 25-mm from pipe North	S23
	On grout – 25-mm from pipe South	S24
	On pipe 25-mm above grout North	S25
	On pipe 25-mm above grout West	S26
Rover	Rover	S27
Ambient	Ambient	S28

Appendix B – Photographs

PHOTOGRAPH 1 – EXPOSED FACE OF SPECIMENS PRIOR TO TESTING

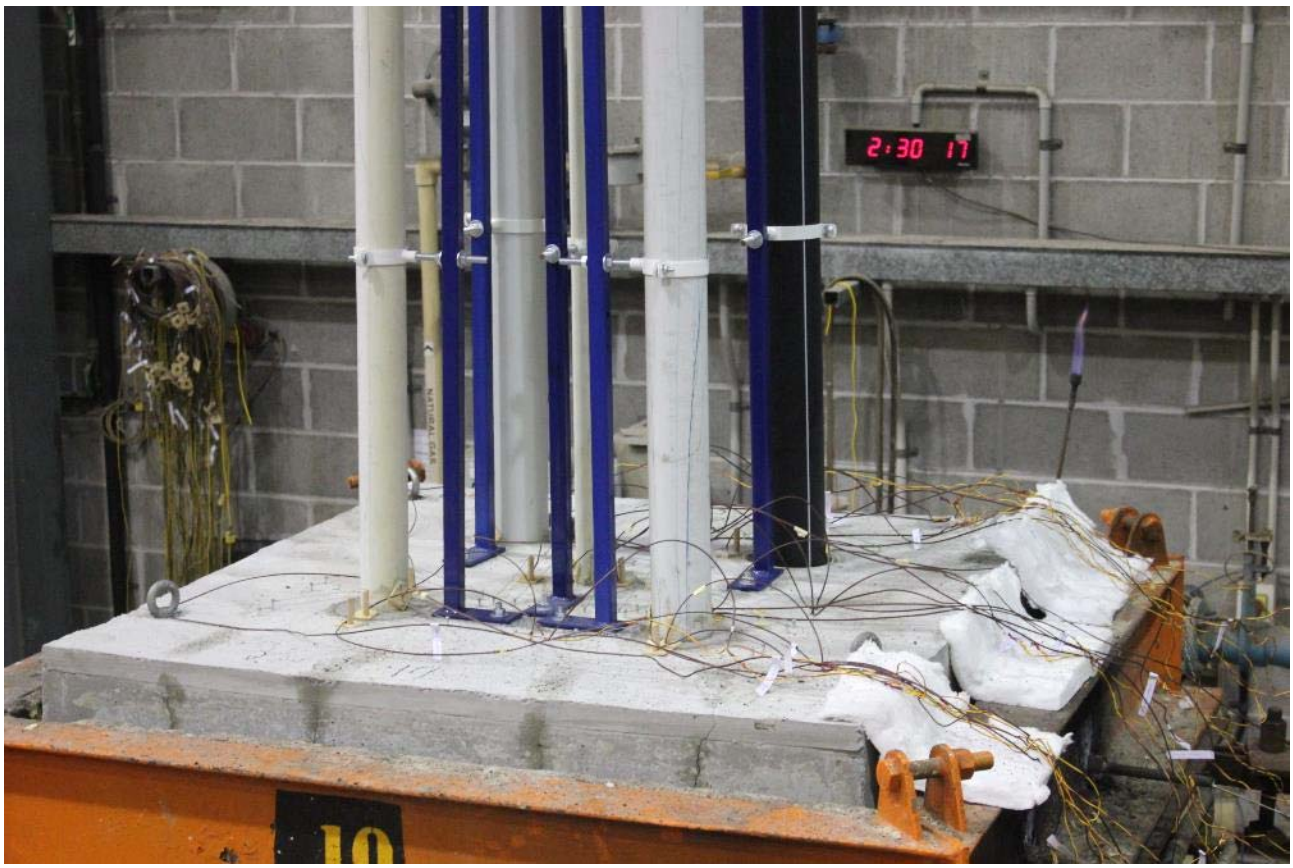
PHOTOGRAPH 2 – UNEXPOSED FACE OF SPECIMENS PRIOR TO TESTING

PHOTOGRAPH 3 – SPECIMENS AFTER 30 MINUTES OF TESTING

PHOTOGRAPH 4 – SPECIMENS AFTER 60 MINUTES OF TESTING

PHOTOGRAPH 5 – SPECIMENS AFTER 90 MINUTES OF TESTING

PHOTOGRAPH 6 – SPECIMENS AFTER 120 MINUTES OF TESTING



PHOTOGRAPH 7 – SPECIMENS AFTER 150 MINUTES OF TESTING

PHOTOGRAPH 8 – SPECIMENS AFTER 180 MINUTES OF TESTING

PHOTOGRAPH 9 – SPECIMENS AFTER 210 MINUTES OF TESTING

PHOTOGRAPH 10 – SPECIMENS AFTER 240 MINUTES OF TESTING

PHOTOGRAPH 11 – UNEXPOSED FACE OF SPECIMENS AT THE CONCLUSION OF TESTING

PHOTOGRAPH 12 – EXPOSED FACE OF SPECIMENS AFTER THE CONCLUSION OF TESTING

Appendix C – Test Data Charts

FIGURE 1 – FURNACE TEMPERATURE

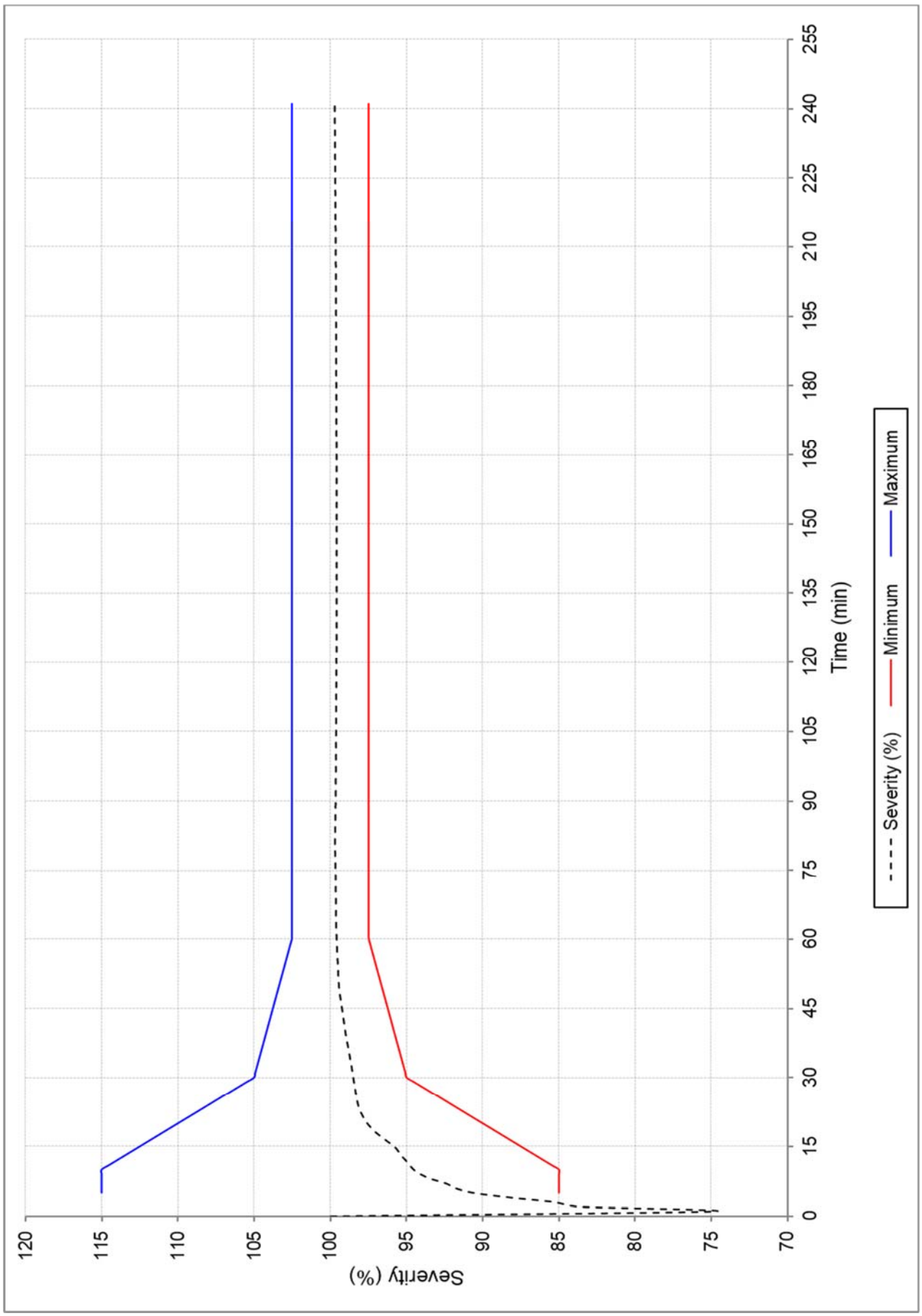


FIGURE 2 – FURNACE SEVERITY

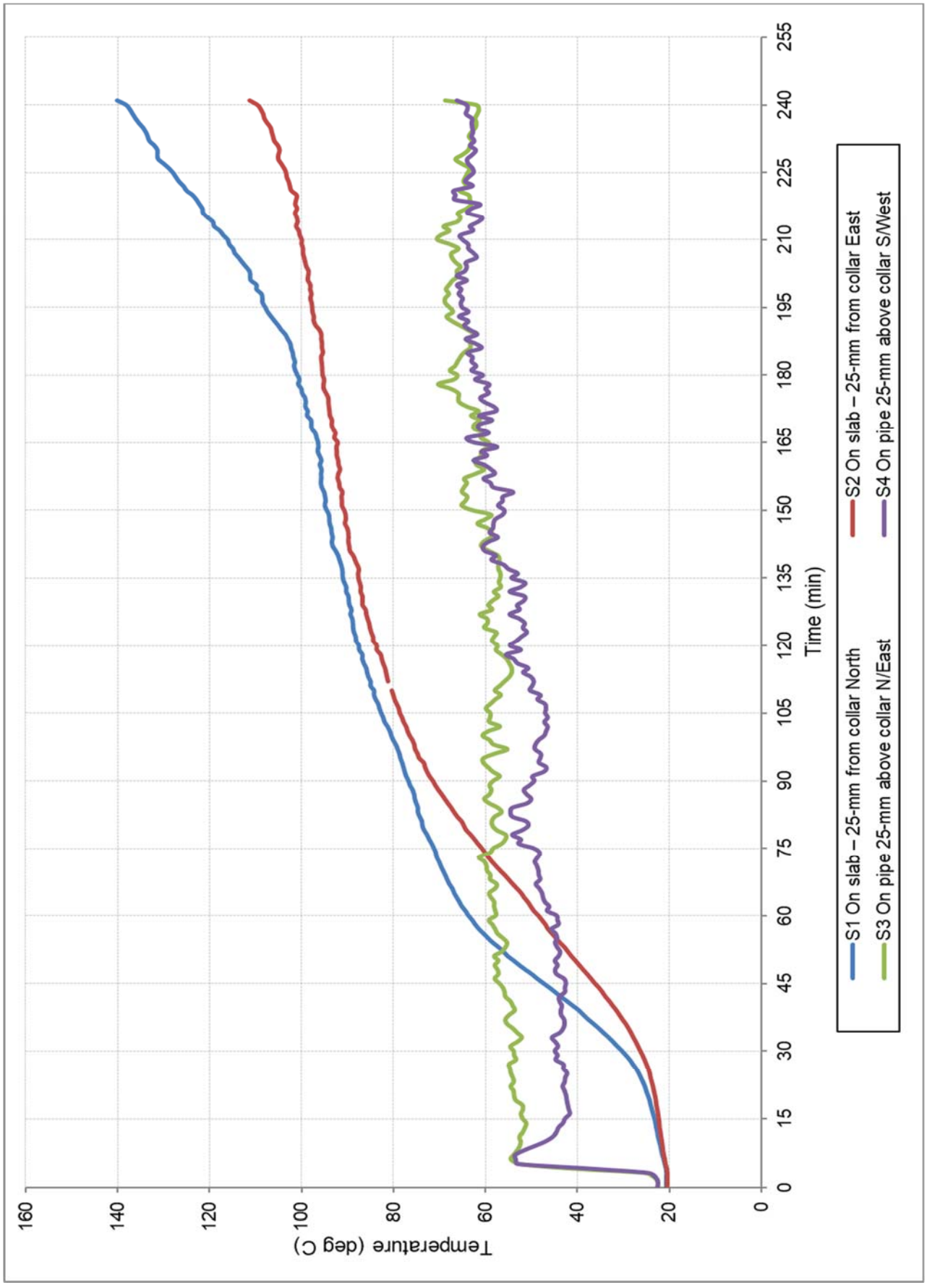


FIGURE 3 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 1

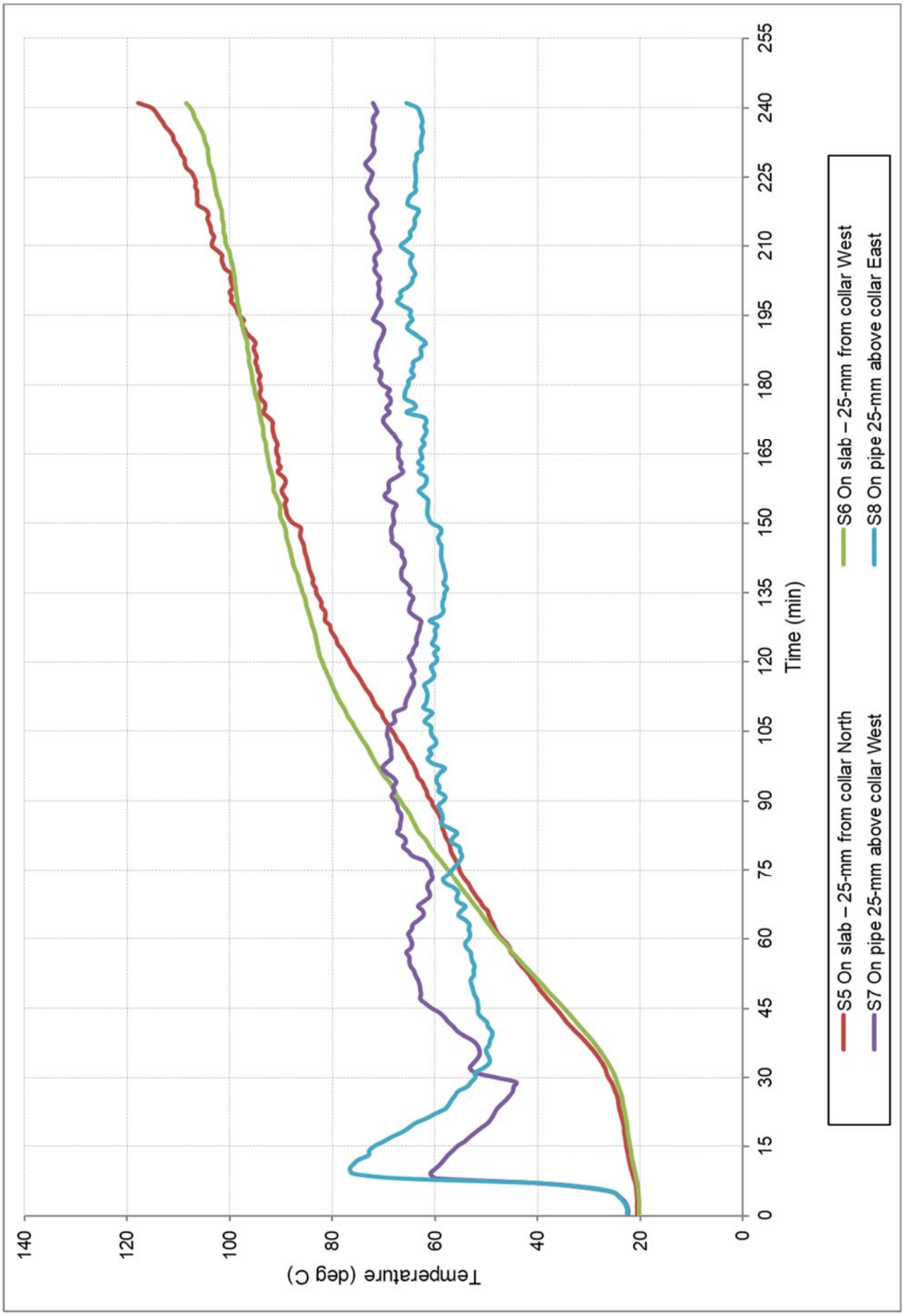


FIGURE 4 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 2

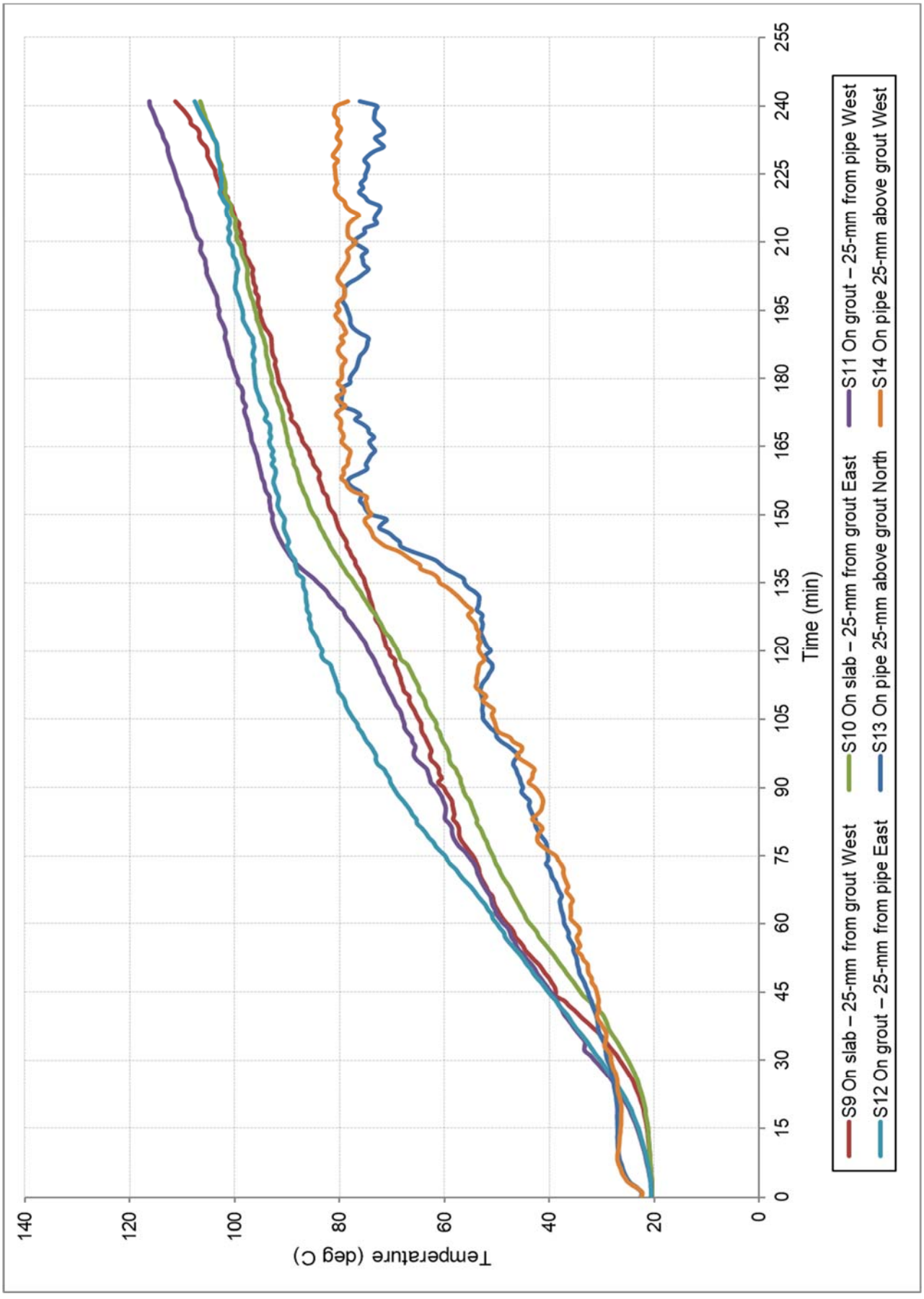


FIGURE 5 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 3

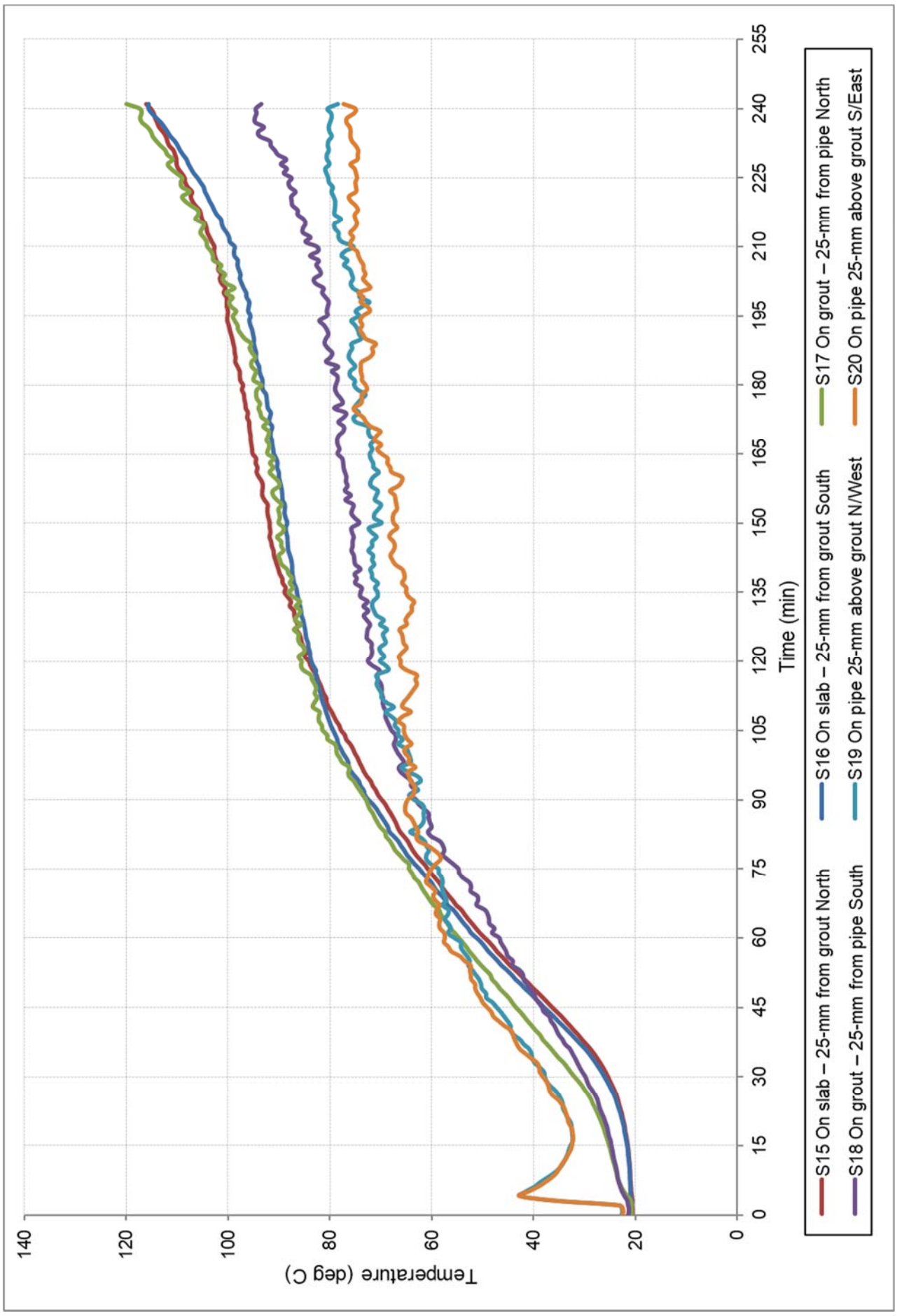


FIGURE 6 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 4

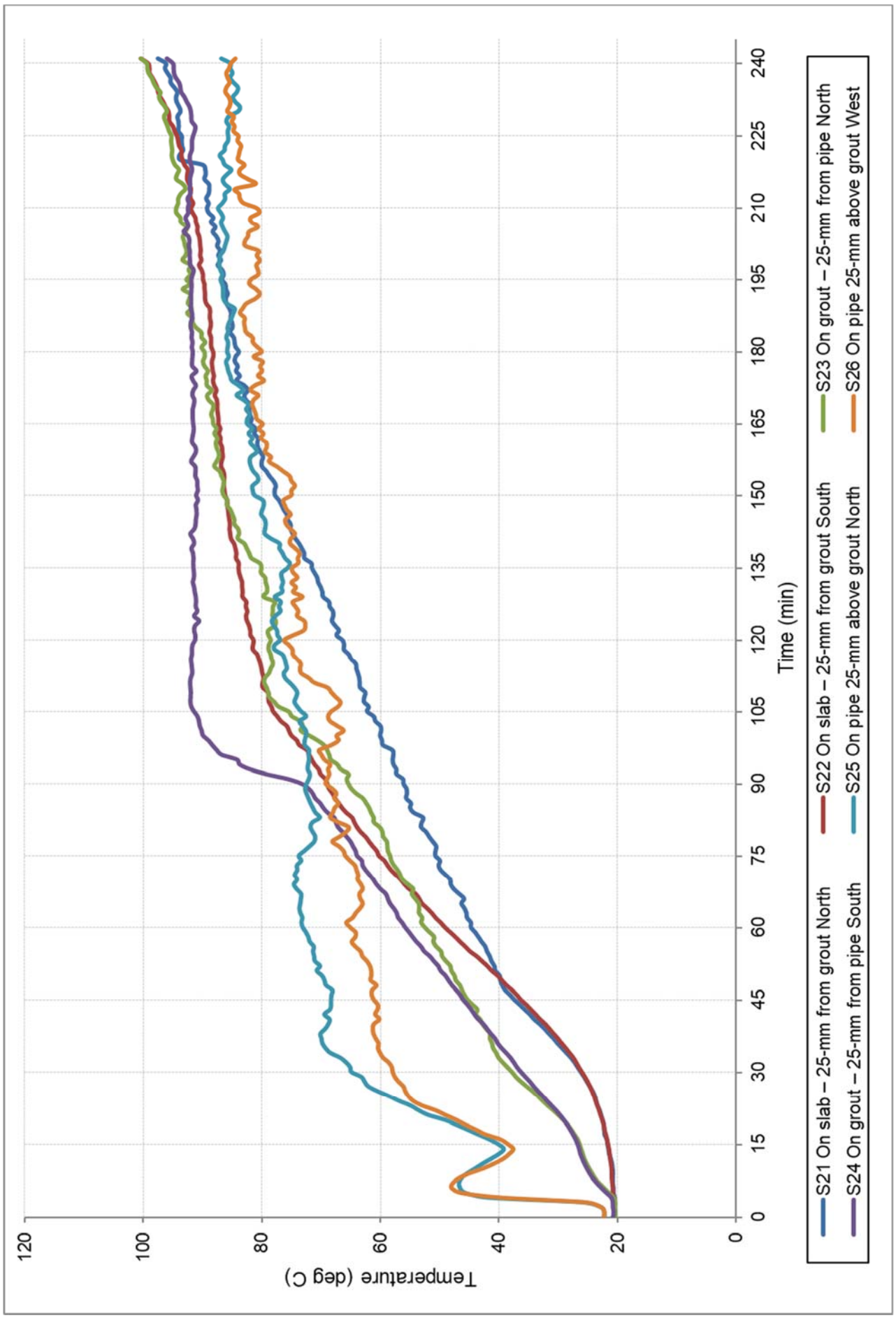
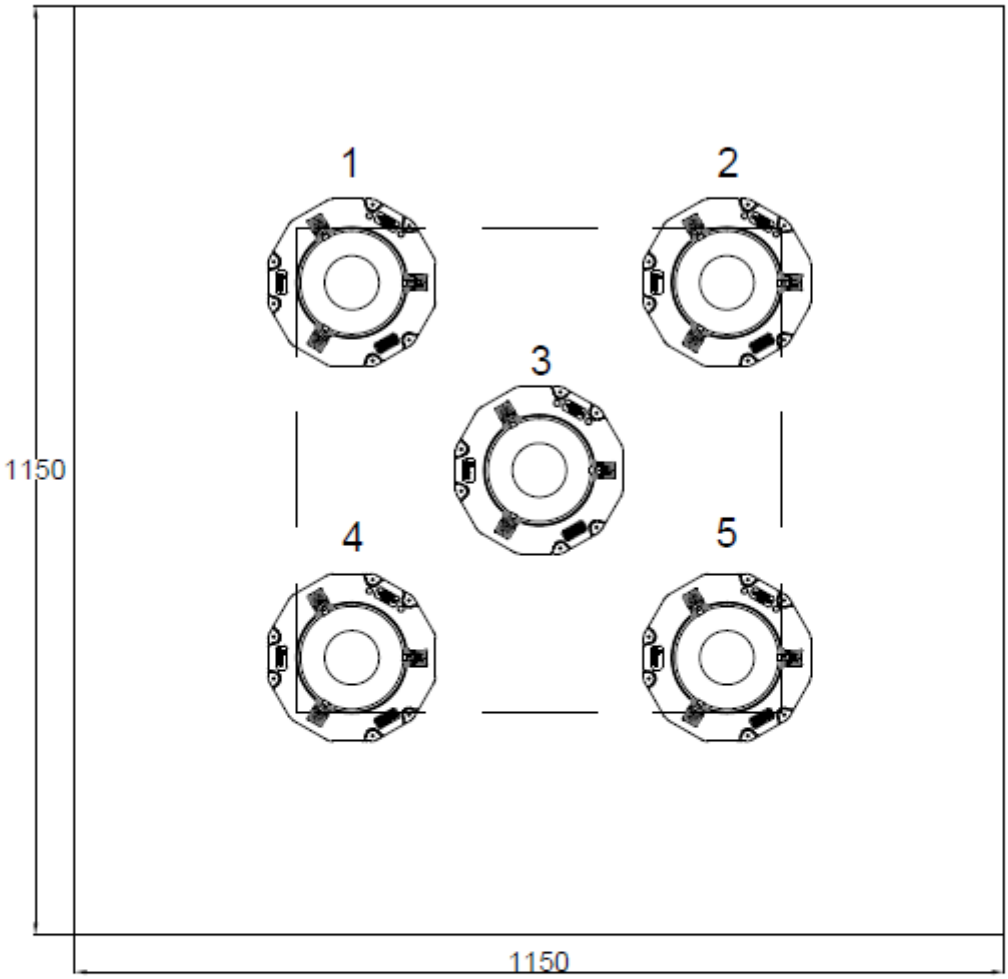


FIGURE 7 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 5

Appendix D – Installation drawings

Snap Fire Systems Pty Ltd
Test Slab S-19-G Layout
Date: 08 MAY 2019



Penetration	Collar Code	Pipe Type	Pipe Diameter (mm)	Fitting
1	H110S	PVC-SC	100	N/A
2	H110S	HDPE	110	N/A
3	H110S	PVC	40	N/A
4	H110S	PVC	65	N/A
5	H110S	PVC	80	N/A

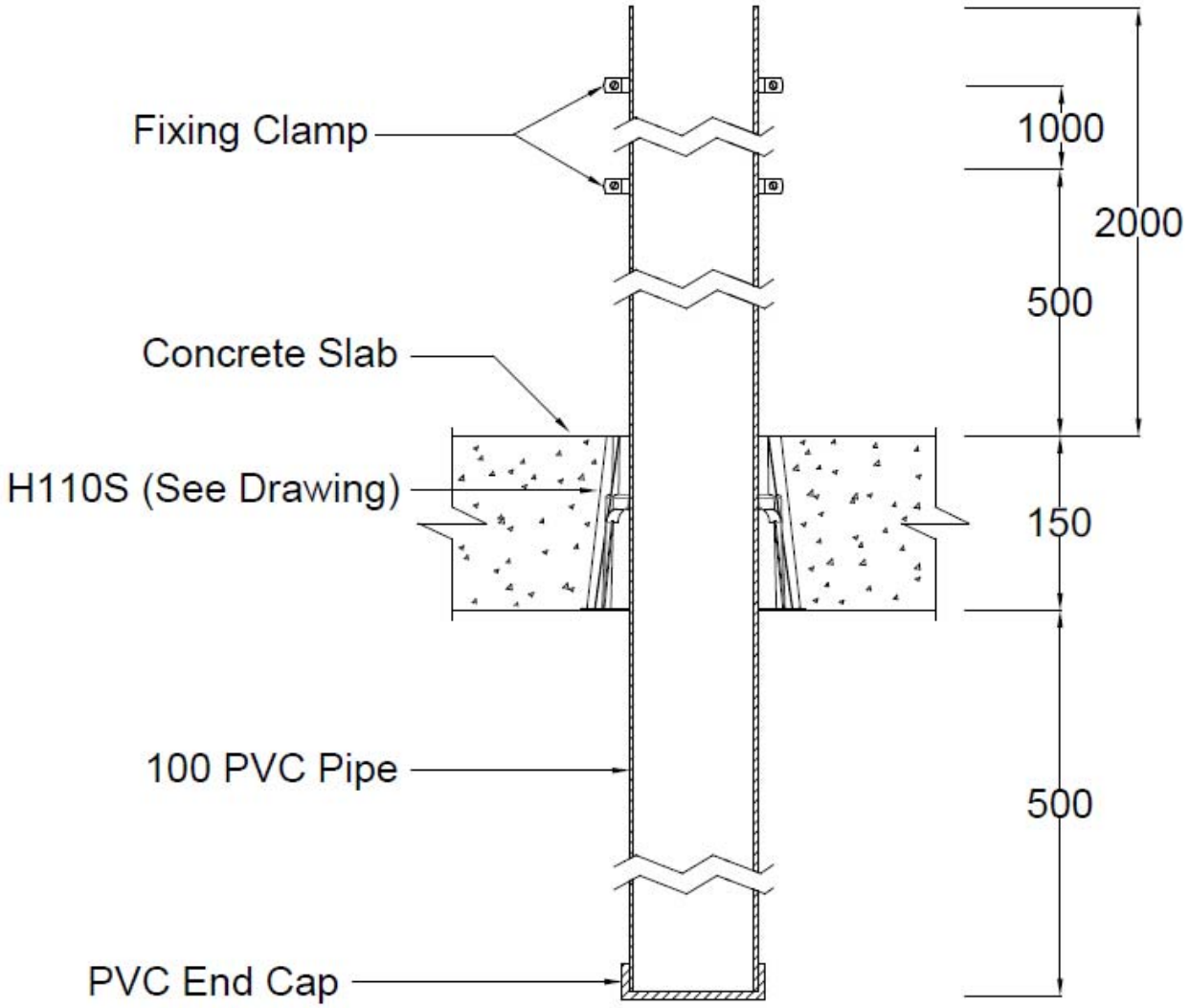
DRAWING TITLED "TEST SLAB S-19-G LAYOUT", DATED 8 MAY 2019, PROVIDED BY SNAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd

Specimen #1

100 PVC Stack & H110S

Date: 15 AUG 2019



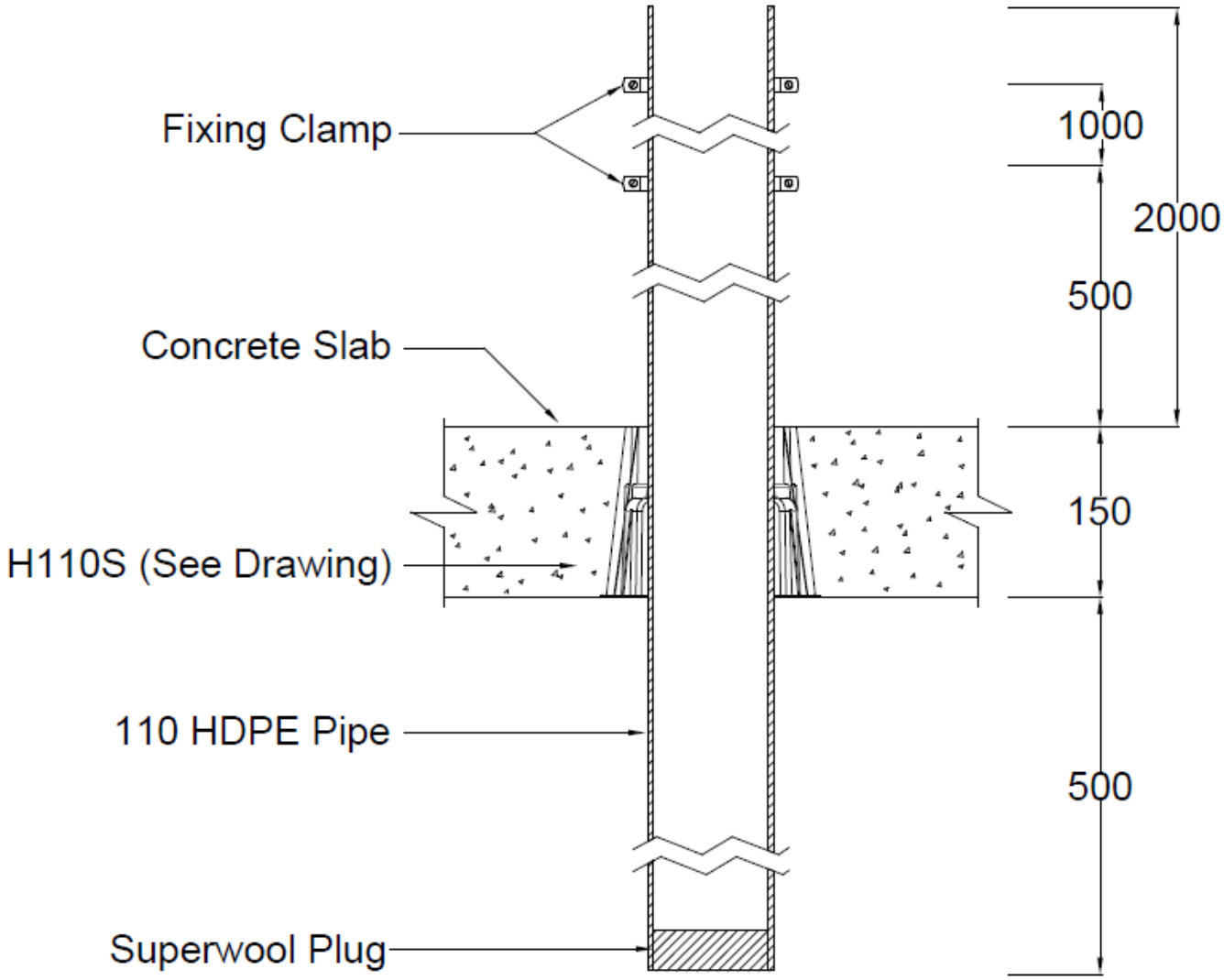
DRAWING "SPECIMEN #1, 100 PVC STACK & H110S", DATED 15 AUGUST 2019, PROVIDED BY SNAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd

Specimen #2

110 HDPE Stack & H110S

Date: 15 AUG 2019



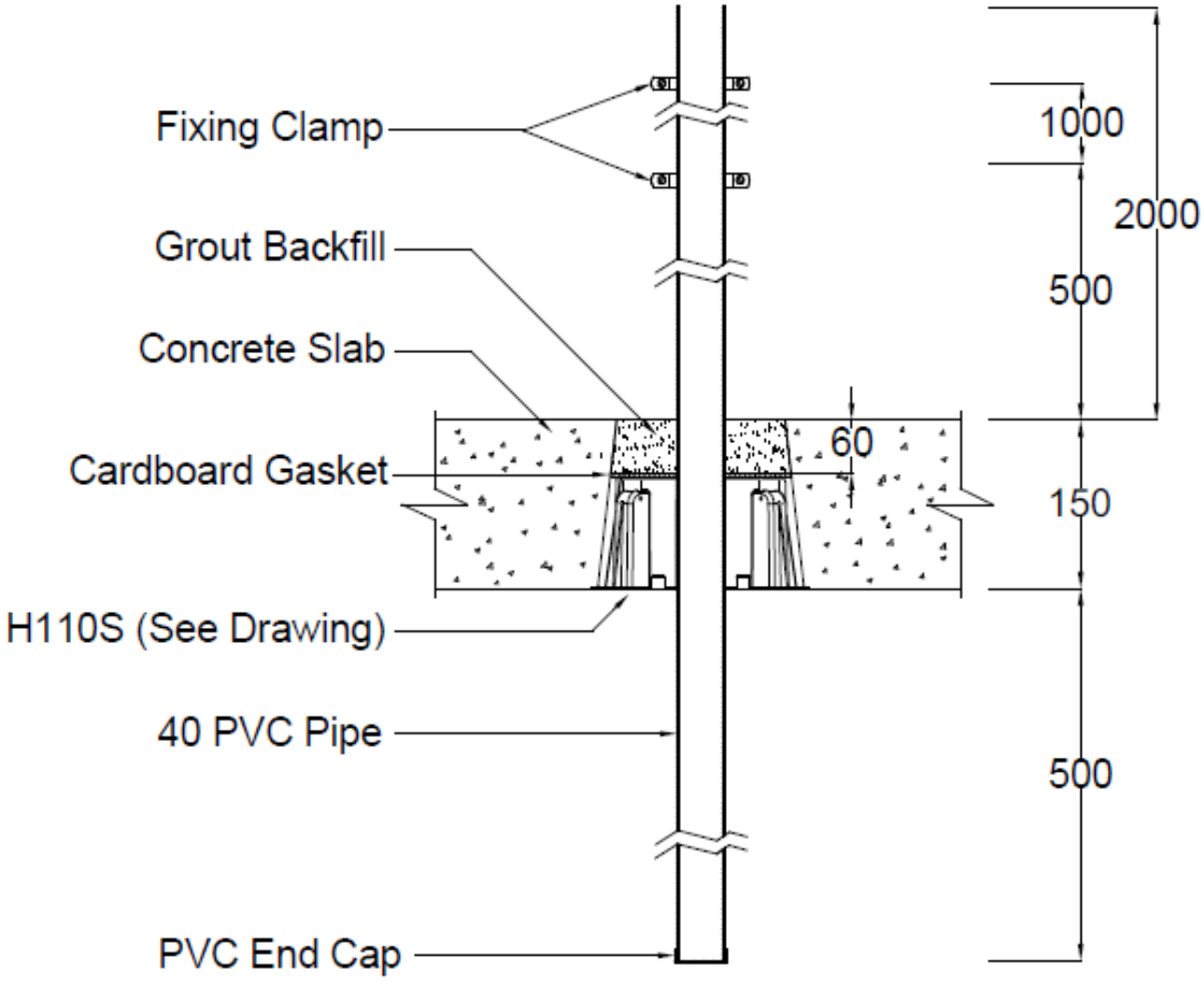
DRAWING TITLED "SPECIMEN # 2, 110 HDPE STACK & H110S", DATED 15 AUGUST 2019, PROVIDED BY SNAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd

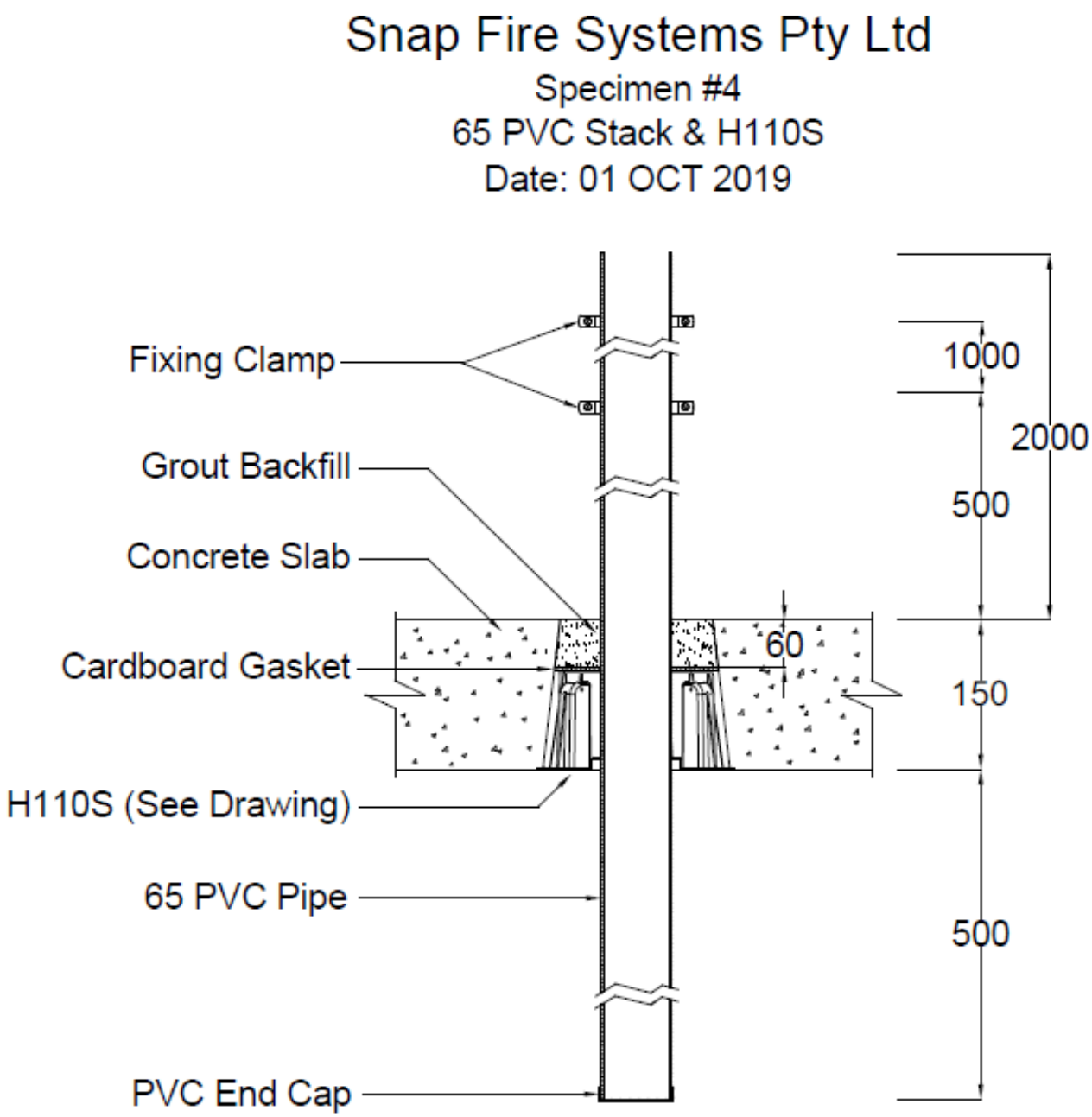
Specimen #3

40 PVC Stack & H110S

Date: 01 OCT 2019



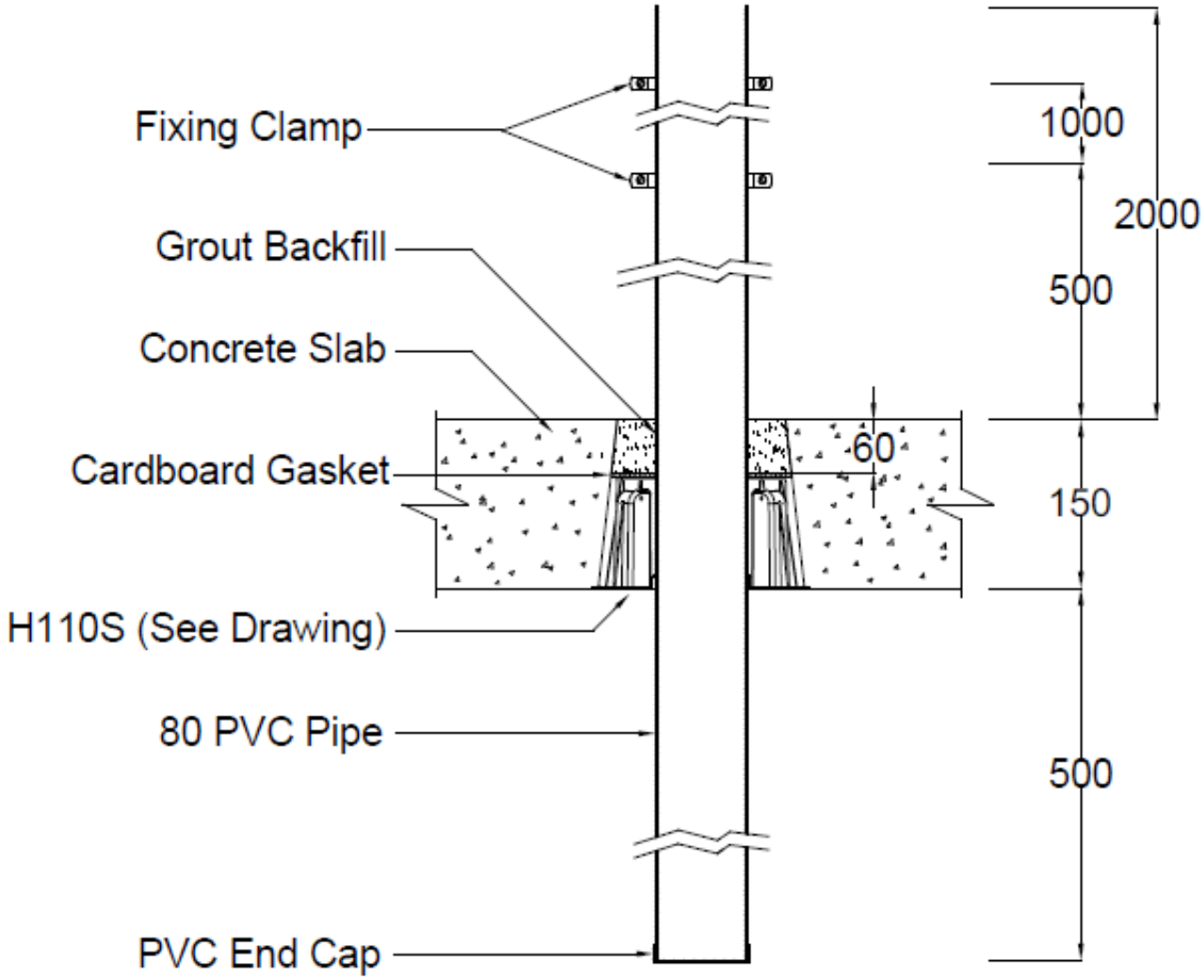
DRAWING TITLED "SPECIMEN # 3, 40 PVC STACK & H110S", DATED 1 OCTOBER 2019, PROVIDED BY SNAP FIRE SYSTEMS PTY LTD



DRAWING TITLED "SPECIMEN #4, 65 PVC STACK & H110S", DATED 1 OCTOBER 2019, PROVIDED BY SNAP FIRE SYSTEMS PTY LTD

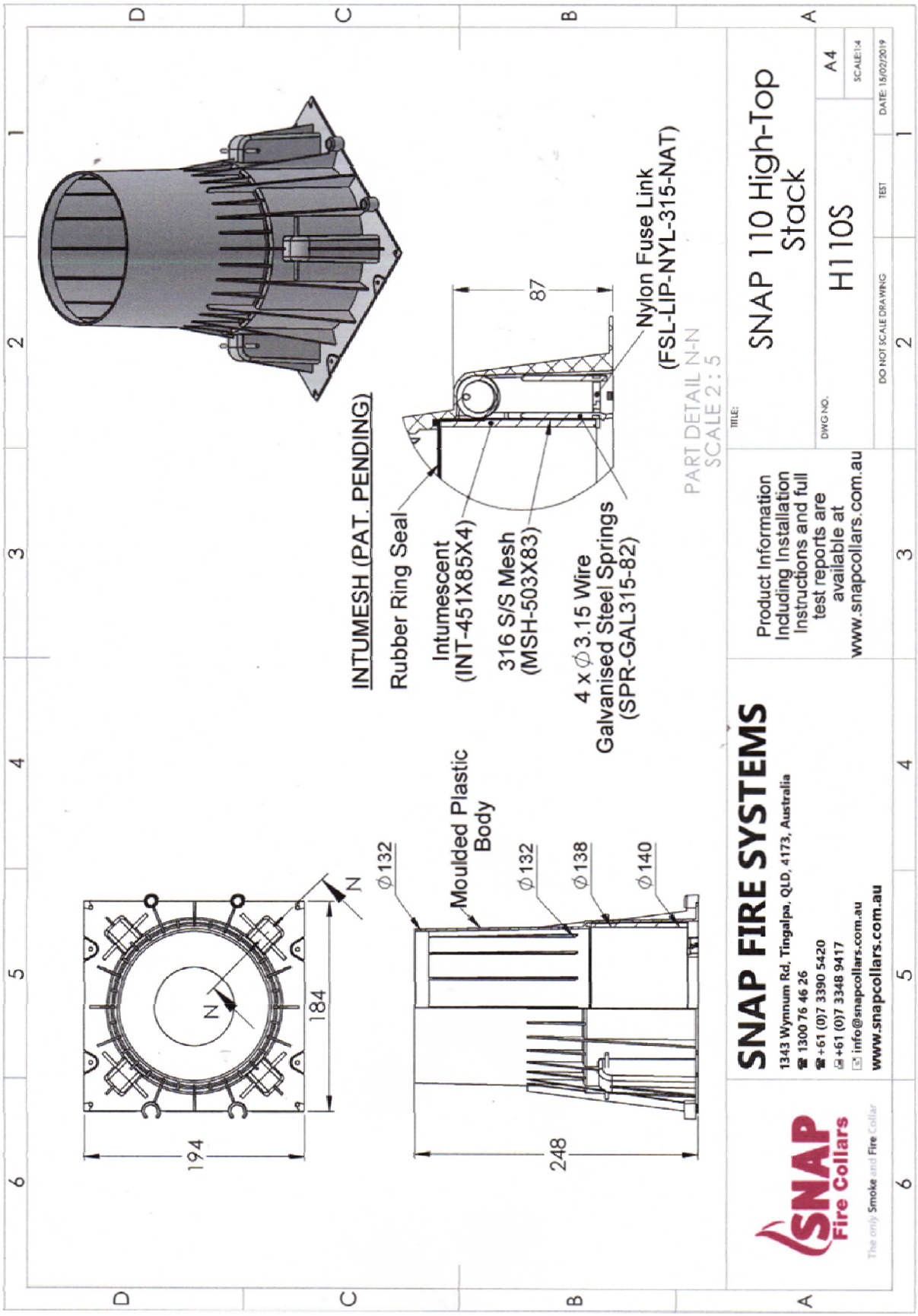
Snap Fire Systems Pty Ltd

Specimen #5
80 PVC Stack & H110S
Date: 01 OCT 2019



DRAWING TITLED "SPECIMEN #5, 80 PVC STACK & H110S", DATED 1 OCTOBER 2019, PROVIDED BY SNAP FIRE SYSTEMS PTY LTD

Appendix E – Specimen Drawings



DRAWING NUMBER H110S, DATED 15 FEBRUARY 2019, 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. 3341

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 report numbered FSP 2050.

Product Name: SNAP H110S Cast-in fire collar protecting a nominal 100-mm polyvinyl chloride sandwich construction (PVC-SC) stack pipe (Specimen 1)

Description: The specimen comprised an 1150-mm x 1150-mm x 150-mm thick concrete slab penetrated by a stack pipe protected by a Snap Fire Systems Cast-in fire collar. The penetrated slab comprised a 150-mm thick concrete slab reinforced with a single layer of steel reinforcement providing a Fire Resistance Period (FRP) for insulation of 180 minutes in accordance with Table 5.5.1 of AS 3600:2018 - Concrete Structures. The SNAP Cast-in H110S fire collar comprised a 1.6-mm thick polypropylene casing with a 140-mm inner diameter and a 194-mm x 184-mm base flange. The 87-mm high collar casing incorporated a layer of 451-mm long x 85-mm wide x 4-mm thick Intumescent material. The closing mechanism comprised four equally spaced steel springs held with nylon fuse links. The springs were fabricated using SPR SS315-82 grade stainless steel wire having a diameter of 3.15-mm, with the springs acting against a layer of 316 grade stainless steel mesh measuring 503-mm x 83-mm. The penetrating service comprised a 110.8-mm outside diameter Iplex polyvinyl chloride sandwich construction pipe with a wall thickness of 3.51-mm fitted through the collar's sleeve. The annular gap between the pipe and the inside collar was left unprotected. The pipe projected vertically, 2000-mm above from the unexposed face of the concrete slab and 500-mm into the furnace chamber. The pipe was supported at nominally 500-mm and 1500 mm from the unexposed face of the slab. The pipe was open at the unexposed end and closed with a PVC end cap on the exposed end.

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

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 -/180/180.

The FRL is applicable when the system is exposed to fire from the same direction as tested. The FRL is limited to that of the separating element. 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. 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: 2 October 2019

Issued on the 29th day of November 2019 without alterations or additions.

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. 3341

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. 3342

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 report numbered FSP 2050.

Product Name: SNAP H110S Cast-in fire collar protecting a nominal 110-mm HDPE (PE100) stack pipe (Specimen 2)

Description: The specimen comprised an 1150-mm x 1150-mm x 150-mm thick concrete slab penetrated by a stack pipe protected by a Snap Fire Systems Cast-in fire collar. The penetrated slab comprised a 150-mm thick concrete slab reinforced with a single layer of steel reinforcement providing a Fire Resistance Period (FRP) for insulation of 180 minutes in accordance with Table 5.5.1 of AS 3600:2018 - Concrete Structures. The SNAP Cast-in H110S fire collar comprised a 1.6-mm thick polypropylene casing with a 140-mm inner diameter and a 194-mm x 184-mm base flange. The 87-mm high collar casing incorporated a layer of 451-mm long x 85-mm wide x 4-mm thick Intumescent material. The closing mechanism comprised four equally spaced steel springs held with nylon fuse links. The springs were fabricated using SPR SS315-82 grade stainless steel wire having a diameter of 3.15-mm, with the springs acting against a layer of 316 grade stainless steel mesh measuring 503-mm long x 83-mm wide. The penetrating service comprised a 111.28-mm outside diameter Vinidex PE100 HDPE pipe with a wall thickness of 4.56-mm fitted through the collar's sleeve. The annular gap between the pipe and the inside collar was left unprotected. The pipe projected vertically, 2000-mm above from the unexposed face of the concrete slab and 500-mm into the furnace chamber. The pipe was supported at nominally 500-mm and 1500-mm from the unexposed face of the slab. The pipe was open at the unexposed end and closed with a PVC end cap.

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

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 -/180/180.

The FRL is applicable when the system is exposed to fire from the same direction as tested. The FRL is limited to that of the separating element. 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. 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: 2 October 2019

Issued on the 29th day of November 2019 without alterations or additions.

B. Roddy

Brett Roddy | Manager, Fire Testing and Assessments

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

Certificate of Test

No. 3343

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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 report numbered FSP 2050.

Product Name: SNAP H110S Cast-in fire collar protecting a nominal 40-mm polyvinyl chloride (PVC) stack pipe (Specimen 3)

Description: The specimen comprised an 1150-mm x 1150-mm x 150-mm thick concrete slab penetrated by a stack pipe protected by a Snap Fire Systems Cast-in fire collar. The penetrated slab comprised a 150-mm thick concrete slab reinforced with a single layer of steel reinforcement providing a Fire Resistance Period (FRP) for insulation of 180 minutes in accordance with Table 5.5.1 of AS 3600:2018 - Concrete Structures. The SNAP Cast-in H110S fire collar comprised a 1.6-mm thick polypropylene casing with a 140-mm inner diameter and a 194-mm x 184-mm base flange. The 87-mm high collar casing incorporated a layer of 451-mm long x 85-mm wide x 4-mm thick Intumescent material. The closing mechanism comprised four equally spaced steel springs held with nylon fuse links. The springs were fabricated using SPR SS315-82 grade stainless steel wire having a diameter of 3.15-mm, with the springs acting against a layer of 316 grade stainless steel mesh measuring 503-mm long x 83-mm wide. The penetrating service comprised a 42.8-mm outside diameter polyvinyl chloride pipe with a wall thickness of 2.1-mm fitted through the collar's sleeve. The annular gap between the pipe and the inside collar was protected with a cardboard gasket then back filled with grout flush to a depth of 60-mm and finished flush with the slab. The pipe projected vertically, 2000-mm above from the unexposed face of the concrete slab and 500-mm into the furnace chamber. The pipe was supported at nominally 500-mm and 1500-mm from the unexposed face of the slab. The pipe was open at the unexposed end and closed with a PVC end cap on the exposed end.

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

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 /180/180.

The FRL is applicable when the system is exposed to fire from the same direction as tested. The FRL is limited to that of the separating element. 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. 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: 2 October 2019

Issued on the 29th day of November 2019 without alterations or additions.

B. Roddy

Brett Roddy | Manager, Fire Testing and Assessments

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Certificate of Test

No. 3344

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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 report numbered FSP 2050.

Product Name: SNAP H110S Cast-in fire collar protecting a nominal 65-mm polyvinyl chloride (PVC) stack pipe (Specimen 4)

Description: The specimen comprised an 1150-mm x 1150-mm x 150-mm thick concrete slab penetrated by a stack pipe protected by a Snap Fire Systems Cast-in fire collar. The penetrated slab comprised a 150-mm thick concrete slab reinforced with a single layer of steel reinforcement providing a Fire Resistance Period (FRP) for insulation of 180 minutes in accordance with Table 5.5.1 of AS 3600:2018 - Concrete Structures. The SNAP Cast-in H110S fire collar comprised a 1.6-mm thick polypropylene casing with a 140-mm inner diameter and a 194-mm x 184-mm base flange. The 87-mm high collar casing incorporated a layer of 451-mm long x 85-mm wide x 4-mm thick Intumescent material. The closing mechanism comprised four equally spaced steel springs held with nylon fuse links. The springs were fabricated using SPR SS315-82 grade stainless steel wire having a diameter of 3.15-mm, with the springs acting against a layer of 316 grade stainless steel mesh measuring 503-mm x 83-mm. The penetrating service comprised a 68.54-mm outside diameter polyvinyl chloride pipe with a wall thickness of 3 mm through the collar's sleeve. The annular gap between the pipe and the inside collar was protected with a cardboard gasket then back filled with grout flush to a depth of 60-mm and finished flush with the slab. The pipe projected vertically, 2000-mm above from the unexposed face of the concrete slab and 500-mm into the furnace chamber. The pipe was supported at nominally 500-mm and 1500-mm from the unexposed face of the slab. The pipe was open at the unexposed end and closed with a PVC end cap on the exposed end.

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

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 /180/180.

The FRL is applicable when the system is exposed to fire from the same direction as tested. The FRL is limited to that of the separating element. 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. 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: 2 October 2019

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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 report numbered FSP 2050.

Product Name: SNAP H110S Cast-in collar protecting a nominal 80-mm polyvinyl chloride (PVC) stack pipe (Specimen 5)

Description: The specimen comprised an 1150-mm x 1150-mm x 150-mm thick concrete slab penetrated by a stack pipe protected by a Snap Fire Systems Cast-in fire collar. The penetrated slab comprised a 150-mm thick concrete slab reinforced with a single layer of steel reinforcement providing a Fire Resistance Period (FRP) for insulation of 180 minutes in accordance with Table 5.5.1 of AS 3600:2018 - Concrete Structures. The SNAP Cast-in H110S fire collar comprised a 1.6-mm thick polypropylene casing with a 140-mm inner diameter and a 194-mm x 184-mm base flange. The 87-mm high collar casing incorporated a layer of 451-mm long x 85-mm wide x 4-mm thick Intumescent material. The closing mechanism comprised four equally spaced steel springs held with nylon fuse links. The springs were fabricated using SPR SS315-82 grade stainless steel wire having a diameter of 3.15-mm, with the springs acting against a layer of 316 grade stainless steel mesh measuring 503-mm long x 83-mm wide. The penetrating service comprised an 81.87-mm outside diameter polyvinyl chloride pipe with a wall thickness of 3.1 mm through the collar's sleeve. The annular gap between the pipe and the inside collar was protected with a cardboard gasket then back filled with grout to a depth of 60 mm and finished flush with the slab. The pipe projected vertically, 2000-mm above from the unexposed face of the concrete slab and 500-mm into the furnace chamber. The pipe was supported at nominally 500-mm and 1500-mm from the unexposed face of the slab. The pipe was open at the unexposed end and closed with a PVC end cap on the exposed end.

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

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 /180/180.

The FRL is applicable when the system is exposed to fire from the same direction as tested. The FRL is limited to that of the separating element. 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. 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: 2 October 2019

Issued on the 29th day of November 2019 without alterations or additions.

B. Roddy

Brett Roddy | Manager, Fire Testing and Assessments

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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.
AS 3600-2018	Concrete structures

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FOR FURTHER INFORMATION

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