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

Test Report

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Report number: FSP 2008
Date: 22 August 2019

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

Commercial-in-confidence

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22 August 2019	22 August 2019	22 August 2019

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

Sponsored Investigation No. FSP 2008

1 Introduction

1.1 Identification of specimen

The sponsor identified the specimen as five (5) cast-in fire collars protecting a 120-mm thick concrete floor slab penetrated by two (2) floor wastes and three (3) 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 4885/4387

1.7 Test date

The fire-resistance test was conducted on 18 June 2019.

2 Description of specimen

2.1 General

The specimen comprised an 1150-mm x 1150-mm x 120-mm thick concrete slab penetrated by two (2) floor wastes and three (3) stack pipes protected by five Snap Fire Systems Cast-in Snap Fire Systems fire collar.

The penetrated slab comprised a 120-mm thick concrete slab reinforced with a single layer of steel reinforcement providing a Fire Resistance Period (FRP) for insulation of 120 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 7671:2010 Plastics piping systems for soil and waste discharge (low and high temperature) inside buildings— Polypropylene (PP).

For the purpose of the test, the specimens were referenced as Specimen 1, 2, 3, 4 and 5. Only four (4) specimens are the subject of this report (Specimens 1, 2, 3 and 5). Documents containing a complete description of each specimen were supplied by the sponsor and are retained on file.

Specimen 1 – SNAP H100S-RR Cast-in collar protecting a nominal 110-mm polypropylene (Valsir Triplus) stack pipe.

The SNAP Cast-in H100S-RR fire collar comprised a 1.6-mm thick polypropylene casing with a 126.5-mm inner diameter and a 213-mm diameter base flange. The 250-mm high collar casing incorporated a 412-mm x 85-mm x 4-mm thick Intumesh intumescent material and a rubber ring seal. The closing mechanism comprised three equally spaced 3.15-mm diameter galvanised steel springs bound with nylon fuse links acting against a 460-mm x 83-mm 316 stainless steel mesh as shown in drawing numbered H100S-RR-T dated 29 September 2017, by Snap Fire Systems Pty Ltd.

The penetrating service comprised a 111.5-mm outside diameter polypropylene pipe with a wall thickness of 4.2-mm through the collar's sleeve. The annular gap between the pipe and the inside collar was protected with a bead of Fullers Firesound sealant as shown in drawing titled "Specimen #1, 110 Triplus Stack & H100S-RR", dated 15 May 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 Superwool plug on the exposed end.

Specimen 2 – SNAP H100FWS-RR Cast-in fire collar protecting a nominal 110-mm polyvinyl chloride sandwich construction (PVC-SC) floor waste incorporating a 4-way riser.

The SNAP Cast-in H100FWS-RR fire collar comprised a 1.6-mm thick polypropylene casing with a 126.5-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 110-mm outside diameter polyvinyl chloride sandwich construction pipe with a wall thickness of 3.4-mm fitted through the collar's sleeve. The floor waste system was fitted with a chrome brass grate and ABS Puddle Flange. A 15-mm thick grout screed was laid on top of the concrete slab and finished flush with the floor grate. On the exposed side of the slab, a 4-way riser was connected to the penetrating pipe, supported by two M10 threaded rod and steel drop-in anchor to the concrete slab. On the exposed face, the 4-way riser was capped using a polyvinyl chloride sandwich construction end cap. The floor waste gully was charged with water to the level shown in drawing titled "Specimen #2, 100 PVC Stack & H100FWS-RR", dated 15 May 2019, provided by Snap Fire Systems Pty Ltd.

Specimen 3 – SNAP H50S-RR Cast-in collar protecting a nominal 40-mm polyvinyl chloride (PVC-U) stack pipe.

The SNAP Cast-in H50S-RR fire collar comprised a 1.6-mm thick polypropylene casing with a 67-mm inner diameter and a 150-mm diameter base flange. The 250-mm high collar casing incorporated a 230-mm x 55-mm x 5-mm thick Intumesh intumescent material and a rubber ring seal. The closing mechanism comprised three galvanised steel springs bound with nylon fuse links and a 268-mm x 53-mm 316 stainless steel mesh as shown in drawing numbered H50S-RR-T dated 29 September 2017, by Snap Fire Systems Pty Ltd.

The penetrating service comprised a 43.35-mm outside diameter PVC pipe with a wall thickness of 2.21-mm through the collar's sleeve. The annular gap between the pipe and the inside collar was protected with a bead of Fullers Firesound sealant as shown in drawing titled "Specimen #3, 40 PVC Stack & H50S-RR", dated 15 May 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 H100S-RR Cast-in collar protecting a nominal 75-mm polypropylene (Triplus) stack pipe.

The SNAP Cast-in H100S-RR fire collar comprised a 1.6-mm thick polypropylene casing with a 126.5-mm inner diameter and a 213-mm diameter base flange. The 250-mm high collar casing incorporated a 412-mm x 85-mm x 4-mm thick Intumesh intumescent material and a rubber ring seal. The closing mechanism comprised three equally spaced 3.15-mm diameter galvanised steel springs bound with nylon fuse links acting against a 460-mm x 83-mm 316 stainless steel mesh as shown in drawing numbered H100S-RR-T dated 29 September 2017, by Snap Fire Systems Pty Ltd.

The penetrating service comprised a 75.4-mm outside diameter polypropylene pipe with a wall thickness of 2.87-mm through the collar's sleeve. The annular gap between the pipe and the inside collar was protected with a cardboard gasket then backfilled flush with grout level with the slab as shown in drawing titled "Specimen #5, 75 Triplus Stack & H100S-RR", dated 15 May 2019, provided by Snap Fire Systems Pty Ltd. The pipe projected vertically, approximately 2000-mm above from the unexposed face of the concrete floor and approximately 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 Superwool plug on the exposed end.

2.2 Dimensions

The specimen comprised an 1150-mm x 1150-mm x 120-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 floor 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-C Layout", dated 8 May 2019 provided by Snap Fire Systems Pty Ltd.
- Drawing titled "Specimen #1 110 Triplus Stack & H100S-RR", dated 15 May 2019, provided by Snap Fire Systems Pty Ltd.
- Drawing titled "Specimen #2 100 PVC Stack & H100FWS-RR", dated 15 May 2019, provided by Snap Fire Systems Pty Ltd.
- Drawing titled "Specimen #3 40 PVC Stack & H50S-RR", dated 15 May 2019, provided by Snap Fire Systems Pty Ltd.
- Drawing titled "Specimen #5 75 Triplus Stack & H100S-RR", dated 15 May 2019, provided by Snap Fire Systems Pty Ltd.

- Drawing number H100S-RR-T, dated 29 September 2017, by Snap Fire Systems Pty Ltd.

- Drawing number H100FWS-RR-T, dated 29 September 2017, by Snap Fire Systems Pty Ltd.
- Drawing number H50S-RR-T, dated 29 September 2017, 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 17°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 pipes of Specimens 1 ,3 and 5.
4 minutes -	Smoke has ceased fluing from Specimens 3 and 5.
5 minutes -	Cotton wool pad test applied above the grate of Specimen 2 floor waste. No ignition noted at this time.
8 minutes -	Smoke level fluing from Specimen 1 has reduced.
22 minutes -	Steam is being emitted from the concrete around the base of Specimen 3 with water pooling.
24 minutes -	Steam is being emitted from the concrete around the base of Specimens 1 and 5.
38 minutes -	Smoke has ceased fluing from Specimens 1.
68 minutes -	Intumescent sealant around the base of Specimens 1 and 2 has begun to swell.
122 minutes -	Intumescent sealant around the base of Specimens 1 and 2 continues to swell. Light smoke is being emitted from the grate of Specimen 2 floor waste.
180 minutes -	Intumescent sealant around the base of Specimens 1 and 3 continues to swell. Cracks have formed at the base of Specimen 5 between the grout and concrete.
184 minutes -	Cotton wool pad test applied above the grate of Specimen 2 floor waste. No ignition noted at this time.
190 minutes -	Insulation failure of Specimen 1 - maximum temperature rise of 180K is exceeded on the slab 25-mm from mastic on the unexposed face.
203 minutes -	Insulation failure of Specimen 5 - maximum temperature rise of 180K is exceeded on the slab 25-mm from grout on the unexposed face.
205 minutes -	Insulation failure of Specimen 3 - maximum temperature rise of 180K is exceeded on the slab 25-mm from mastic on the unexposed face.
235 minutes -	Insulation failure of Specimen 2 - maximum temperature rise of 180K is exceeded on the slab 25-mm from screed on the unexposed face.
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 5.

8.5 Performance

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

Specimen 1 – SNAP H100S-RR Cast-in collar protecting a nominal 110-mm polypropylene (Valsir Triplus) stack pipe.

Structural adequacy	-	not applicable
Integrity	-	no failure at 241 minutes
Insulation	-	190 minutes

Specimen 2 – SNAP H100FWS-RR Cast-in fire collar protecting a nominal 110-mm polyvinyl chloride sandwich construction (PVC-SC) floor waste incorporating a 4-way riser.

Structural adequacy	-	not applicable
Integrity	-	no failure at 241 minutes
Insulation	-	235 minutes

Specimen 3 – SNAP H50S-RR Cast-in collar protecting a nominal 40-mm polyvinyl chloride (PVC-U) stack pipe.

Structural adequacy	-	not applicable
Integrity	-	no failure at 241 minutes
Insulation	-	205 minutes

Specimen 5 – SNAP H100S-RR Cast-in collar protecting a nominal 75-mm polypropylene (Triplus) stack pipe.

Structural adequacy	-	not applicable
Integrity	-	no failure at 241 minutes
Insulation	-	203 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 - -/120/120

Specimen 2 - -/120/120

Specimen 3 - -/120/120

Specimen 5 - -/120/120

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

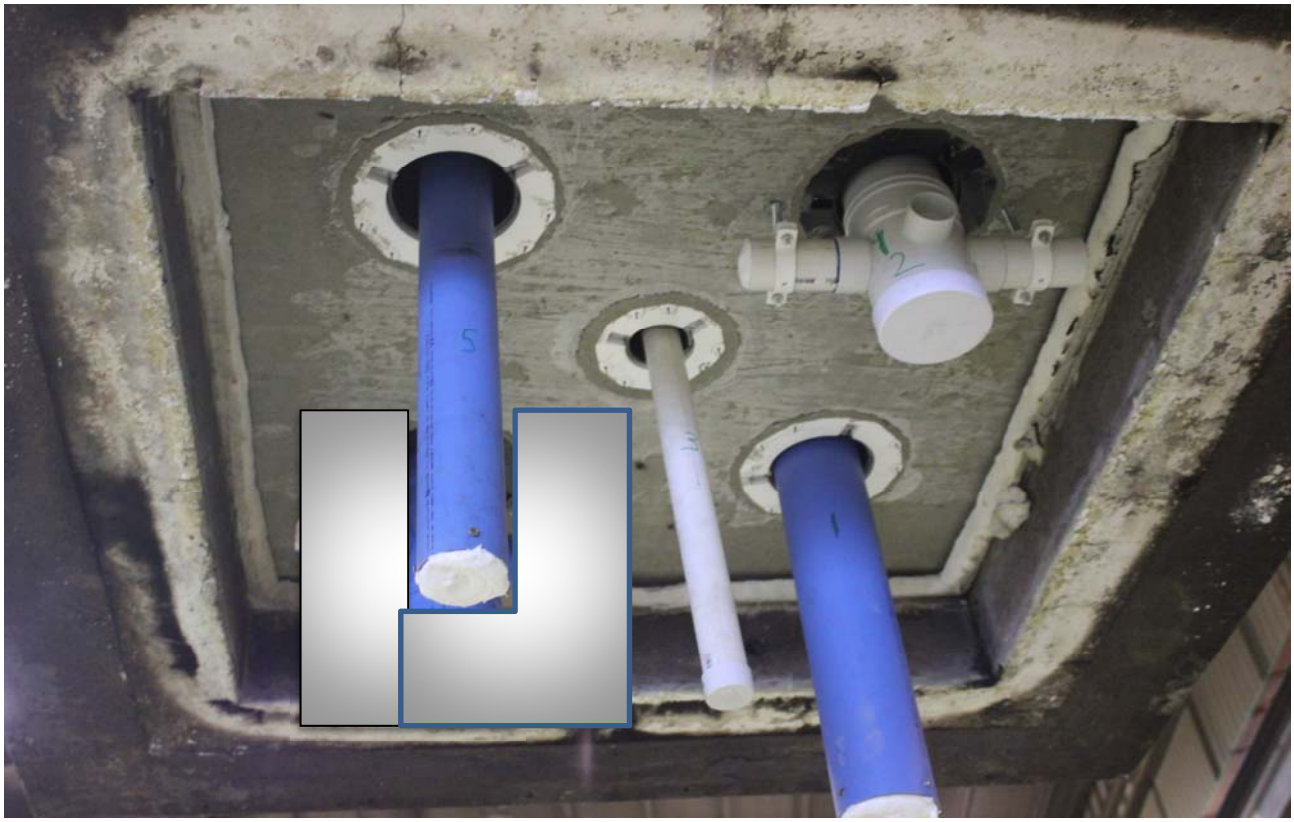
Peter Gordon
Testing Officer

Appendices

Appendix A – Measurement location

Specimen	Thermocouple Position	T/C designation
SPECIMEN 1 – Valsir Triplus polypropylene 111.5-mm OD x 4.2-mm wall thickness ***stack pipe*** protected with a H100S-RR Cast-in fire collar.	On top of the slab – 25-mm from Mastic (North)	S1
	On top of the slab – 25-mm from Mastic (East)	S2
	On Pipe 25-mm above mastic (East)	S3
	On Pipe 25-mm above mastic(South)	S4
SPECIMEN 2 – Ipex PVC-SC pipe 100-mm OD x 3.4-mm wall thickness pipe with a ***floor waste*** and 4-Way riser protected with a H100FWS cast-in fire collar	On top of the slab – 25-mm from screed (West)	S5
	On top of the slab – 25-mm from screed (South)	S6
	On Screed 25-mm from Grate (West)	S7
	On Screed 25-mm from Grate (South)	S8
	On centre of the Grate	S9
SPECIMEN 3 – Ipex PVC 43.35-mm OD x 2.1-mm thick ***stack pipe*** protected with a H50S-RR Cast-in fire collar.	On top of the slab – 25-mm from Mastic (West)	S10
	On top of the slab – 25-mm from Mastic (East)	S11
	On Pipe 25-mm above mastic(South-West)	S12
	On Pipe 25-mm above mastic (North-East)	S13
SPECIMEN 5 – Valsir Triplus polypropylene 75.4-mm OD x 2.87-mm thick ***stack pipe*** protected with a H100S-RR Cast-in fire collar.	On top of the slab – 25-mm from Mastic (North)	S19
	On top of the slab – 25-mm from Mastic (South)	S20
	On grout 25-mm from pipe (North)	S21
	On grout 25-mm from pipe (South)	S22
	On Pipe 25-mm from Grout (North-East)	S23
	On Pipe 25-mm from Grout (West)	S24
Rover	Rover	S25
Ambient	Ambient	S26

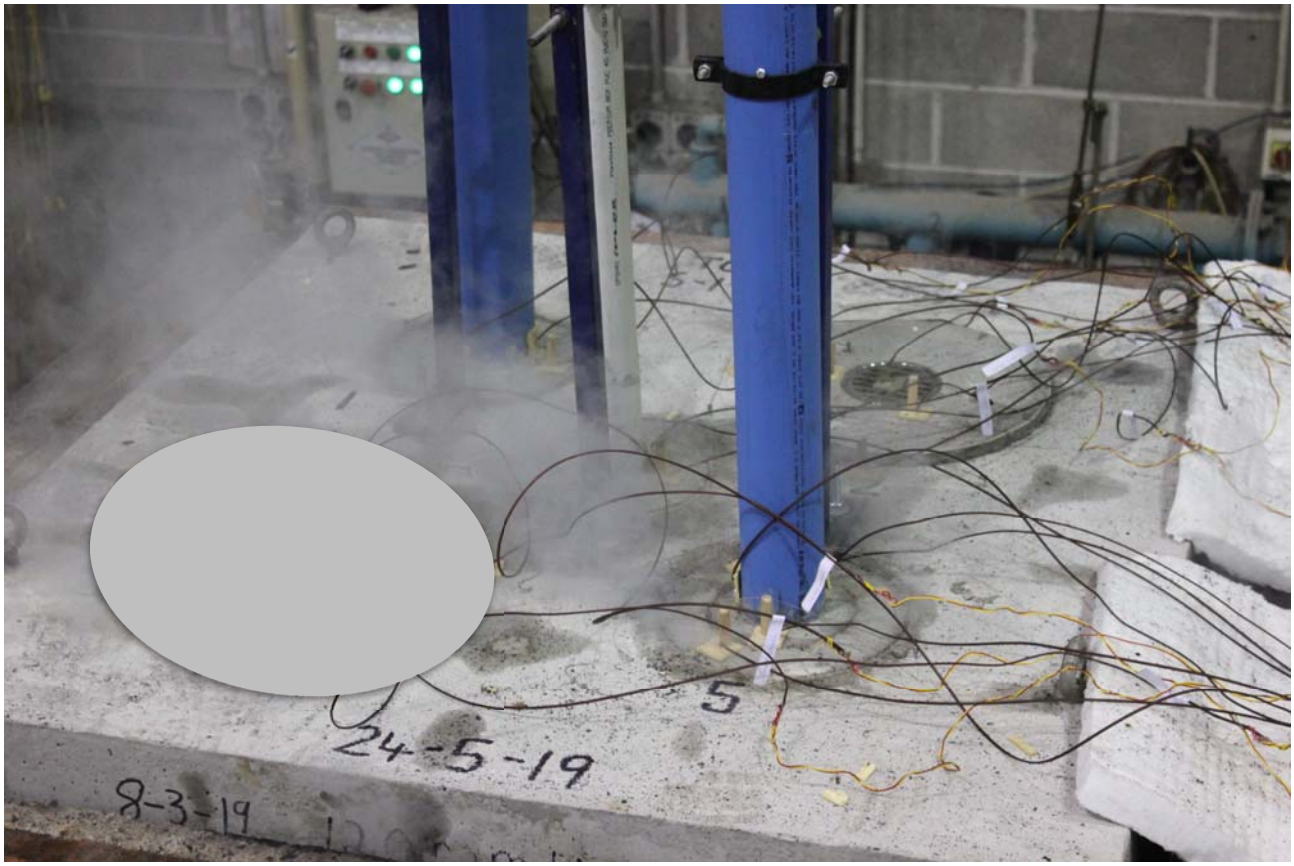
Appendix B – Photographs



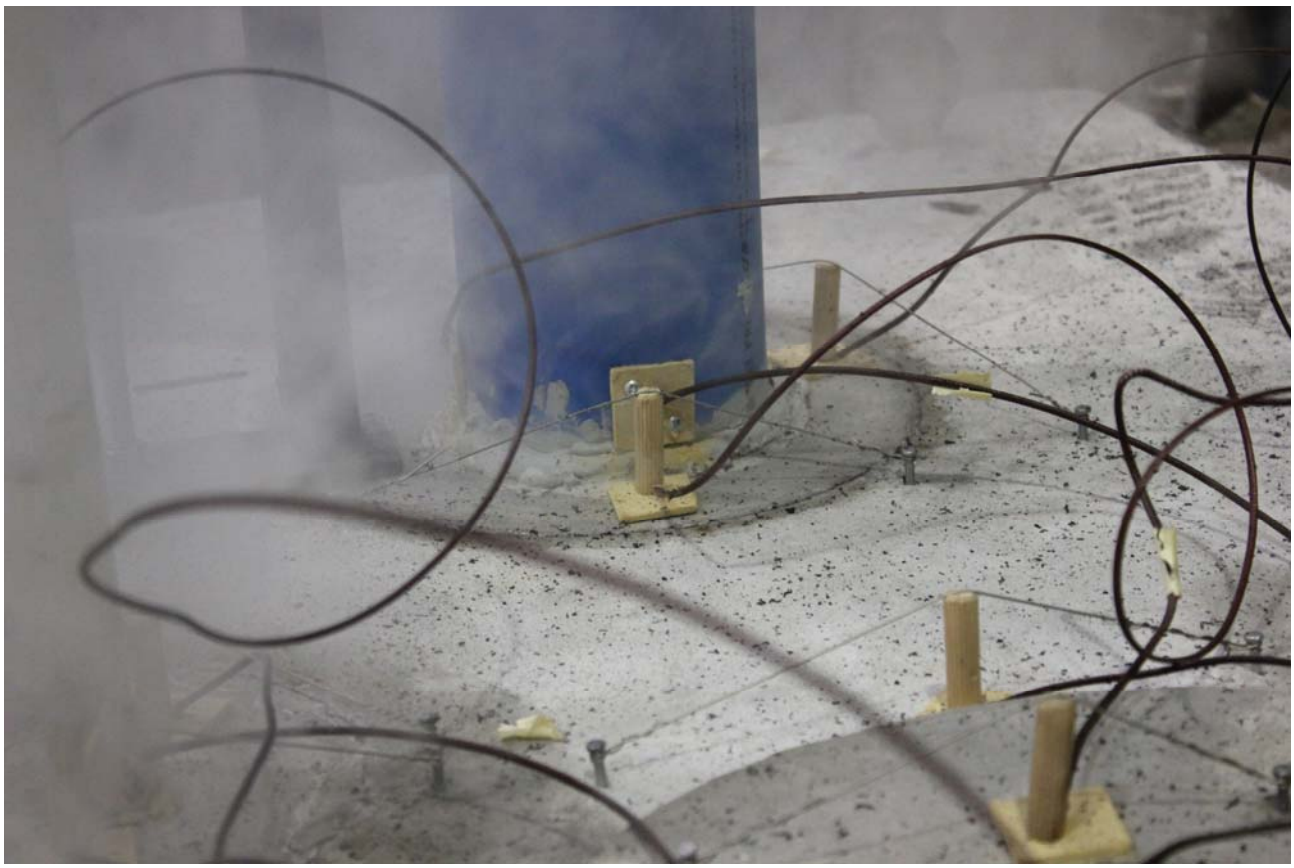
PHOTOGRAPH 1 – EXPOSED FACE OF SPECIMENS PRIOR TO TESTING

PHOTOGRAPH 2 – UNEXPOSED FACE OF SPECIMENS PRIOR TO TESTING

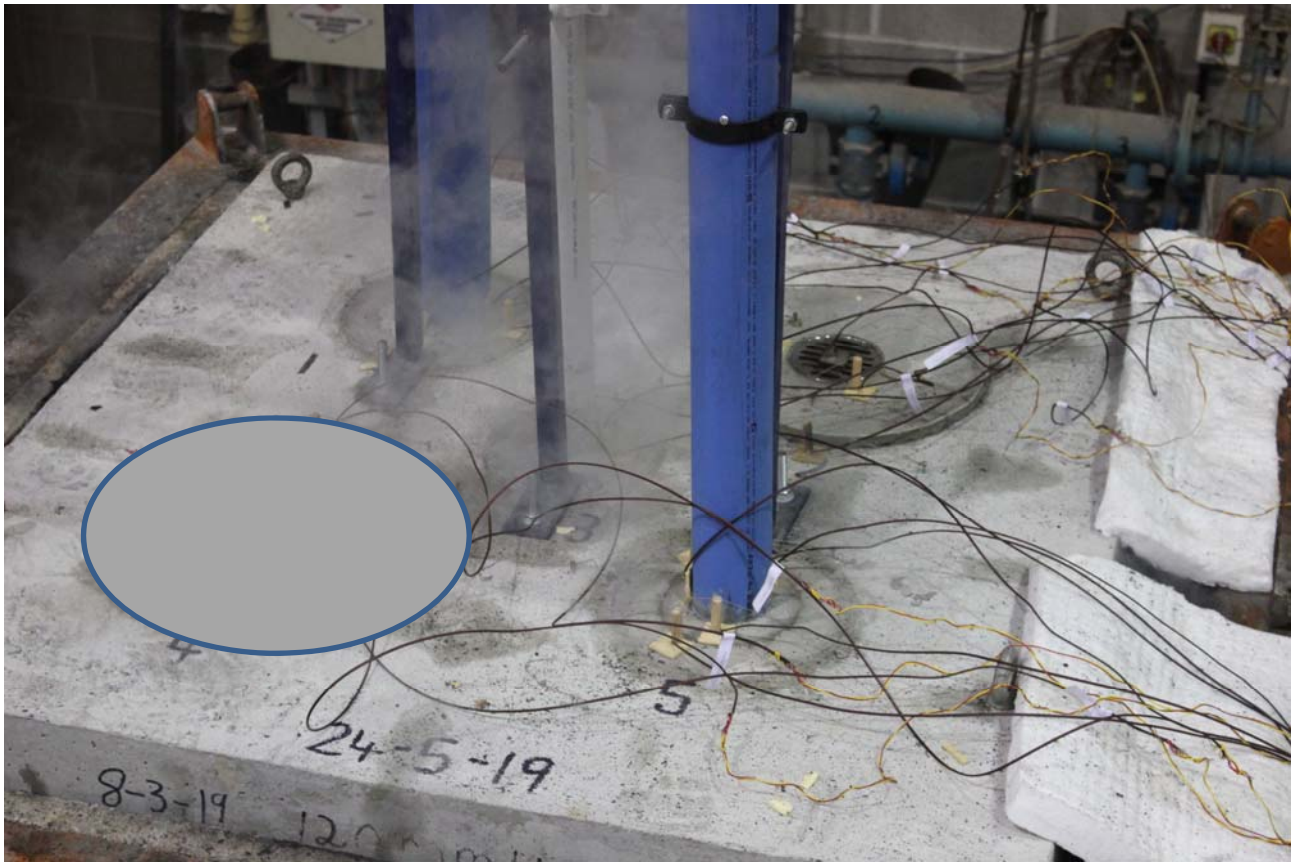
PHOTOGRAPH 3 – SPECIMENS AFTER 30 MINUTES OF TESTING



PHOTOGRAPH 4 – SPECIMENS AFTER 60 MINUTES OF TESTING

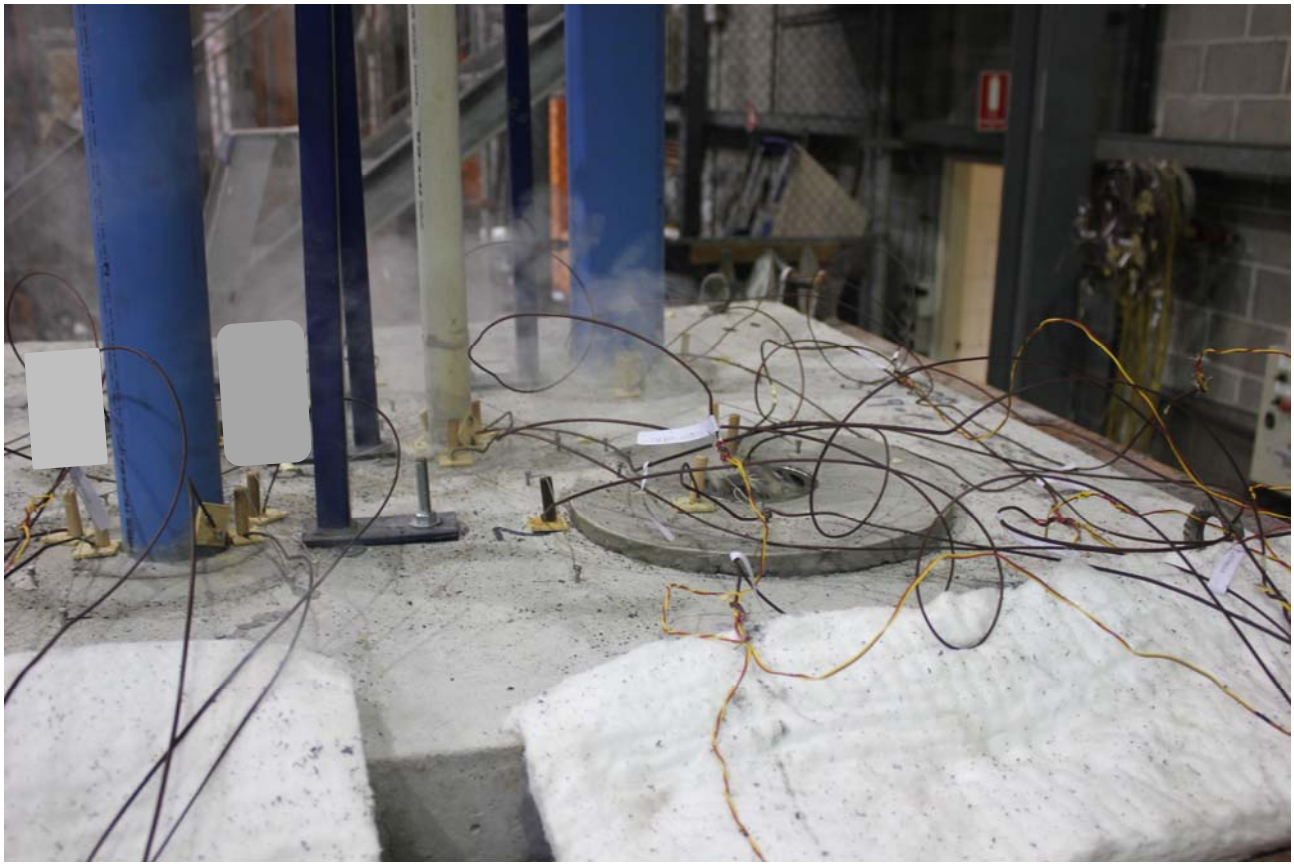


PHOTOGRAPH 5 – SPECIMEN 1 AFTER 68 MINUTES OF TESTING



PHOTOGRAPH 6 – SPECIMENS AFTER 90 MINUTES OF TESTING

PHOTOGRAPH 7 – SPECIMENS AFTER 120 MINUTES OF TESTING



PHOTOGRAPH 8 – SPECIMENS AFTER 150 MINUTES OF TESTING

PHOTOGRAPH 9 – SPECIMENS AFTER 180 MINUTES OF TESTING

PHOTOGRAPH 10 – SPECIMENS AFTER 240 MINUTES OF TESTING

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

Appendix C – Test Data Sheets

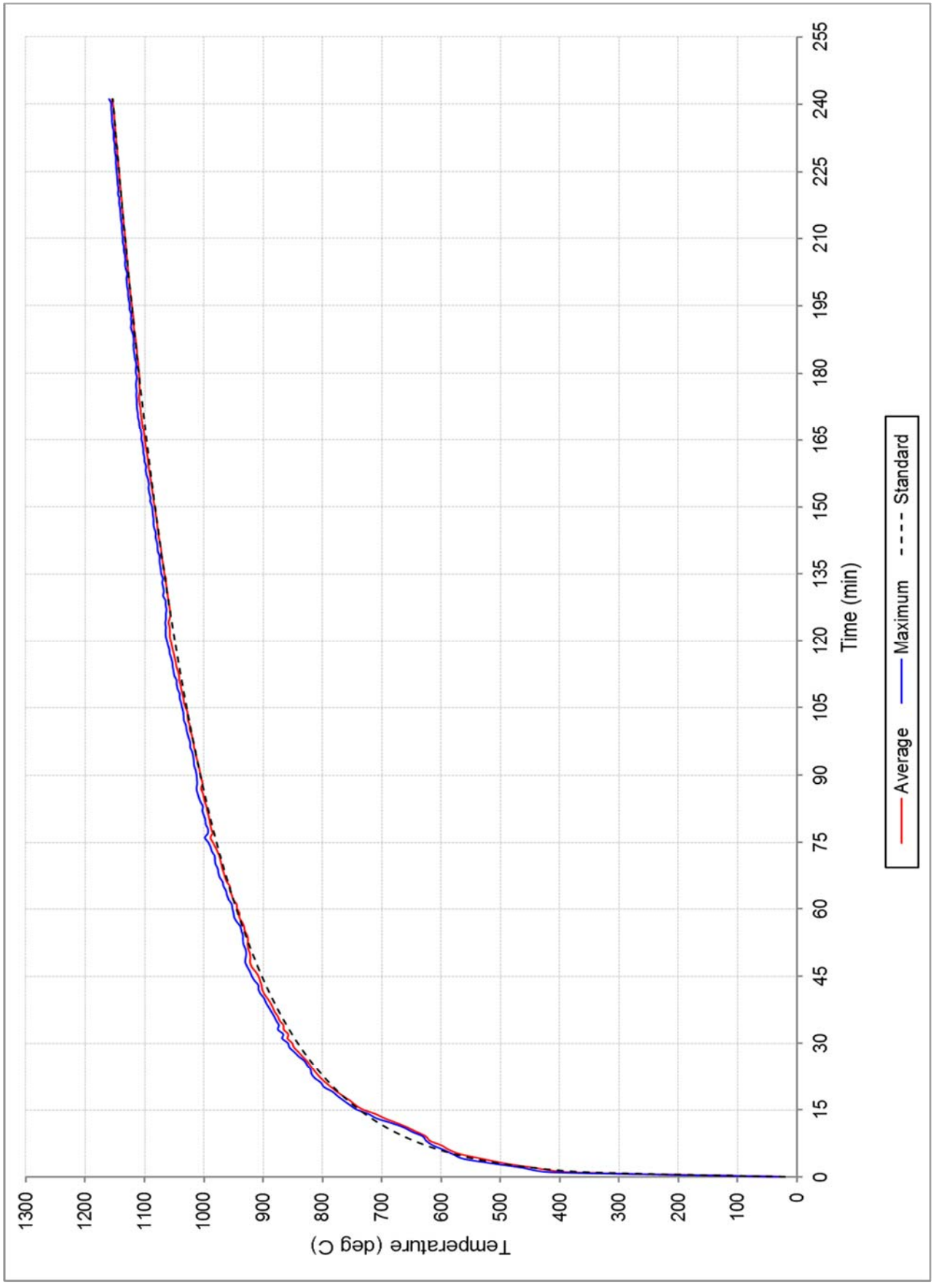


FIGURE 1 – FURNACE TEMPERATURE

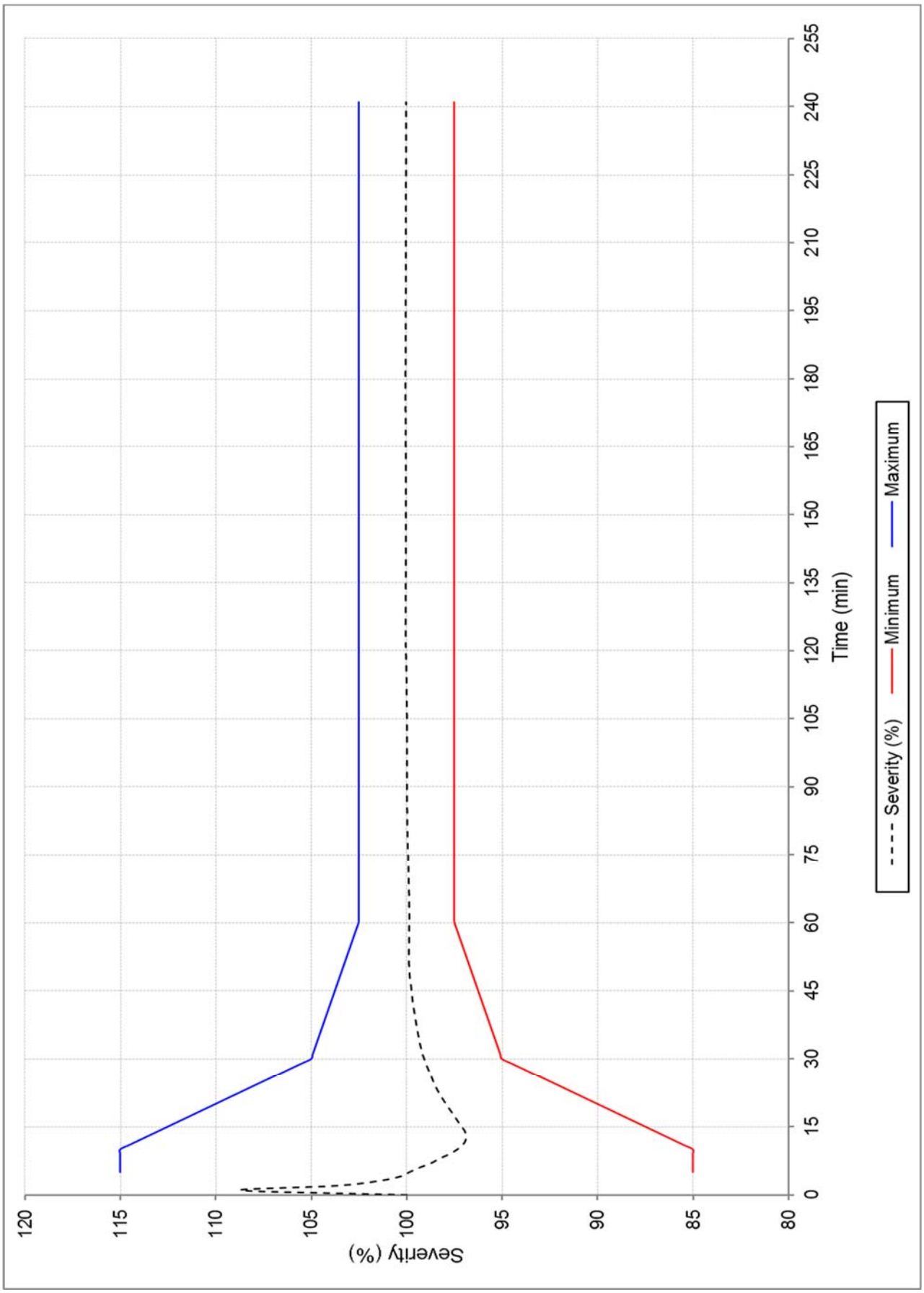


FIGURE 2 – FURNACE SEVERITY

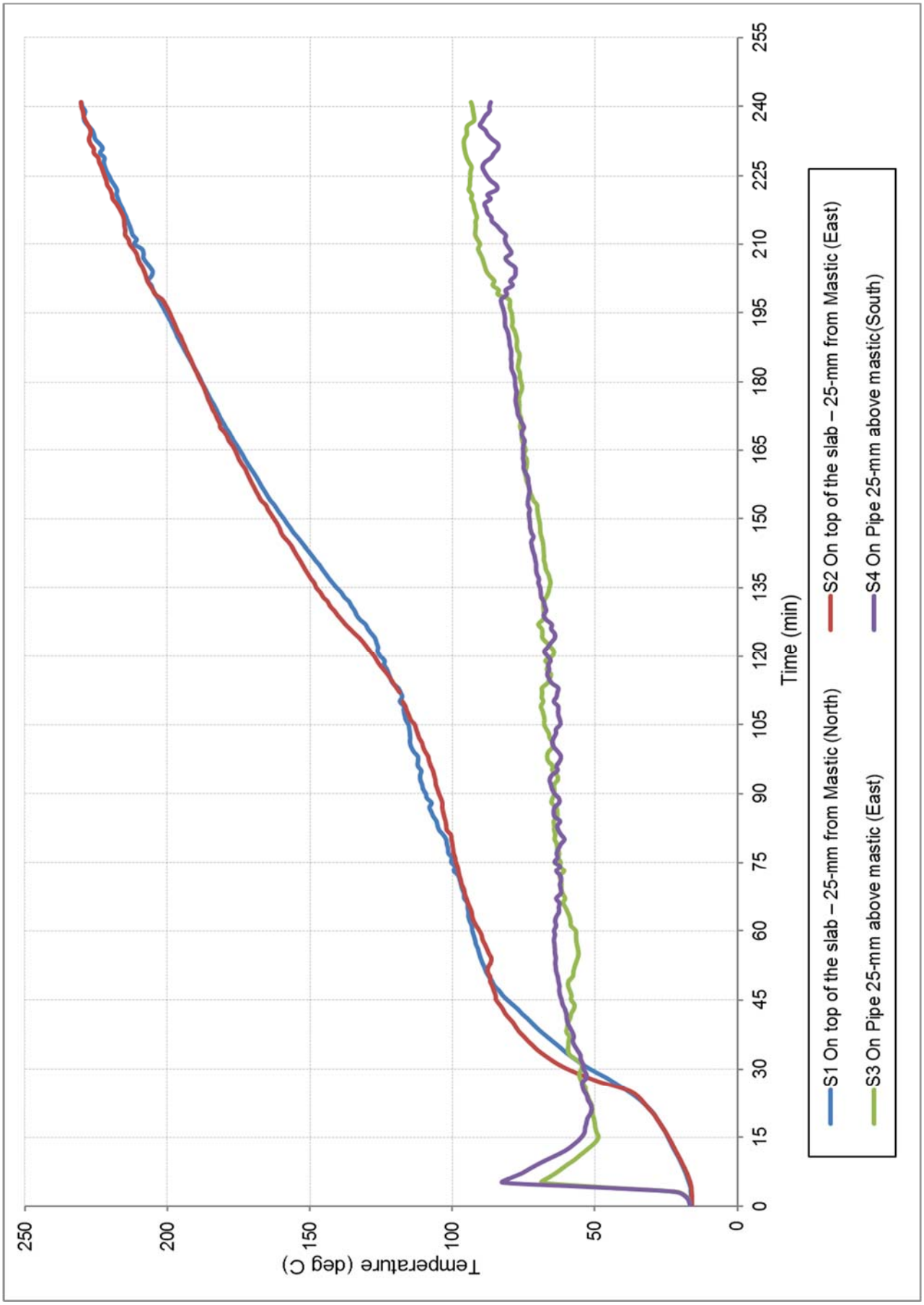


FIGURE 3 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 1

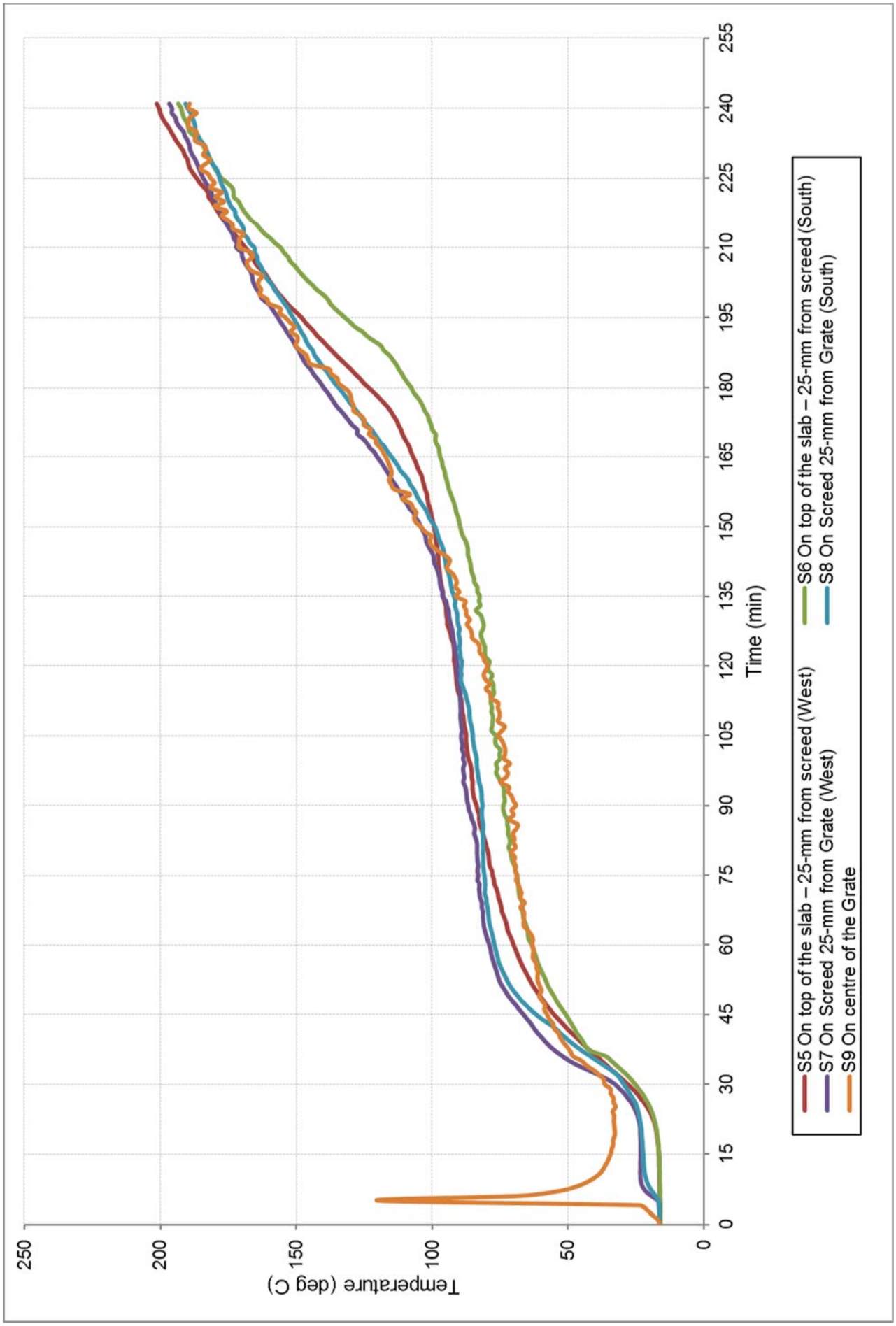


FIGURE 4 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 2

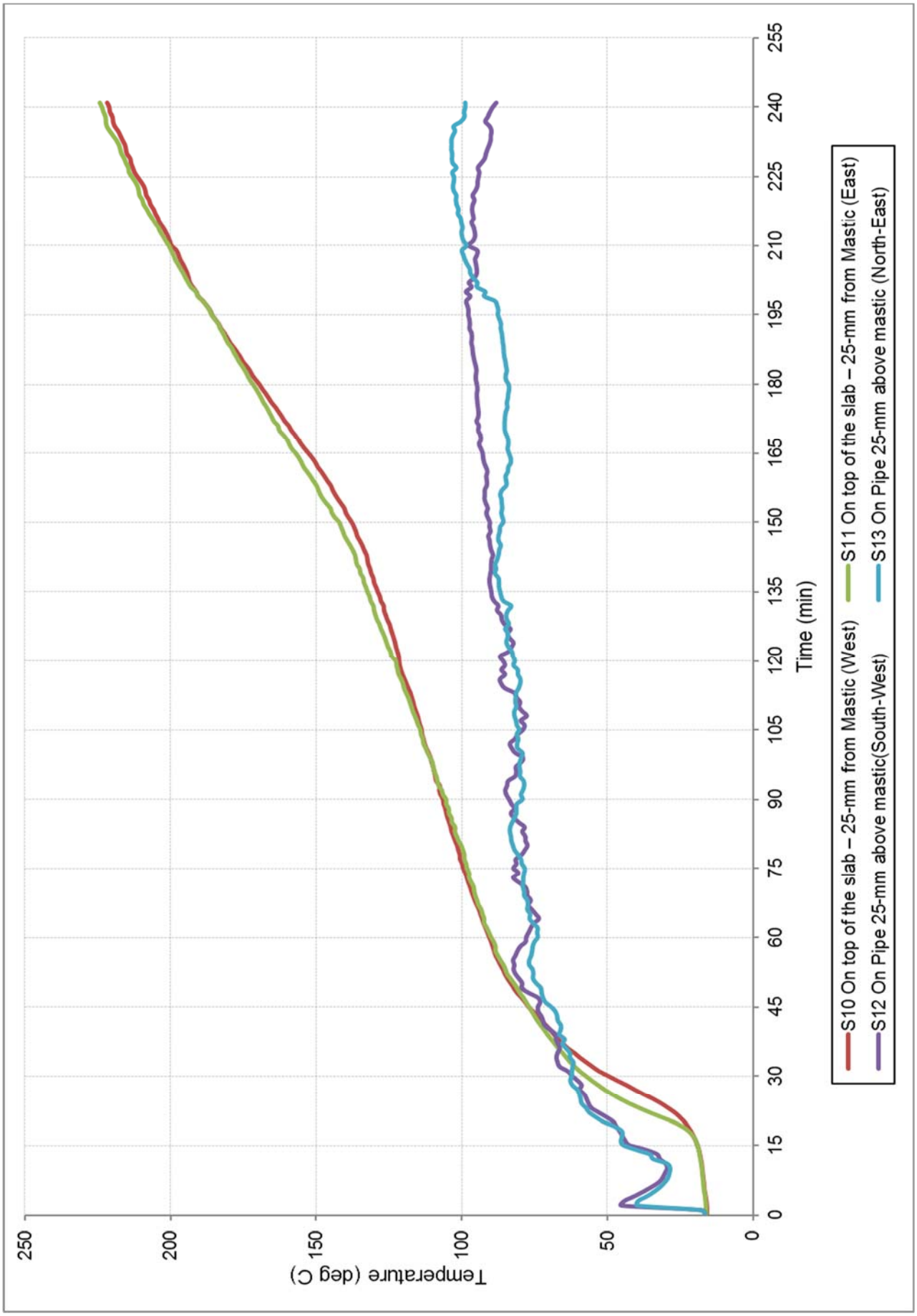


FIGURE 5 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 3

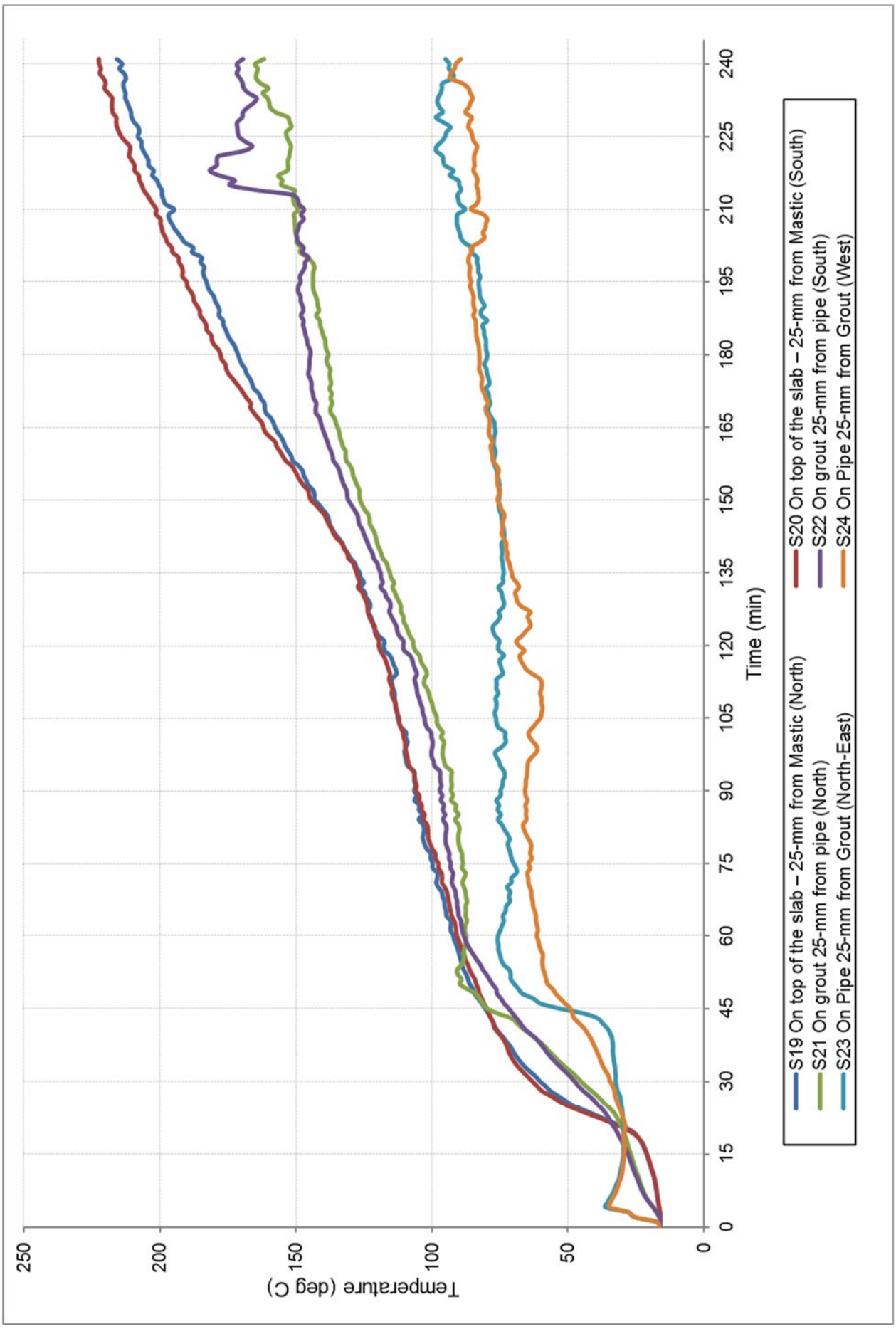
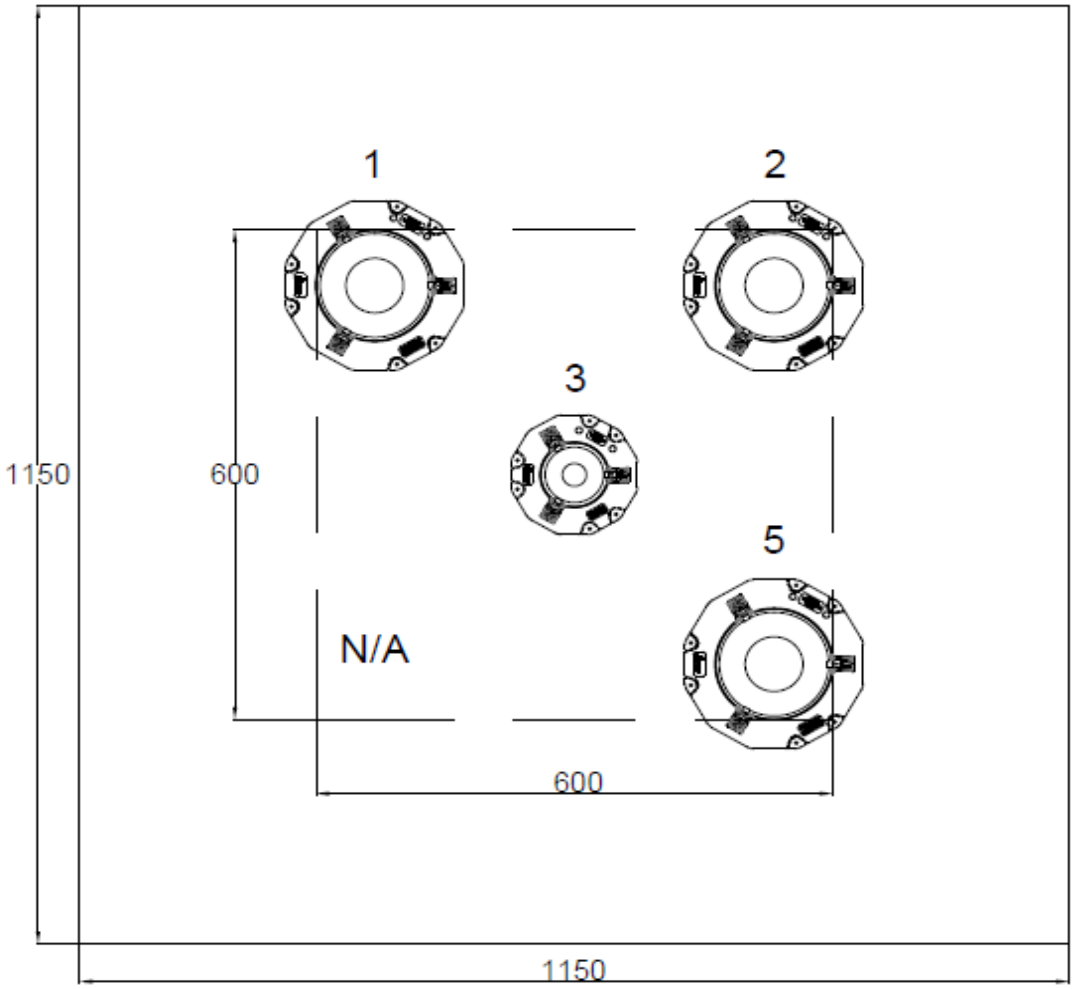


FIGURE 6 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 5

Appendix D – Installation drawings

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



Penetration	Collar Code	Pipe Type	Pipe Diameter (mm)	Fitting
1	H100S	Triplus	110	N/A
2	H100FWS	PVC-SC	100	N/A
3	H50S	PVC-SC	40	N/A
5	H100S	Triplus	75	N/A

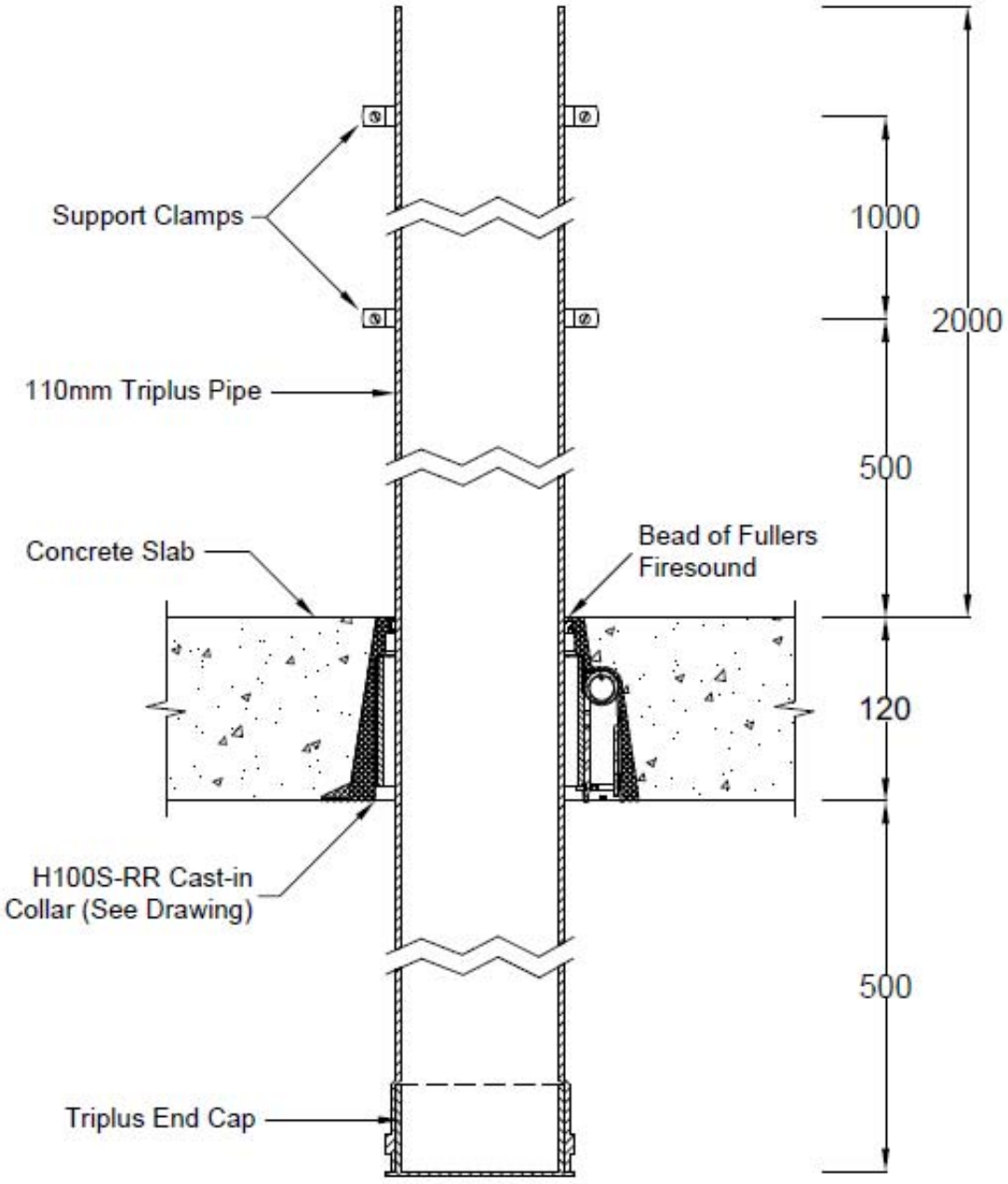
DRAWING TITLED "TEST SLAB S-19-C LAYOUT", DATED 8 MAY 2019, PROVIDED BY SNAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd

Specimen #1

110 Triplus Stack & H100S-RR

Date: 15 MAY 2019



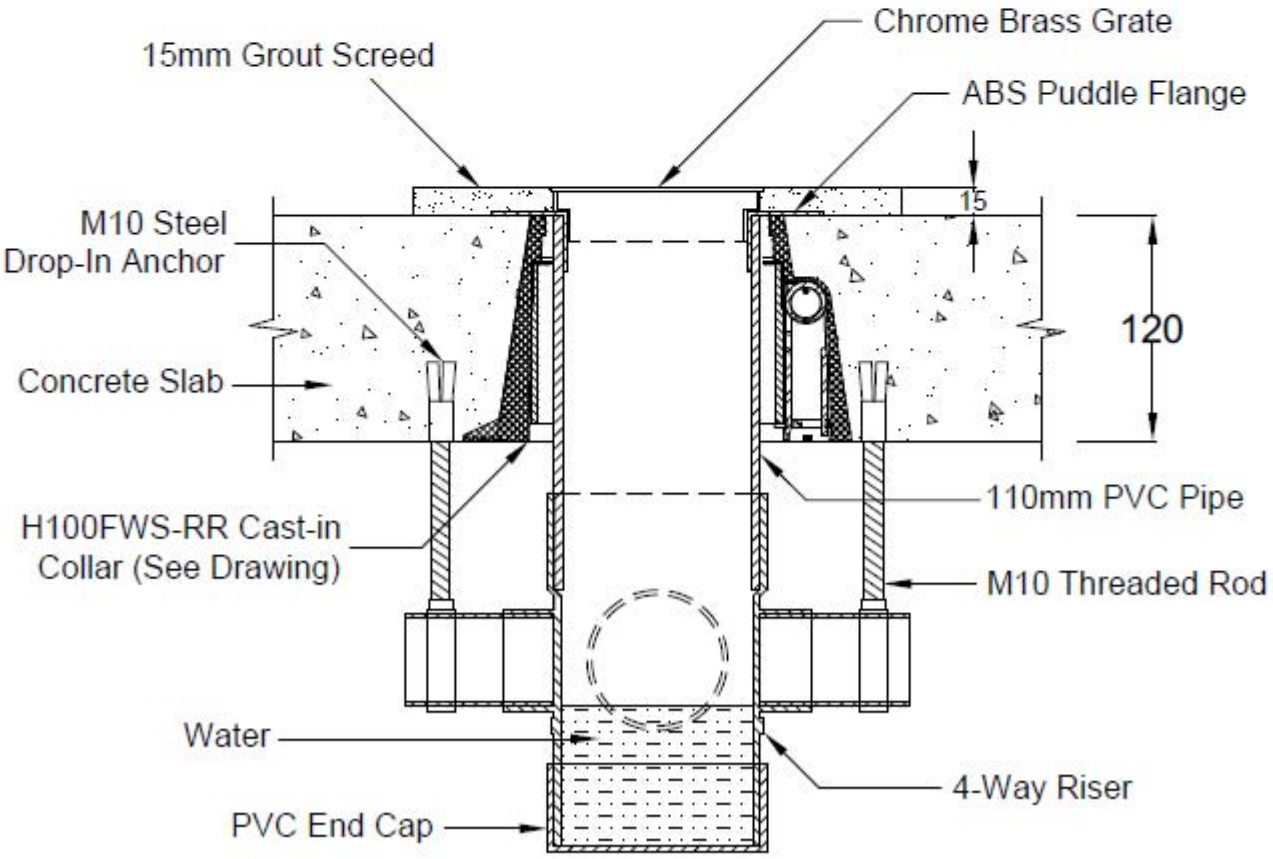
DRAWING "SPECIMEN #1, 110 TRIPLUS STACK & H100S-RR", DATED 15 MAY 2019, PROVIDED BY SNAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd

Specimen #2

100 PVC Stack & H100FWS-RR

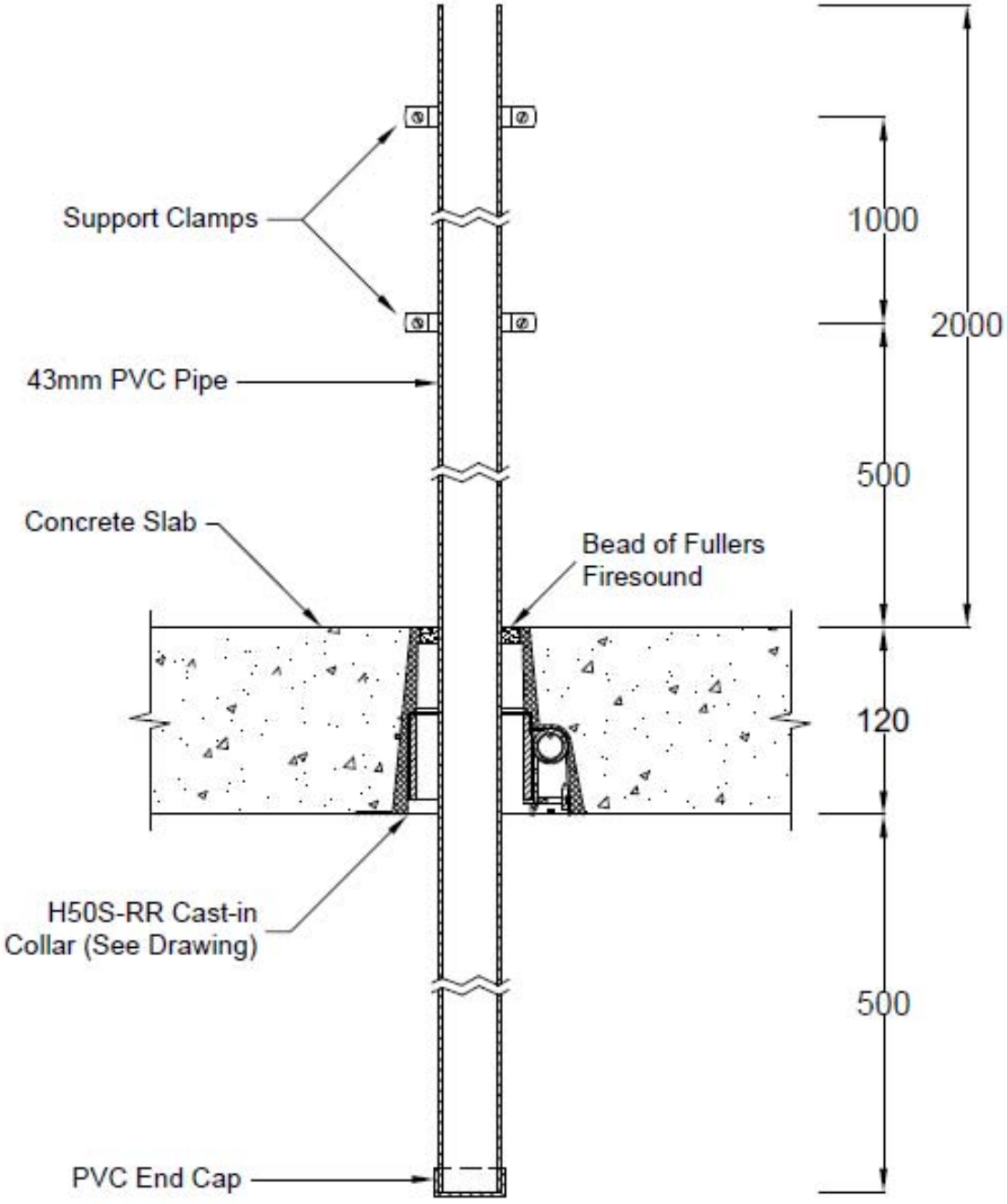
Date: 15 MAY 2019



DRAWING TITLED "SPECIMEN # 2, 100 PVC STACK & H100FWS-RR", DATED 15 MAY 2019, PROVIDED BY NAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd

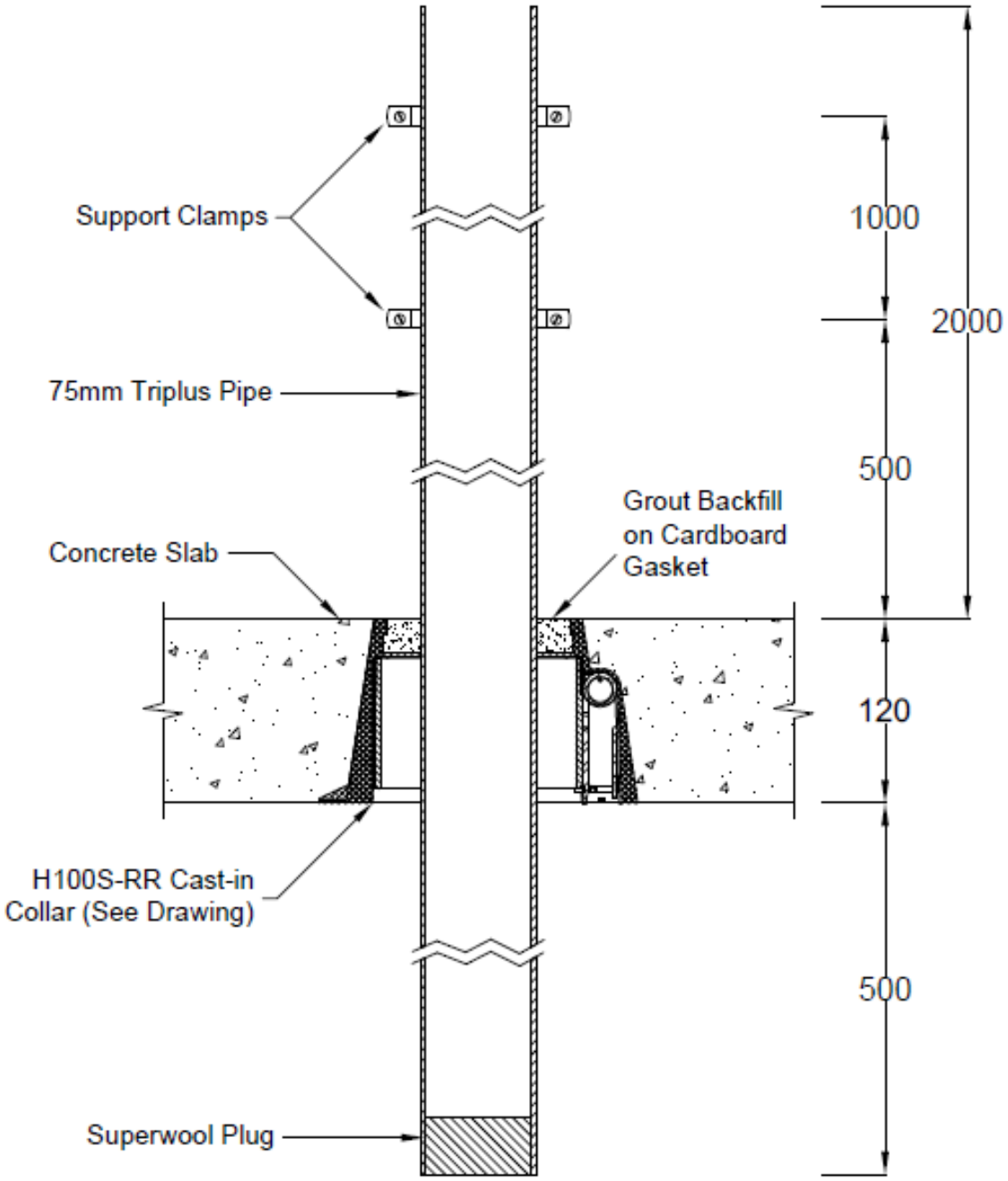
Specimen #3
40 PVC Stack & H50S-RR
Date: 15 MAY 2019



DRAWING TITLED "SPECIMEN # 3, 40 PVC STACK & H50R-SS", DATED 15 MAY 2019, PROVIDED BY SNAP FIRE SYSTEMS PTY LTD

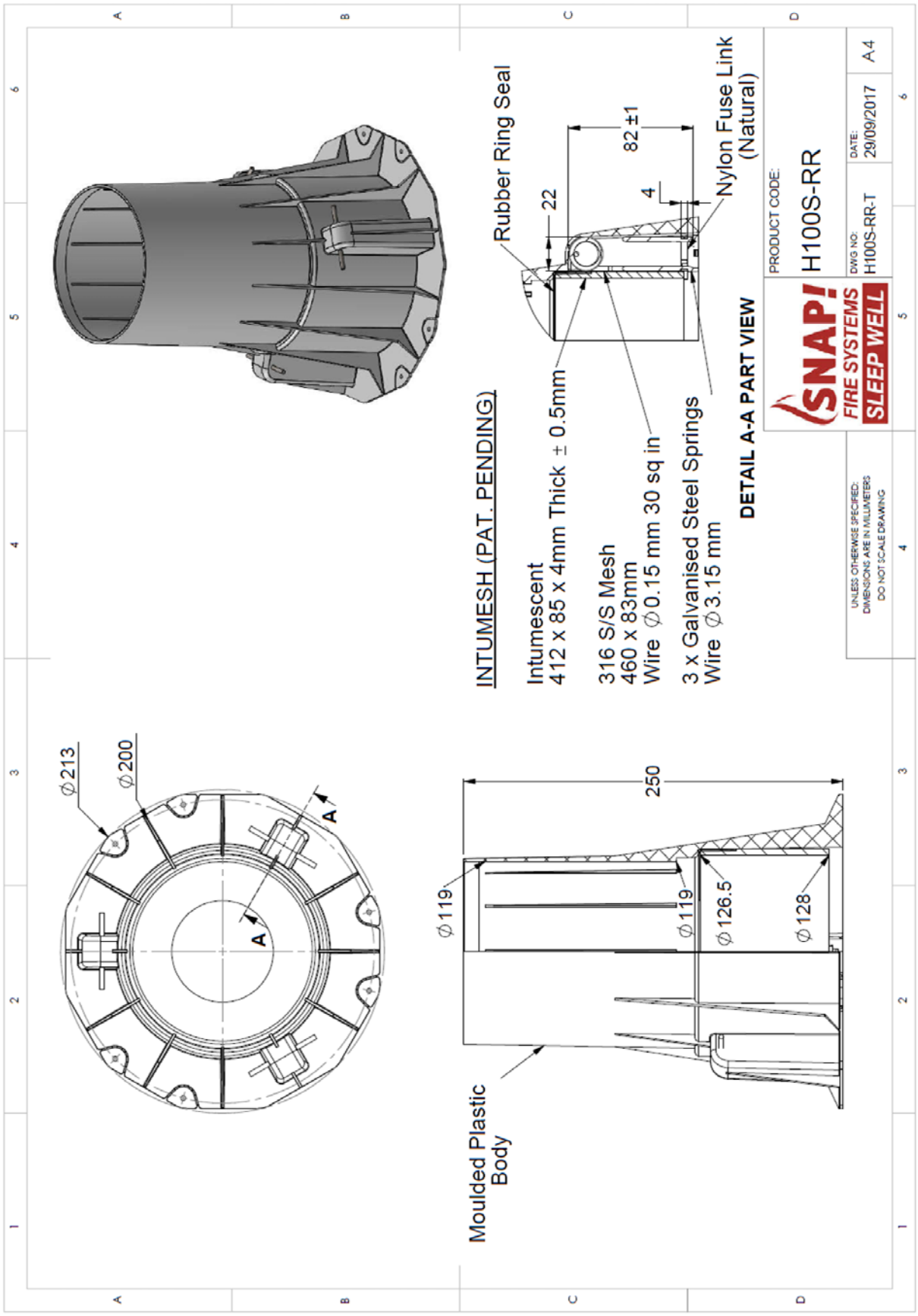
Snap Fire Systems Pty Ltd

Specimen #5
75 Triplus Stack & H100S-RR
Date: 15 MAY 2019

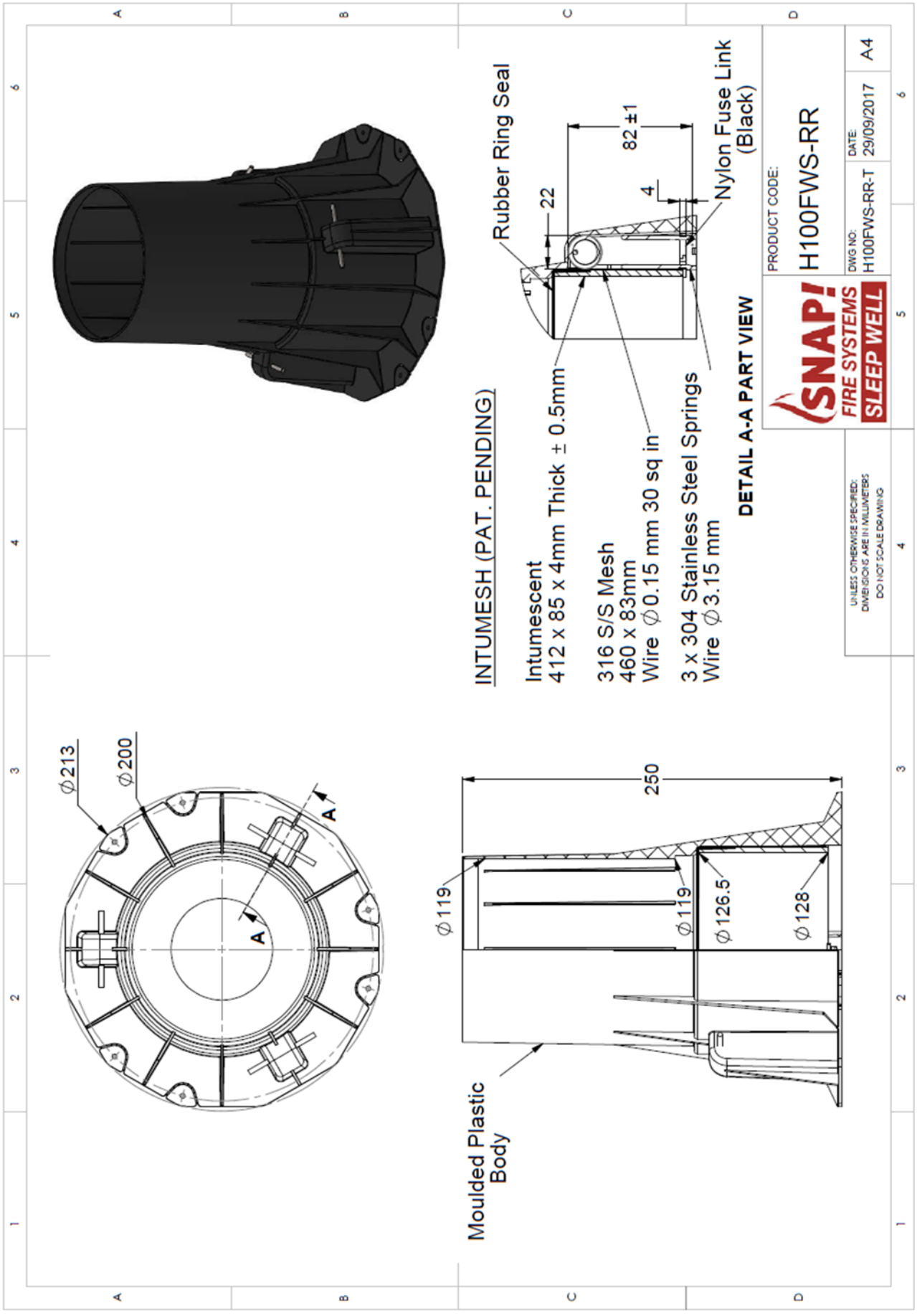


DRAWING TITLED "SPECIMEN #5, 75 TRIPLUS STACK & H100S-RR", DATED 15 MAY 2019, PROVIDED BY SNAP FIRE SYSTEMS PTY LTD

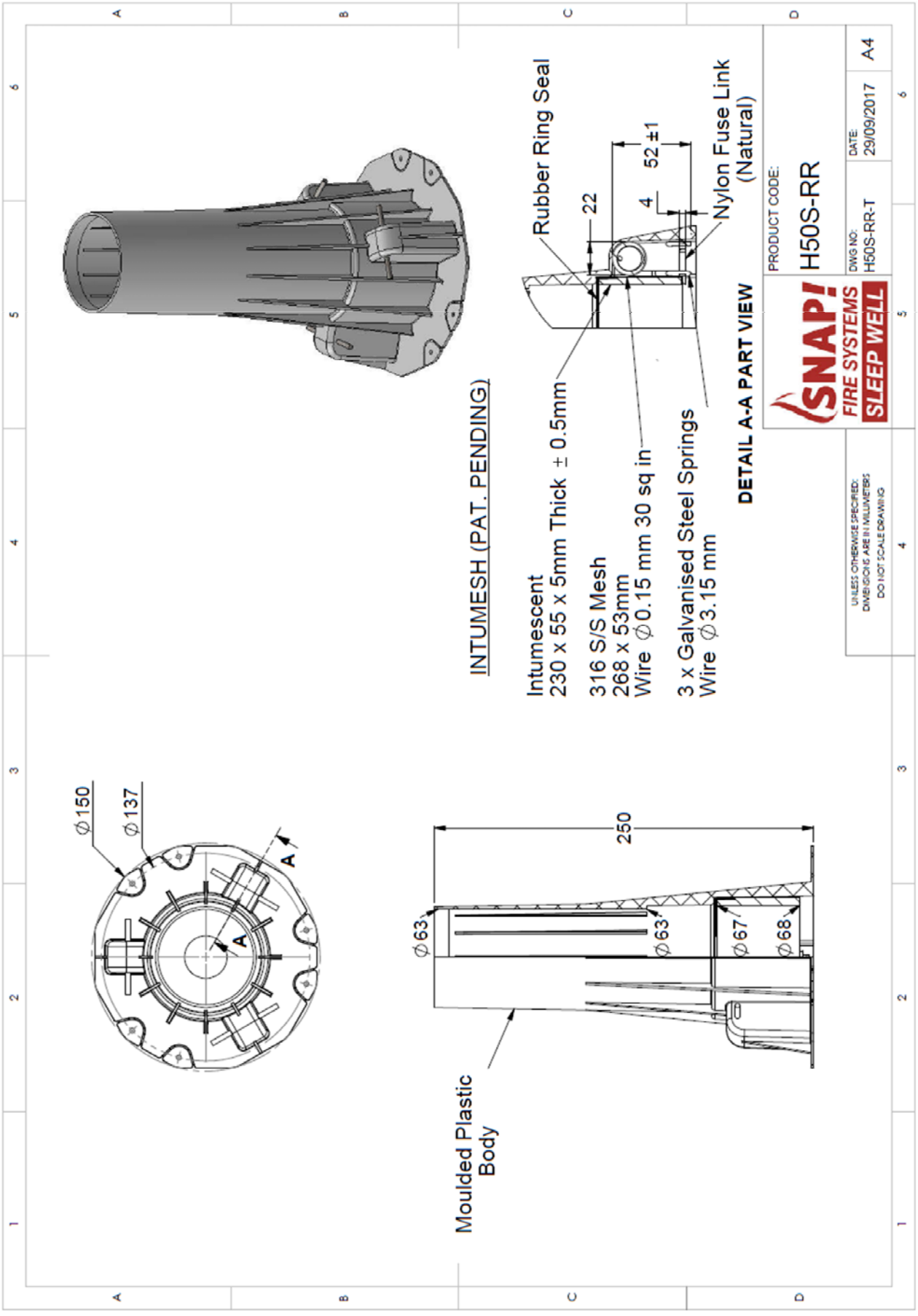
Appendix E – Specimen Drawings



DRAWING NUMBER H100S-RR-T, DATED 29 SEPTEMBER 2017, BY SNAP FIRE SYSTEMS PTY LTD.



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



DRAWING NUMBER H50S-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. 3291

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 2008.

Product Name: SNAP H100S-RR Cast-in collar protecting a nominal 110-mm polypropylene (Valsir Triplus) stack pipe (Specimen 1)

Description: The specimen comprised an 1150-mm x 1150-mm x 120-mm thick concrete slab penetrated by a stack pipe protected by a Snap Fire Systems Cast-in Snap Fire Systems fire collar. The penetrated slab comprised a 120-mm thick concrete slab reinforced with a single layer of steel reinforcement providing a Fire Resistance Period (FRP) for insulation of 120 minutes in accordance with table 5.5.1 of AS 3600:2018 - Concrete structures. The SNAP Cast-in H100S-RR fire collar comprised a 1.6-mm thick polypropylene casing with a 126.5-mm inner diameter and a 213-mm diameter base flange. The 250-mm high collar casing incorporated a 412-mm x 85-mm x 4-mm thick Intumesh intumescent material and a rubber ring seal. The closing mechanism comprised three equally spaced 3.15-mm diameter galvanised steel springs bound with nylon fuse links acting against a 460-mm x 83-mm 316 stainless steel mesh as shown in drawing numbered H100S-RR-T dated 29 September 2017, by Snap Fire Systems Pty Ltd. The penetrating service comprised a 111.5-mm outside diameter polypropylene pipe with a wall thickness of 4.2-mm through the collar's sleeve. The annular gap between the pipe and the inside collar was protected with a bead of Fullers Firesound sealant as shown in drawing titled "Specimen #1, 110 Triplus Stack & H100S-RR", dated 15 May 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 Superwool plug 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	-	190 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/120/120.

The fire-resistance level of the specimen is applicable when the system is exposed to fire from the same direction as tested. The fire-resistance level (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 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: 18 June 2019

Issued on the 22nd day of August 2019 without alterations or additions.

Brett Roddy | Manager, Fire Testing and Assessments

COPY OF CERTIFICATE OF TEST – NO. 3291

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. 3292

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 2008.

Product Name: SNAP H100FWS-RR Cast-in fire collar protecting a nominal 110-mm polyvinyl chloride sandwich construction (PVC-SC) floor waste incorporating a 4-way riser (Specimen 2)

Description: The specimen comprised an 1150-mm x 1150-mm x 120-mm thick concrete slab penetrated by a floor waste protected by a Snap Fire Systems Cast-in Snap Fire Systems fire collar. The penetrated slab comprised a 120-mm thick concrete slab reinforced with a single layer of steel reinforcement providing a Fire Resistance Period (FRP) for insulation of 120 minutes in accordance with table 5.5.1 of AS 3600:2018 - Concrete structures. The SNAP Cast-in H100FWS-RR fire collar comprised a 1.6-mm thick polypropylene casing with a 126.5-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 110-mm outside diameter polyvinyl chloride sandwich construction pipe with a wall thickness of 3.4-mm fitted through the collar's sleeve. The floor waste system was fitted with a chrome brass grate and ABS Puddle Flange. A 15-mm thick grout screed was laid on top of the concrete slab and finished flush with the floor grate. On the exposed side of the slab, a 4-way riser was connected to the penetrating pipe, supported by two M10 threaded rod and steel drop-in anchor to the concrete slab. On the exposed face, the 4-way riser was capped using a polyvinyl chloride sandwich construction end cap. The floor waste gully was charged with water to the level shown in drawing titled "Specimen #2, 100 PVC Stack & H100FWS-RR", dated 15 May 2019, provided by Snap Fire Systems Pty Ltd.

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

Structural Adequacy	-	not applicable
Integrity	-	no failure at 241 minutes
Insulation	-	235 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/120/120.

The fire-resistance level of the specimen is applicable when the system is exposed to fire from the same direction as tested. The fire-resistance level (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 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: 18 June 2019

Issued on the 22nd day of August 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
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COPY OF CERTIFICATE OF TEST – NO. 3292

INFRASTRUCTURE TECHNOLOGIES
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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. 3293

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 2008.

Product Name: SNAP H50S-RR Cast-in collar protecting a nominal 40-mm polyvinyl chloride (PVC-U) stack pipe (Specimen 3)

Description: The specimen comprised an 1150-mm x 1150-mm x 120-mm thick concrete slab penetrated by a stack pipe protected by a Snap Fire Systems Cast-in Snap Fire Systems fire collar. The penetrated slab comprised a 120-mm thick concrete slab reinforced with a single layer of steel reinforcement providing a Fire Resistance Period (FRP) for insulation of 120 minutes in accordance with table 5.5.1 of AS 3600:2018 - Concrete structures. The SNAP Cast-in H50S-RR fire collar comprised a 1.6-mm thick polypropylene casing with a 67-mm inner diameter and a 150-mm diameter base flange. The 250-mm high collar casing incorporated a 230-mm x 55-mm x 5-mm thick Intumesh intumescent material and a rubber ring seal. The closing mechanism comprised three galvanised steel springs bound with nylon fuse links and a 268-mm x 53-mm 316 stainless steel mesh as shown in drawing numbered H50S-RR-T dated 29 September 2017, by Snap Fire Systems Pty Ltd. The penetrating service comprised a 43.35-mm outside diameter PVC pipe with a wall thickness of 2.21-mm through the collar's sleeve. The annular gap between the pipe and the inside collar was protected with a bead of Fullers Firesound sealant as shown in drawing titled "Specimen #3, 40 PVC Stack & H50S-RR", dated 15 May 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.

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

Structural Adequacy	-	not applicable
Integrity	-	no failure at 241 minutes
Insulation	-	205 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/120/120.

The fire-resistance level of the specimen is applicable when the system is exposed to fire from the same direction as tested. The fire-resistance level (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 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: 18 June 2019

Issued on the 22nd day of August 2019 without alterations or additions.

Brett Roddy | Manager, Fire Testing and Assessments

This document is issued in accordance with NATA's accreditation requirements.
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Certificate of Test

No. 3294

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 2008.

Product Name: SNAP H100S-RR Cast-in collar protecting a nominal 75-mm polypropylene (Triplus) stack pipe (Specimen 5)

Description: The specimen comprised an 1150-mm x 1150-mm x 120-mm thick concrete slab penetrated by a stack pipe protected by a Snap Fire Systems Cast-in Snap Fire Systems fire collar. The penetrated slab comprised a 120-mm thick concrete slab reinforced with a single layer of steel reinforcement providing a Fire Resistance Period (FRP) for insulation of 120 minutes in accordance with table 5.5.1 of AS 3600:2018 - Concrete structures. The SNAP Cast-in H100S-RR fire collar comprised a 1.6-mm thick polypropylene casing with a 126.5-mm inner diameter and a 213-mm diameter base flange. The 250-mm high collar casing incorporated a 412-mm x 85-mm x 4-mm thick Intumesh intumescent material and a rubber ring seal. The closing mechanism comprised three equally spaced 3.15-mm diameter galvanised steel springs bound with nylon fuse links acting against a 460-mm x 83-mm 316 stainless steel mesh as shown in drawing numbered H100S-RR-T dated 29 September 2017, by Snap Fire Systems Pty Ltd. The penetrating service comprised a 75.4-mm outside diameter polypropylene pipe with a wall thickness of 2.87-mm through the collar's sleeve. The annular gap between the pipe and the inside collar was protected with a cardboard gasket then backfilled flush with grout level with the slab as shown in drawing titled "Specimen #5, 75 Triplus Stack & H100S-RR", dated 15 May 2019, provided by Snap Fire Systems Pty Ltd. The pipe projected vertically, approximately 2000-mm above from the unexposed face of the concrete floor and approximately 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 Superwool plug 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	-	203 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/120/120.

The fire-resistance level of the specimen is applicable when the system is exposed to fire from the same direction as tested. The fire-resistance level (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 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: 18 June 2019

Issued on the 22nd day of August 2019 without alterations or additions.

B. Roddy

Brett Roddy | Manager, Fire Testing and Assessments

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COPY OF CERTIFICATE OF TEST – NO. 3294

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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