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

Test Report

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Client: IG6 Pty Ltd

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Revision A	Final for issue	22/04/2022	CSIRO and The Client	FSP 2274
Revision B	Amend to reflect correction to FRL for Specimen 1.	02/11/2022	CSIRO and The Client	FSP 2274
Revision C	Amend to correct pipe product identification	20/12/2023	CSIRO and The Client	FSP 2274

Report Authorisation:

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20 December 2023	20 December 2023	20 December 2023

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

Sponsored Investigation No. FSP 2274

1 Introduction

1.1 Identification of specimen

The sponsor identified the specimens as SNAP fire collars protecting a 150-mm thick concrete floor slab penetrated by four (4) George Fischer Fuseal PP110 polypropylene pipes.

1.2 Sponsor

IG6 Pty Ltd
1343 Wynnum Road
Tingalpa QLD

1.3 Manufacturers

Snap Fire Systems Pty Ltd
1343 Wynnum Road
Tingalpa QLD

1.4 Test standard

Australian Standard 1530, Methods for fire tests on building materials, components and structures, Part 4-2014, Fire-resistance tests for 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 5166/4750

1.7 Test date

The fire-resistance test was conducted on 21 March 2022.

2 Description of specimen

2.1 General

The specimen comprised an 1150-mm x 1150-mm x 150mm/180-mm concrete slab which was penetrated by a total of four (4) polypropylene pipes protected with SNAP retrofit and cast-in fire collars.

The 180-mm thick section of the concrete slab used in the installation of Specimen 1 was reinforced with a single layer of steel reinforcement providing a Fire Resistance Period (FRP) for insulation of 240 minutes in accordance with table 5.5.1 of AS 3600:2018 - Concrete structures.

The 150-mm thick section of the concrete slab used in the installation of Specimens 2, 3 and 4 was 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.

For the purpose of the test, the penetrations were referenced as Specimen 1, 2, 3 and 4. Documents containing a complete description of each specimen were supplied by the sponsor and are retained on file.

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

- AS/NZS 7671:2010 Plastic piping system for soil and waste discharge (low and high temperature) inside buildings – Polypropylene (PP).

Specimen 1 – A SNAP LP100R-D Low Profile Retrofit fire collar and SNAP H100FWS-RR High-Top Floor Waste Shower Cast-in fire collar protecting a nominal 4-inch Fuseal polypropylene pipe incorporating a floor waste and a P-Trap

The SNAP H100FWS-RR High-Top Floor Waste Shower Cast-in fire collar comprised a 1.6-mm thick polypropylene casing with a 119-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 and a rubber ring seal. The closing mechanism comprised three equally spaced 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 titled 'SNAP 100 High-Top Floor Waste Shower', dated 29 September 2017, by Snap Fire Systems Pty Ltd.

The SNAP H100FWS-RR High-Top Floor Waste Shower collar was cast into a 180-mm thick concrete slab with the collar's casing cut down to 180-mm high finishing flush with the unexposed face of the concrete slab.

The SNAP LP100R-D Low Profile Retrofit fire collar comprised a 0.95-mm steel casing with a 122-mm inner diameter and a 260-mm diameter base flange. The 65-mm high collar casing incorporated a closing mechanism which comprised a 5-mm thick x 59-mm wide x 418-mm long Intumesh intumescent wrap lined within the internal circumference of the collar casing. The closing mechanism comprised four 4-mm diameter 304 stainless steel springs with black nylon fuse links and a 415-mm long x 120-mm wide mesh with a wire diameter of 0.15 mm as shown in drawing numbered LP100R-D-T dated 10 February 2017, by Snap Fire Systems Pty Ltd.

The SNAP LP100R-D fire collar was centrally located over the SNAP H100FWS-RR cast-in collar on the exposed face of the concrete slab and fixed in place through the four mounting brackets using 5-mm x 30-mm long concrete screw bolts.

The penetrating service comprised a polypropylene pipe with a floor waste system incorporating a P-Trap. The penetrating George Fischer Fuseal PP110 polypropylene pipe had a 114.3-mm outside diameter pipe with a wall thickness of 6.7 mm and was fitted through a sleeve on both fire collars. The top of the propylene pipe incorporated a floor waste comprising a chrome plated brass grate and a plastic 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 Fuseal P-Trap was coupled below the SNAP LP100R-D fire collar. The end of the P-Trap was closed with a ceramic fibre (Superwool) plug. The P-Trap was supported from the centre coupling using double hanging side nut clips fixed to the slab with 5-mm x 30-mm long steel concrete screw bolts and from the end of the P-Trap, with a nut clip and M10 threaded rod that was fixed to the concrete slab with a steel drop-in anchor.

The P-trap was charged with water to the level shown in drawing titled 'Specimen #1 110 Fuseal PP110 Floor Waste & LP100R-D over H100FWS-RR', dated 9 March 2022, by Snap Fire Systems Pty Ltd.

<u>Specimen 2 - A SNAP H100S-RR High-Top Stack cast-in fire collar protecting a nominal 4-inch Fuseal polypropylene stack pipe</u>

The SNAP H100-S-RR High-Top Stack cast-in fire collar comprised a 1.6-mm thick polypropylene casing with a 119-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 titled "SNAP 100 High-Top Stack", dated 29 September 2017, by Snap Fire Systems Pty Ltd

The SNAP H100S-RR High-Top Stack fire collar was cast into a 150-mm thick concrete slab with the collar's casing cut down to 150-mm high finishing flush with the unexposed face of the concrete slab.

The penetrating service comprised a George Fischer Fuseal PP110 polypropylene pipe with a 114.3-mm outside diameter pipe and a wall thickness of 6.7-mm fitted through the collars sleeve. The pipe projected vertically 2000-mm above the unexposed face of the concrete slab and 500-mm below into the furnace chamber. The pipe was supported at nominally 500-mm and 1500-mm from the unexposed face of the slab, left open at the unexposed end and capped with a ceramic fibre (Superwool) plug on the exposed end.

On the unexposed face the annular gap between the pipe and the collars sleeve was left unprotected as shown in drawing titled 'Specimen #2, 110 Fuseal PP110 Stack & H100S-RR', dated 9 March 2022 by Snap Fire Systems Pty Ltd.

<u>Specimen 3 - A SNAP H50S-RR High-Top Stack cast-in fire collar protecting a nominal 2-inch Fuseal polypropylene stack pipe.</u>

The SNAP H50S-RR High-Top Stack cast-in fire collar comprised a 1.6-mm thick polypropylene casing with a 63 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 titled 'SNAP 50 High-Top Stack', dated 29 September 2017, by Snap Fire Systems Pty Ltd.

The SNAP H50S-RR High-Top Stack fire collar was cast into a 150-mm thick concrete slab with the collar casing cut down to 150-mm high finishing flush with the unexposed face of the concrete slab.

The penetrating service comprised a George Fischer Fuseal PP110 polypropylene pipe with a 61.2-mm outside diameter pipe and a wall thickness of 4.5-mm fitted through the collars sleeve. The pipe projected vertically 2000-mm above the unexposed face of the concrete slab and 500-mm below into the furnace chamber. The pipe was supported at nominally 500-mm and 1500-mm from the unexposed face of the slab, left open at the unexposed end and capped with a ceramic fibre (Superwool) plug on the exposed end.

On the unexposed face the annular gap between the pipe and the collars sleeve was left unprotected as shown in drawing titled 'Specimen #3, 50 Fuseal PP110 Stack & H50S-RR', dated 9 March 2022 by Snap Fire Systems Pty Ltd.

Specimen 4 - A SNAP H150S-RR High-Top Stack cast-in fire collar protecting a nominal 6-inch Fuseal polypropylene stack pipe.

The SNAP H150S-RR High Top Stack fire collar comprised a white 2-mm thick polypropylene casing with a 180 mm inner diameter sleeve and a 292-mm diameter base flange. The 250-mm high collar casing incorporated a 600-mm wide x 110-mm wide x 6-mm thick intumescent material and a rubber ring seal. The closing mechanism comprised four x 4-mm diameter galvanised steel springs, four nylon fuse links and a 640 mm x 109-mm 316 stainless steel mesh as shown in drawing titled 'SNAP 150 High-Top Stack', dated 29 September 2017, by SNAP Fire Systems.
The H150S-RR collar was cast into a 150-mm thick concrete slab with the collar casing cut down to 150-mm high finishing flush with the unexposed face of the concrete slab.

The penetrating service comprised a George Fischer Fuseal PP110 polypropylene pipe with a 168.2-mm outside diameter pipe and a wall thickness of 7.58-mm fitted through the collars sleeve. The pipe projected vertically 2000-mm above the unexposed face of the concrete slab and 500-mm below into the furnace chamber. The pipe was supported at nominally 500-mm and 1500-mm from the unexposed face of the slab, left open at the unexposed end and capped with a ceramic fibre (Superwool) plug on the exposed end.

On the unexposed face the annular gap between the pipe and the collars sleeve was left unprotected as shown in drawing titled 'Specimen #4, 160 Fuseal PP110 Stack & H150S-RR', dated 9 March 2022 by Snap Fire Systems Pty Ltd.

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. The specimen was delivered on 8 March 2022 and stored under standard laboratory atmospheric conditions until the test date.

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:

- Technical brochure 'Fuseal Corrosive Waste Piping Systems' dated May 2012 by Georg Fischer LLC.
- Drawing titled 'Test Slab S-22-D' Layout', dated 18 January 2022, by Snap Fire Systems Pty Ltd.
- Drawing titled 'Specimen #1 110 Fuseal PP110 Floor Waste & LP100R-D over H100FWS-RR', dated 9 March 2022, by Snap Fire Systems Pty Ltd.
- Drawing titled 'Specimen #2, 110 Fuseal PP110 Stack & H100S-RR', dated 9 March 2022, by Snap Fire Systems Pty Ltd.
- Drawing titled 'Specimen #3 50 Fuseal PP110 Stack & H50S-RR', dated 9 March 2022, by Snap Fire Systems Pty Ltd.
- Drawing titled 'Specimen #4, 160 Fuseal PP110 Stack & H150S-RR', dated 9 March 2022, by Snap Fire Systems Pty Ltd.
- Drawing titled 'SNAP 100 High-Top Floor Waste Shower', dated 29 September 2017, by Snap Fire Systems Pty Ltd.
- Drawing numbered LP100R-D-T dated 10 February 2017, by Snap Fire Systems Pty Ltd.
- Drawing tilted 'SNAP 100 High-Top Stack', dated 29 September 2017, by Snap Fire Systems Pty Ltd.
- Drawing titled 'SNAP 50 High-Top Stack', dated 29 September 2017, by Snap Fire Systems Pty Ltd.
- Drawing titled 'SNAP 150 High-Top Stack', dated 29 September 2017, by Snap Fire Systems Pty Ltd.

Confidential information about the test specimen has been submitted to CSIRO Infrastructure Technologies.

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 Pressure

The furnace pressure was measured by a differential low-pressure transducer with a range of ± 50 Pa.

The pressure probe was located approximately 350-mm below the concrete slab supporting construction.

4.4 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 24°C at the commencement of the test.

6 Departure from standard

The furnace pressure was below the tolerances of the requirements of AS 1530.4-2014 for a brief period of time as shown in Figure 3. The test laboratory confirms that this departure in furnace pressure would not have significantly affected the results of this test.

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 fluing from the end of the pipe of specimen 2.
5 minutes -	Smoke is fluing from end of the pipes of specimens 3 and 4.
6 minutes -	The level of smoke fluing from the end of the pipe of specimens 2 and 3 has reduced.
7 minutes -	Smoke has begun fluing from the floor waste grate of specimen 1. Cotton pad test was applied above the floor waste grate of specimen 1 – no ignition was noted at this time.
8 minutes -	Smoke has ceased fluing from the floor waste grate of specimen 1.
9 minutes -	Smoke has ceased fluing from the pipes of specimens 2 and 3.
12 minutes -	The level of smoke fluing from end of the pipe of specimen 4 has reduced.
14 minutes -	The pipe of specimen 4 has begun to distort
16 minutes -	Light smoke has resumed fluing from the end of the pipes of specimens 2 and 3.
34 minutes -	Light smoke has resumed fluing from the floor waste grate of specimen 1.
45 minutes -	Smoke has ceased fluing from the pipe of specimen 3.
69 minutes -	Smoke has ceased fluing from the pipe of specimens 2 and 4.
83 minutes -	The white-collar casing at the base of specimen 4 has begun to melt, the pipe at the base of the specimen continues to deform.
124 minutes -	The white-collar casing at the base of specimen 4 has continues to melt, the pipe at the base specimen continues to deform.
151 minutes -	Insulation failure of specimen 4 - maximum temperature rise of 180K is exceeded on the slab 25-mm from the collar case at the base (north side).
204 minutes -	The thermocouple (#13) pad at the base of specimen 4 has been covered with molten white plastic from the collar.
230 minutes -	The white-collar casing at the base of specimen 2 has been pushed up above the slab with some sections melted.
235 minutes -	The white-collar casing and black pipe at the base of specimen 4 have melted.
236 minutes -	Intumescent material is visible through the metal grate inside the pipe of the floor waste of specimen 1.
237 minutes -	Insulation failure of specimen 2 - maximum temperature rise of 180K is exceeded on the northern side of the slab, 25-mm from the collar.
242 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 Furnace pressure

Figure 3 shows the curve of average pressure versus time inside the furnace chamber recorded during the heating period.

8.5 Specimen temperature

Figure 4 shows the curve of temperature versus time associated with specimen 1.

Figure 5 shows the curve of temperature versus time associated with specimen 2.

Figure 6 shows the curve of temperature versus time associated with specimen 3.

Figure 7 shows the curve of temperature versus time associated with specimen 4.

8.6 Performance

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

Specimen 1 – A SNAP LP100R-D Low Profile Retrofit fire collar and SNAP H100FWS-RR High-Top Floor Waste Shower Cast-in fire collar protecting a nominal 4-inch Fuseal polypropylene pipe incorporating a floor waste and a P Trap

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

Specimen 2 - A SNAP H100S-RR High-Top Stack cast-in fire collar protecting a nominal 4-inch Fuseal polypropylene stack pipe

Structural adequacy	-	not applicable
Integrity	-	no failure at 241 minutes
Insulation	-	237 minutes

Specimen 3 - A SNAP H50S-RR High-Top Stack cast-in fire collar protecting a nominal 2-inch Fuseal polypropylene stack pipe

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

Specimen 4 - A SNAP H150S-RR High-Top Stack cast-in fire collar protecting a nominal 6-inch Fuseal polypropylene stack pipe

Structural adequacy	-	not applicable
Integrity	-	no failure at 241 minutes
Insulation	-	151 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 AS 1530.4. Any significant variation with respect to size, construction details, loads, stresses, edge of end conditions, other than that 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 the measurement of fire resistance, it is not possible to provide a stated degree for 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	-	-/240/240
Specimen 2	-	-/240/180*
Specimen 3	-	-/240/180*
Specimen 4	-	-/240/120

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

* Specimens were tested in a concrete slab with a Fire Resistance Period (FRP) for insulation of 180 minutes in accordance with Table 5.5.1 of AS 3600:2018 - Concrete structures. The maximum FRL of any test specimen cannot exceed the FRL achieved by the concrete slab in which it was installed.

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

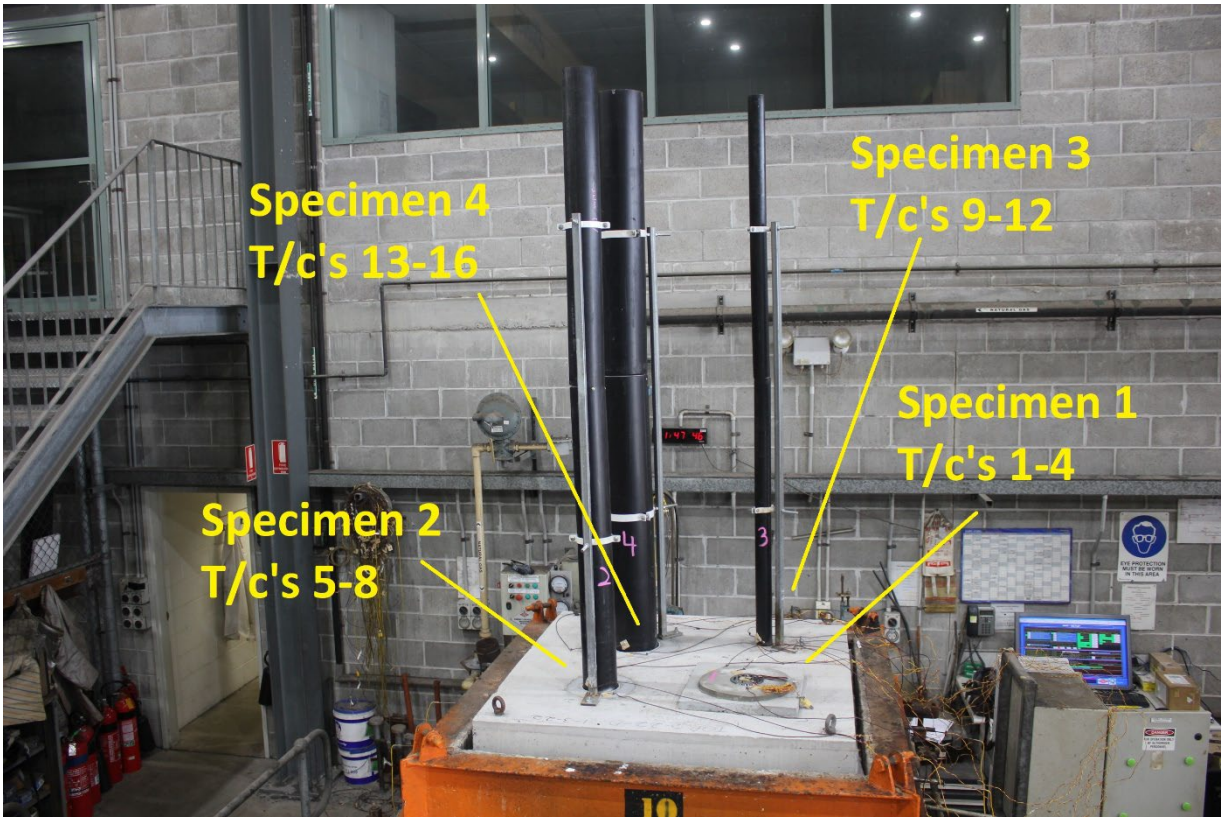
Appendices

Appendix A – Measurement location

Specimen	T/C Position	T/C designation
Specimen 1 - A SNAP LP100R-D Low Profile Retrofit fire collar and a SNAP H100FWS-RR cast-in fire collar protecting a nominal 4-inch Fuseal PP110 pipe incorporating a floor waste and a P-Trap	On the centre of the grate	S1
	On the screed, 25-mm from the grate (North)	S2
	On the screed, 25-mm from the grate (South)	S3
	On the slab, 25-mm from the screed (North)	S4
Specimen 2 - A SNAP H100S-RR High-Top cast-in fire collar protecting a nominal 4-inch Fuseal polypropylene stack pipe	On the slab, 25-mm from the collar (North)	S5
	On the slab, 25-mm from collar (South)	S6
	On the pipe, 25-mm above the slab (North)	S7
	On the pipe, 25-mm above the slab (South)	S8
Specimen 3 - A SNAP H50S-RR High-Top cast-in fire collar protecting a nominal 2-inch Fuseal polypropylene stack pipe	On the slab, 25-mm from the collar (North)	S9
	On the slab, 25-mm from collar (South)	S10
	On the pipe, 25-mm above the slab (North)	S11
	On the pipe, 25-mm above the slab (South)	S12
Specimen 4 - A SNAP H150S-RR High-Top cast-in fire collar protecting a nominal 6-inch Fuseal polypropylene stack pipe	On the slab, 25-mm from the collar (North)	S13
	On the slab, 25-mm from collar (South)	S14
	On the pipe, 25-mm above the slab (North)	S15
	On the pipe, 25-mm above the slab (South)	S16
Rover		S17
Ambient		S18

Appendix B – Photographs

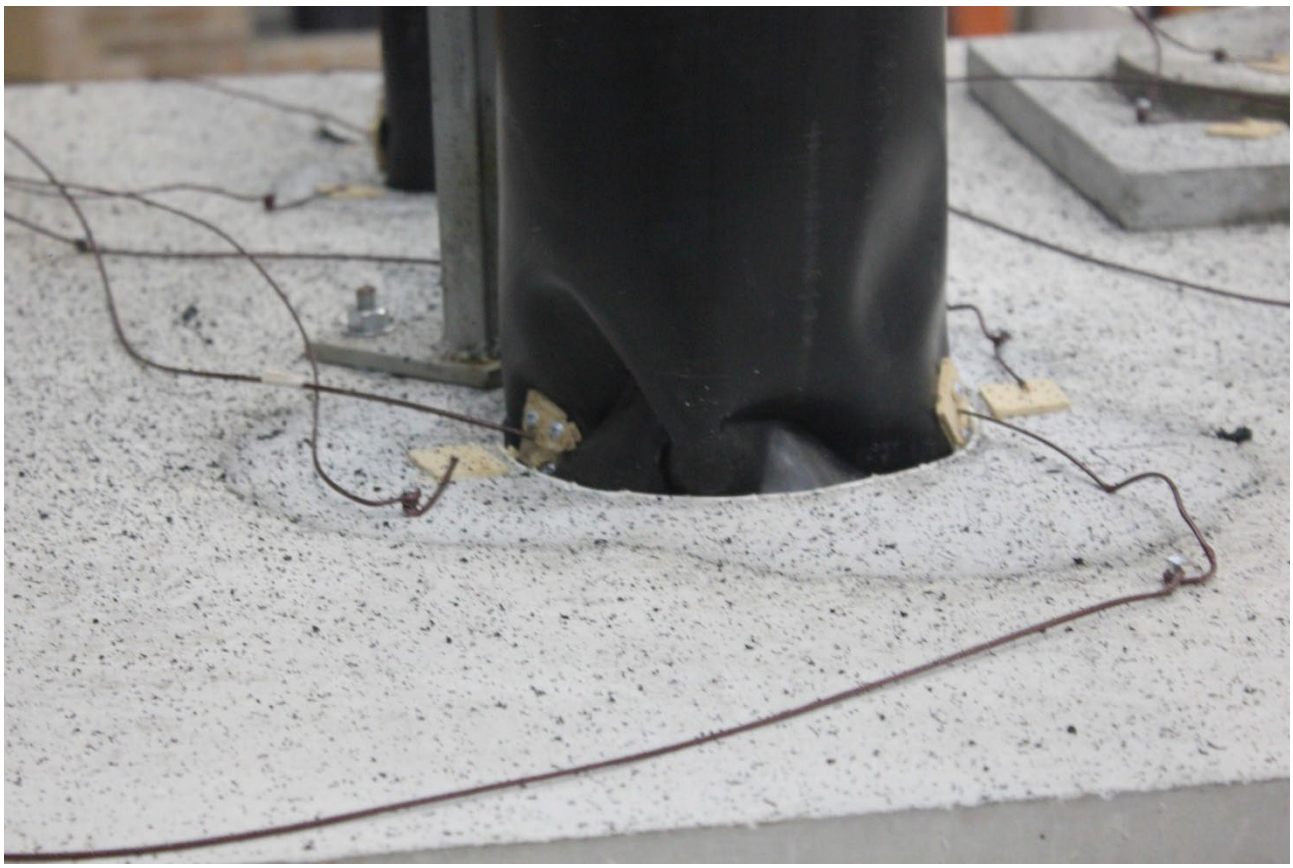
PHOTOGRAPH 1 – EXPOSED FACE OF SPECIMENS PRIOR TO TESTING



PHOTOGRAPH 2 – UNEXPOSED FACE OF SPECIMENS PRIOR TO TESTING

PHOTOGRAPH 3 – UNEXPOSED FACE OF SPECIMENS PRIOR TO TESTING

PHOTOGRAPH 4 – SPECIMENS AT 9 MINUTES INTO THE TEST



PHOTOGRAPH 5 – SPECIMEN 4 AT 14 MINUTES INTO THE TEST

PHOTOGRAPH 6 –SPECIMENS AT 30 MINUTES INTO THE TEST

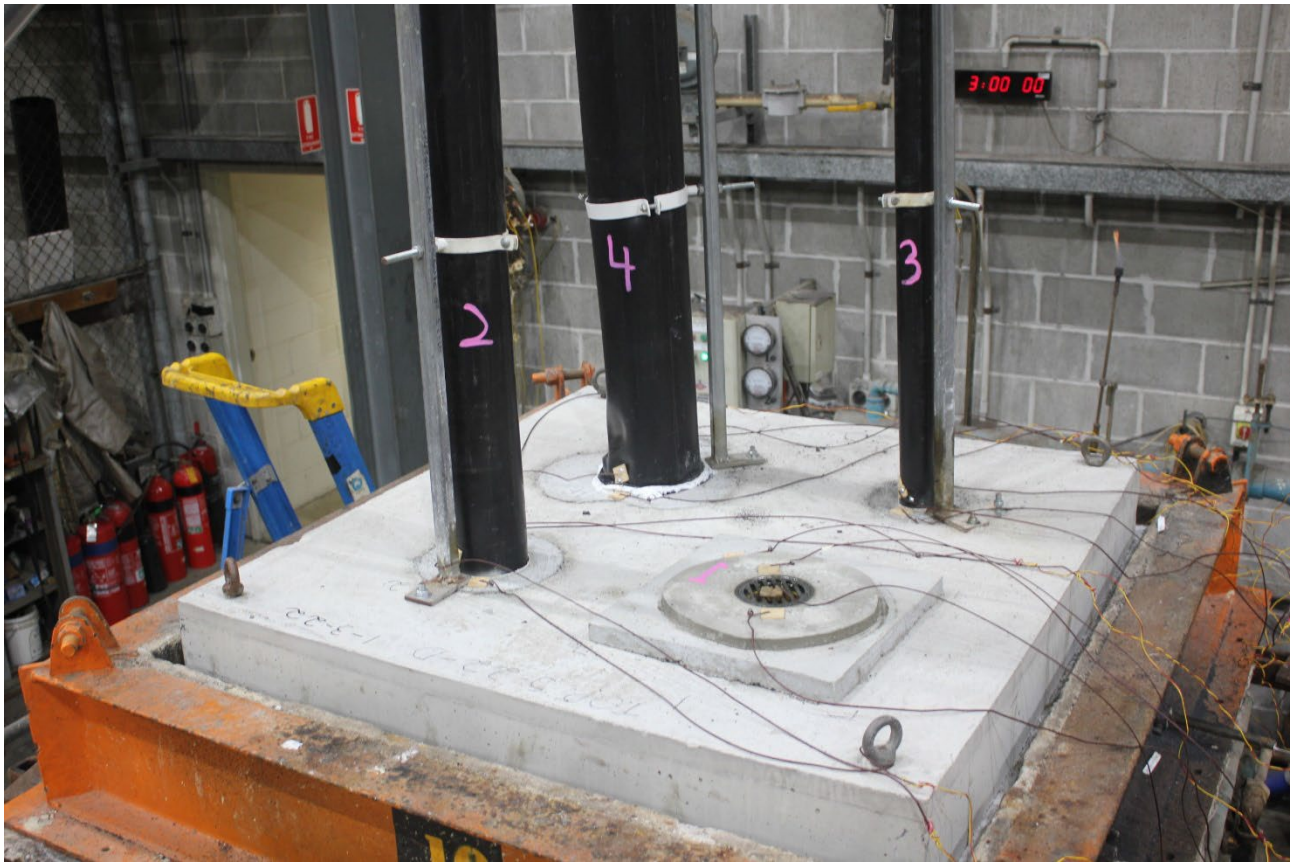
PHOTOGRAPH 7 – SPECIMENS AT 60 MINUTES INTO THE TEST

PHOTOGRAPH 8 – SPECIMEN 4 AT 88 MINUTES INTO THE TEST

PHOTOGRAPH 9 – SPECIMENS AT 90 MINUTES INTO THE TEST

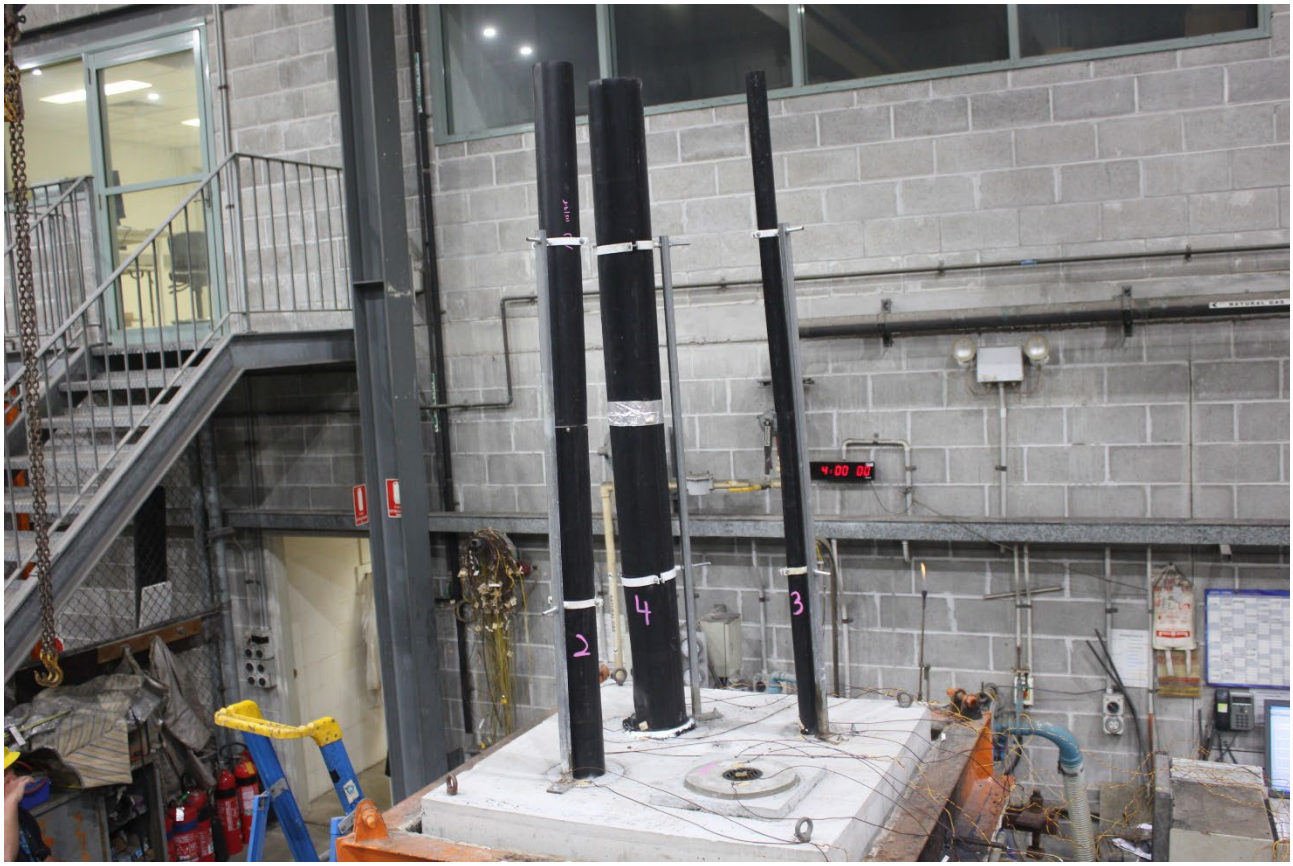
PHOTOGRAPH 10 – SPECIMEN 1 AT 120 MINUTES INTO THE TEST

PHOTOGRAPH 11 – SPECIMENS AT 150 MINUTES INTO THE TEST

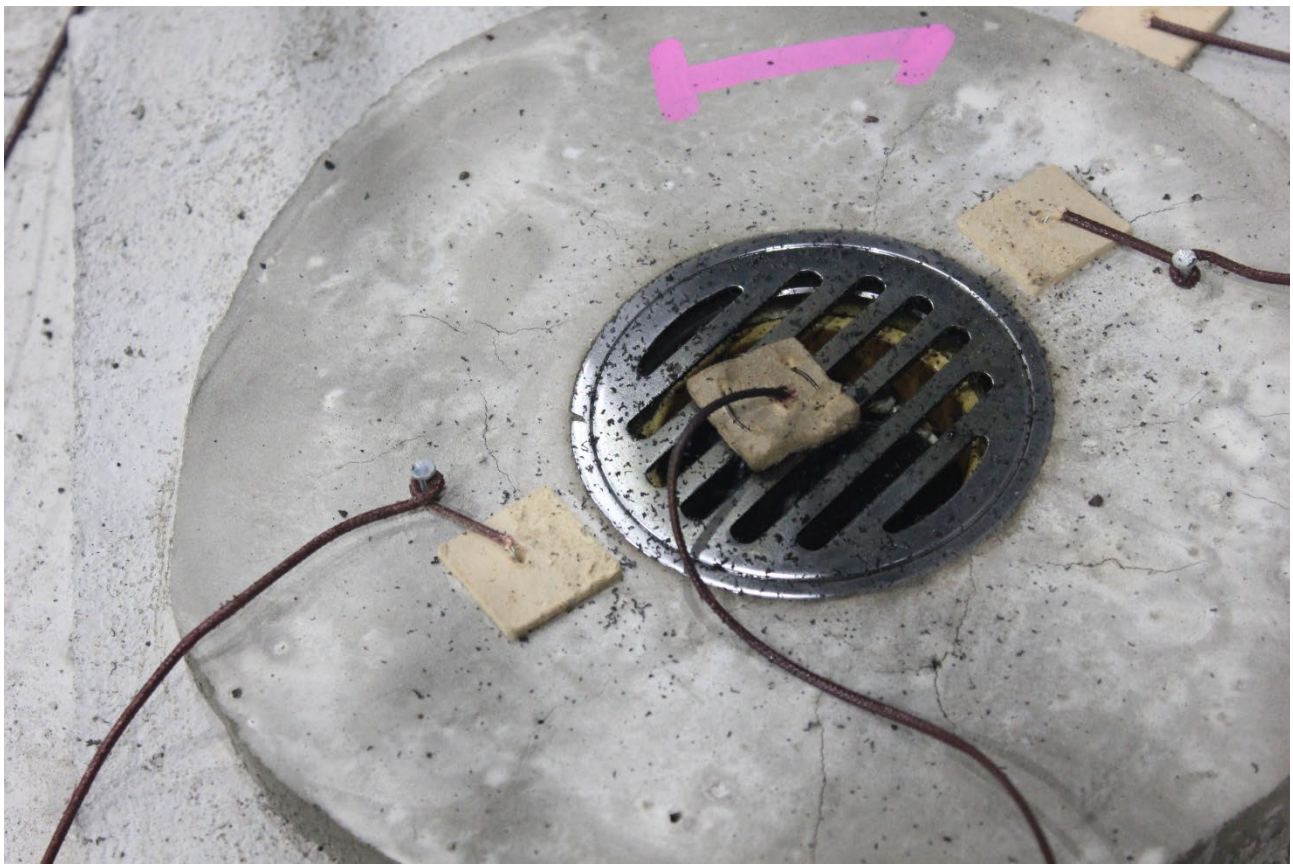


PHOTOGRAPH 12 – SPECIMENS AT 180 MINUTES INTO THE TEST

PHOTOGRAPH 13 – THE BASE OF SPECIMEN 2 AT 230 MINUTES INTO THE TEST

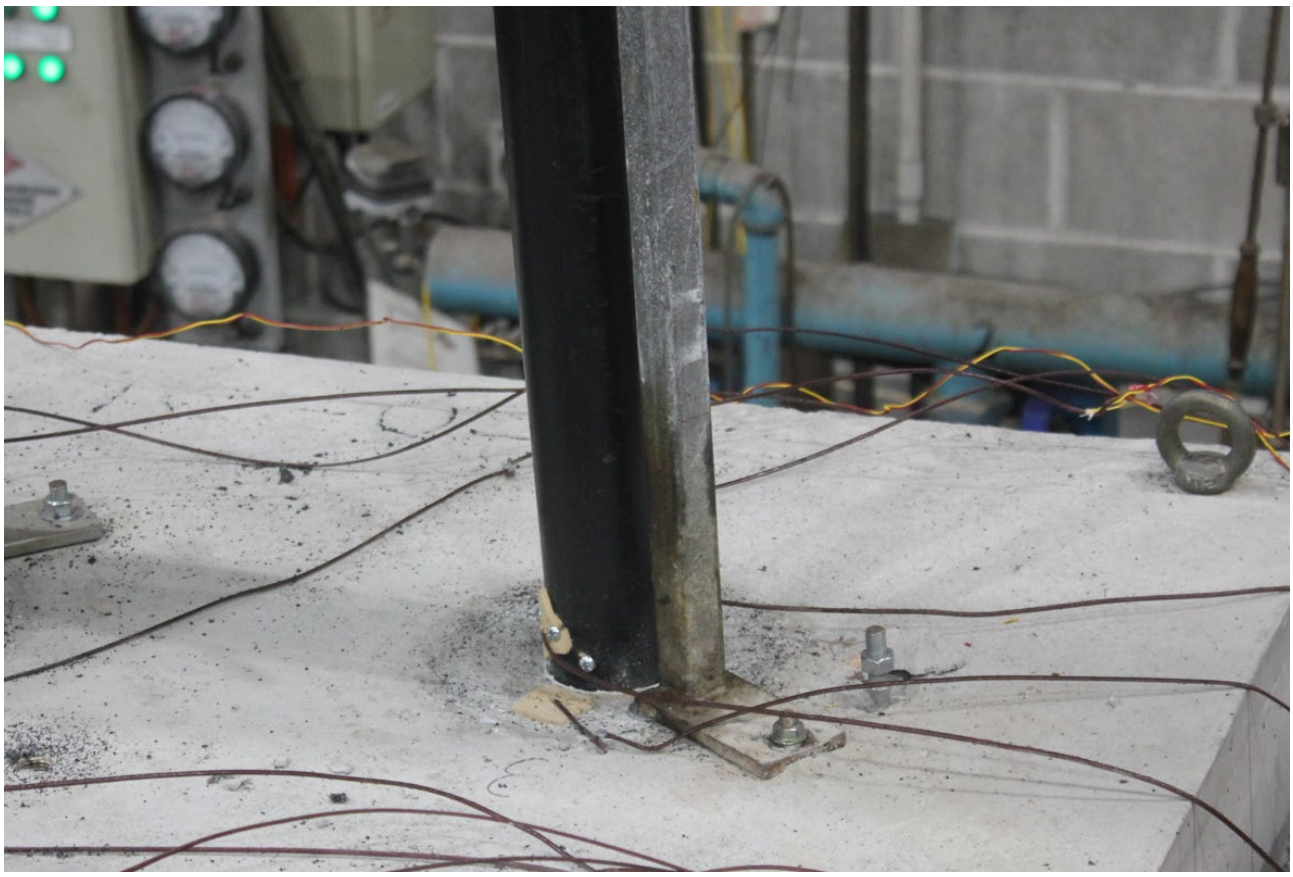


PHOTOGRAPH 14 – SPECIMENS AT 240 MINUTES INTO THE TEST.



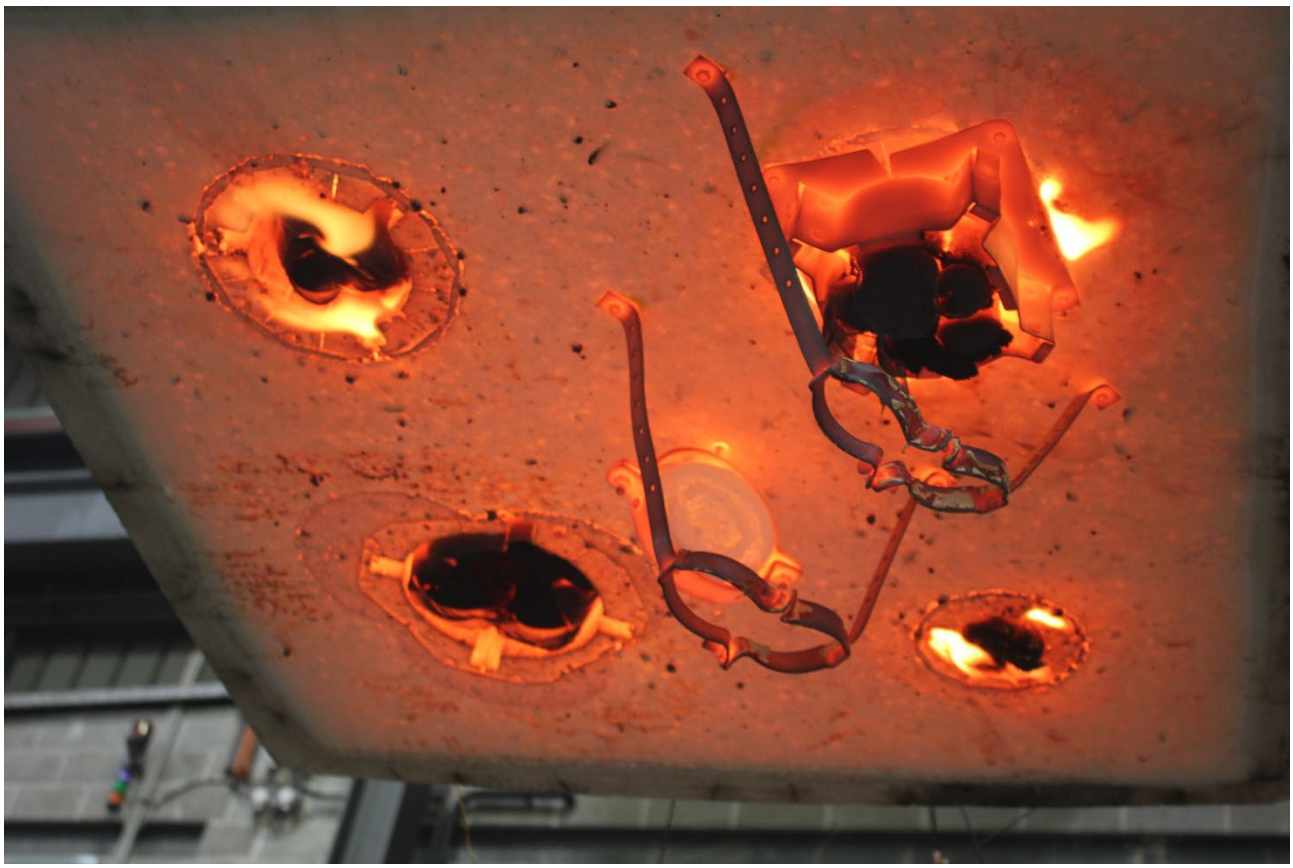
PHOTOGRAPH 15 – SPECIMEN 1 AT 240 MINUTES INTO THE TEST

PHOTOGRAPH 16 – SPECIMEN 2 AT 240 MINUTES INTO THE TEST



PHOTOGRAPH 17 – SPECIMEN 3 AT 240 MINUTES INTO THE TEST

PHOTOGRAPH 18 – SPECIMEN 4 AT 240 MINUTES INTO THE TEST



PHOTOGRAPH 19 – EXPOSED FACE OF SPECIMENS AT THE CONCLUSION OF TESTING

Appendix C – Test Data charts

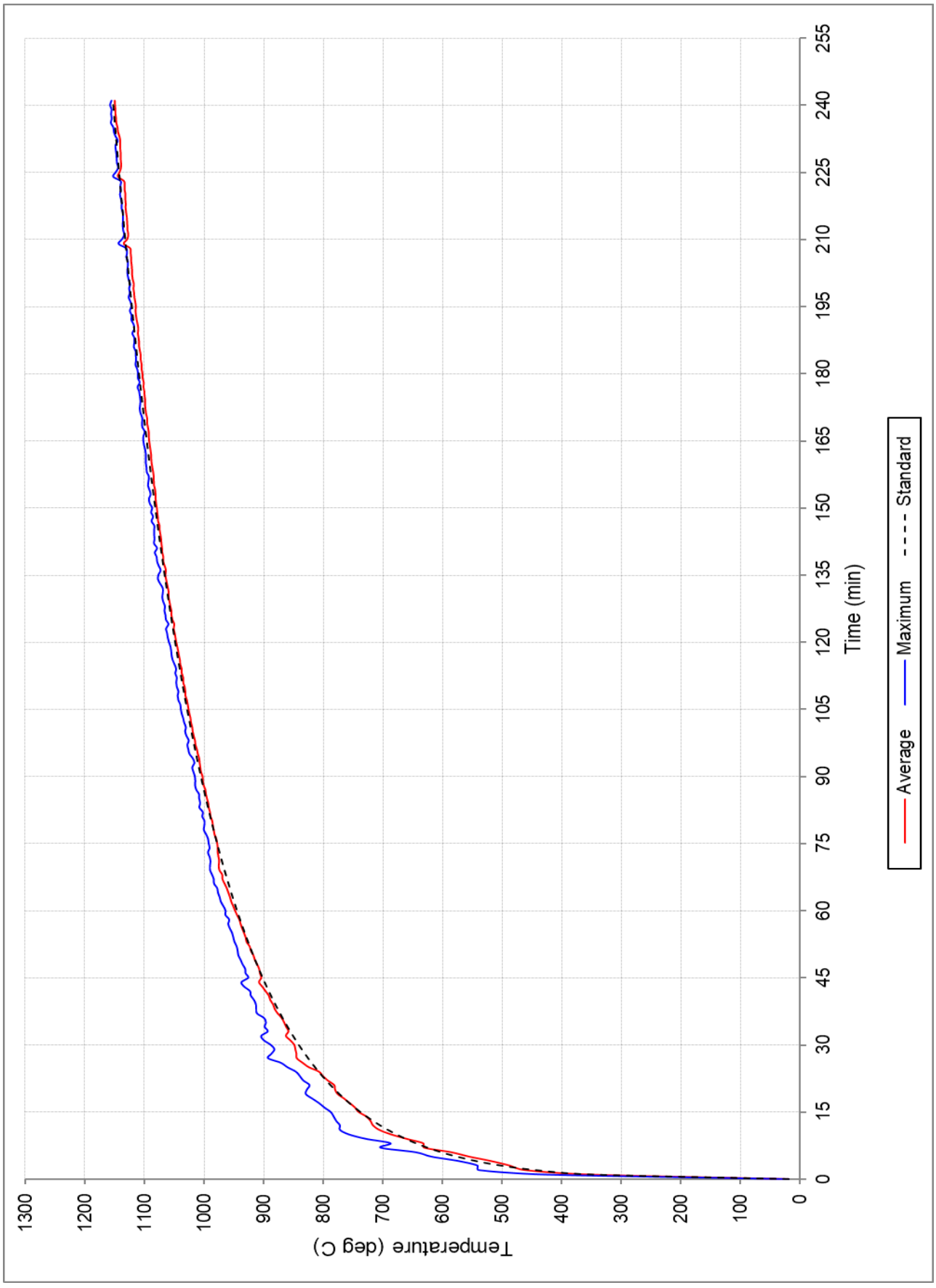


FIGURE 1 – FURNACE TEMPERATURE

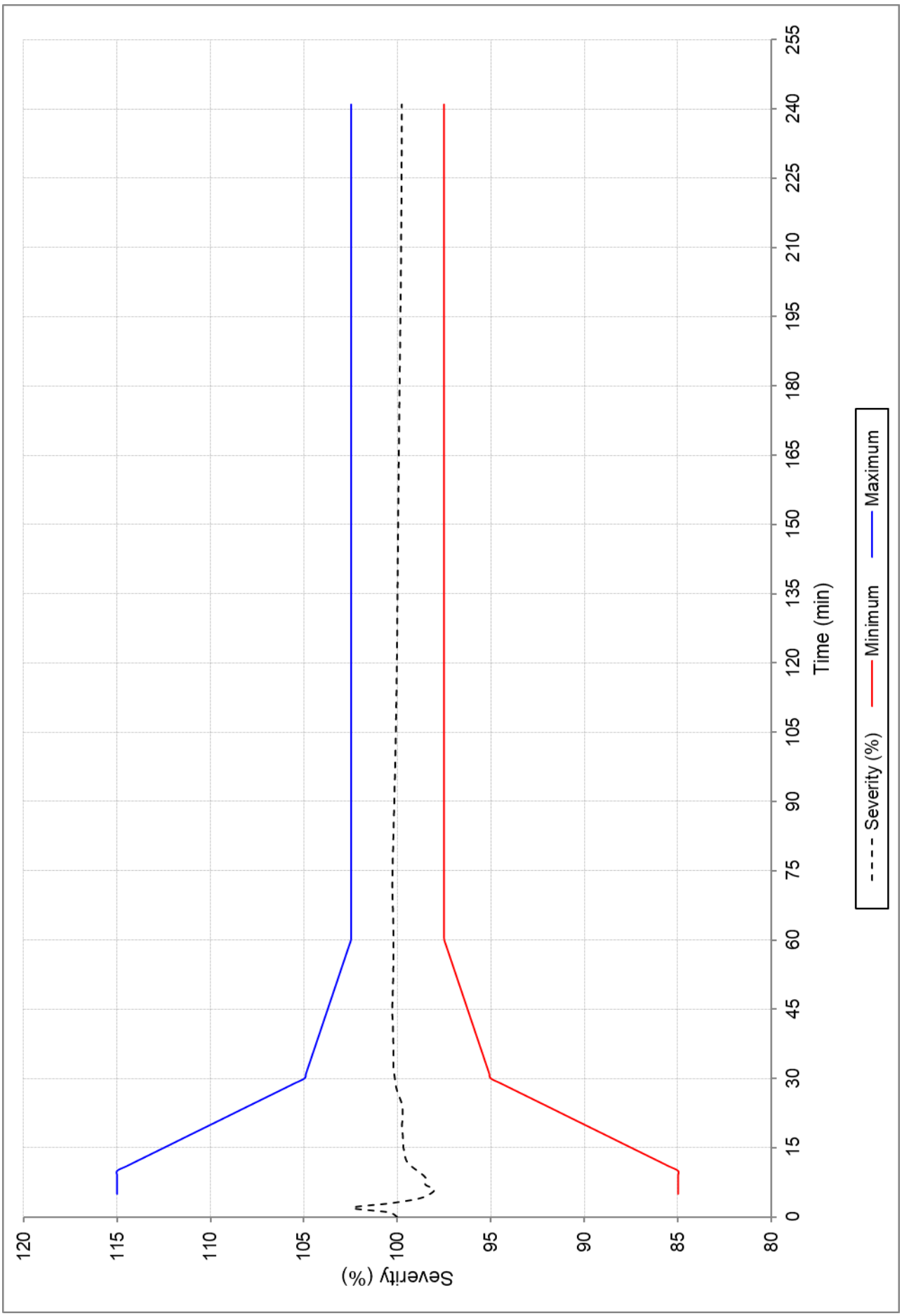


FIGURE 2 – FURNACE SEVERITY

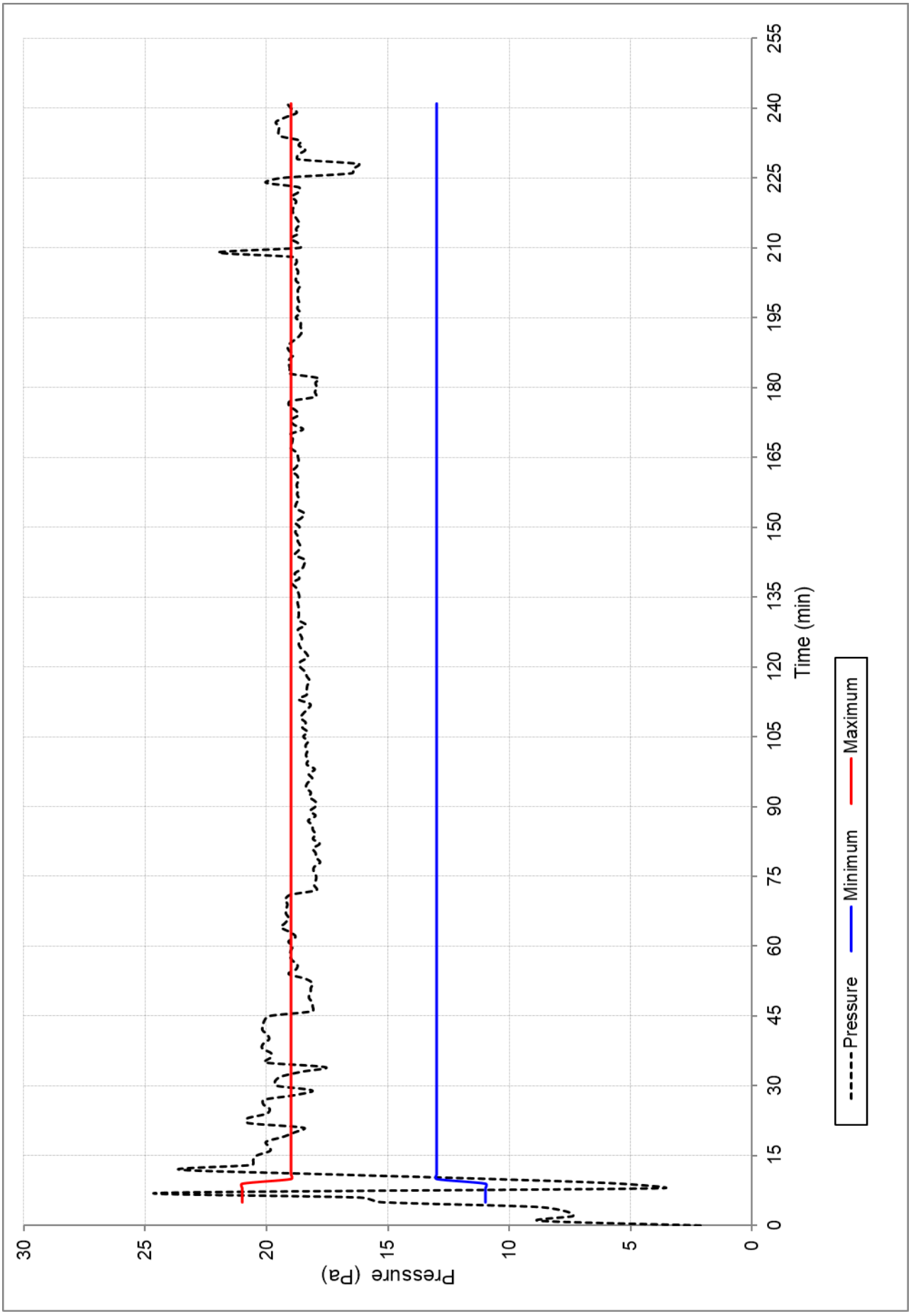


FIGURE 3 – FURNACE PRESSURE

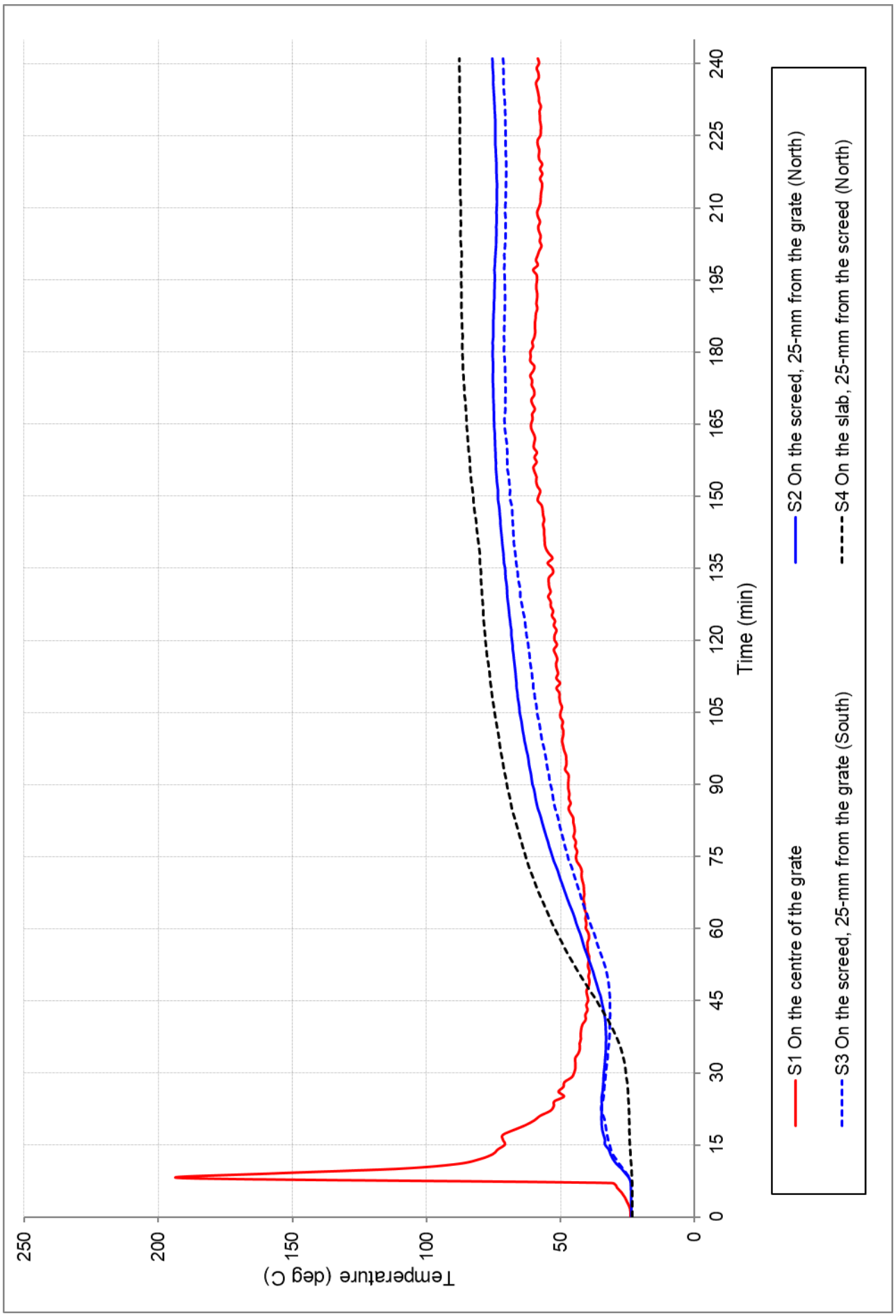


FIGURE 4 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 1

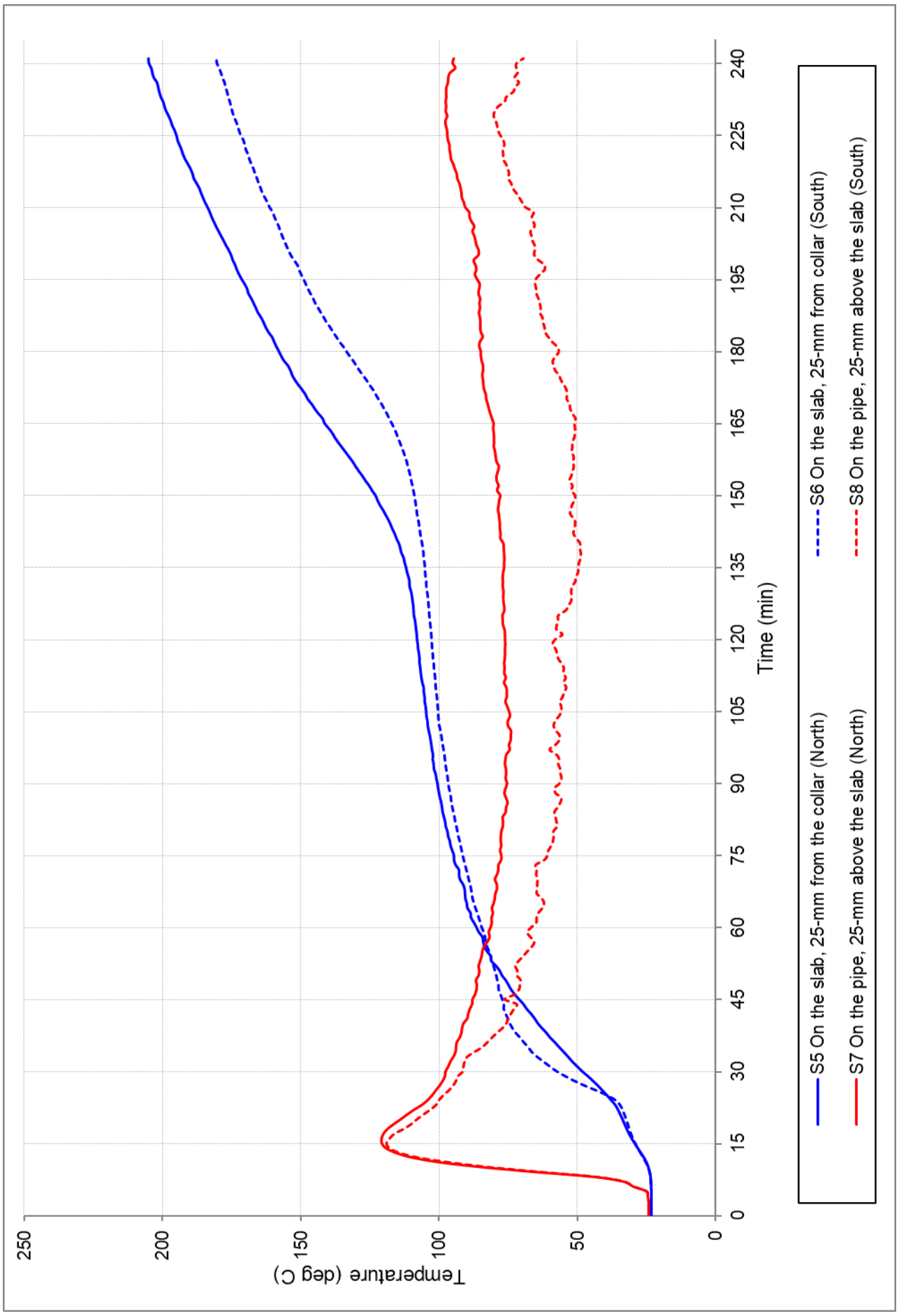


FIGURE 5 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 2

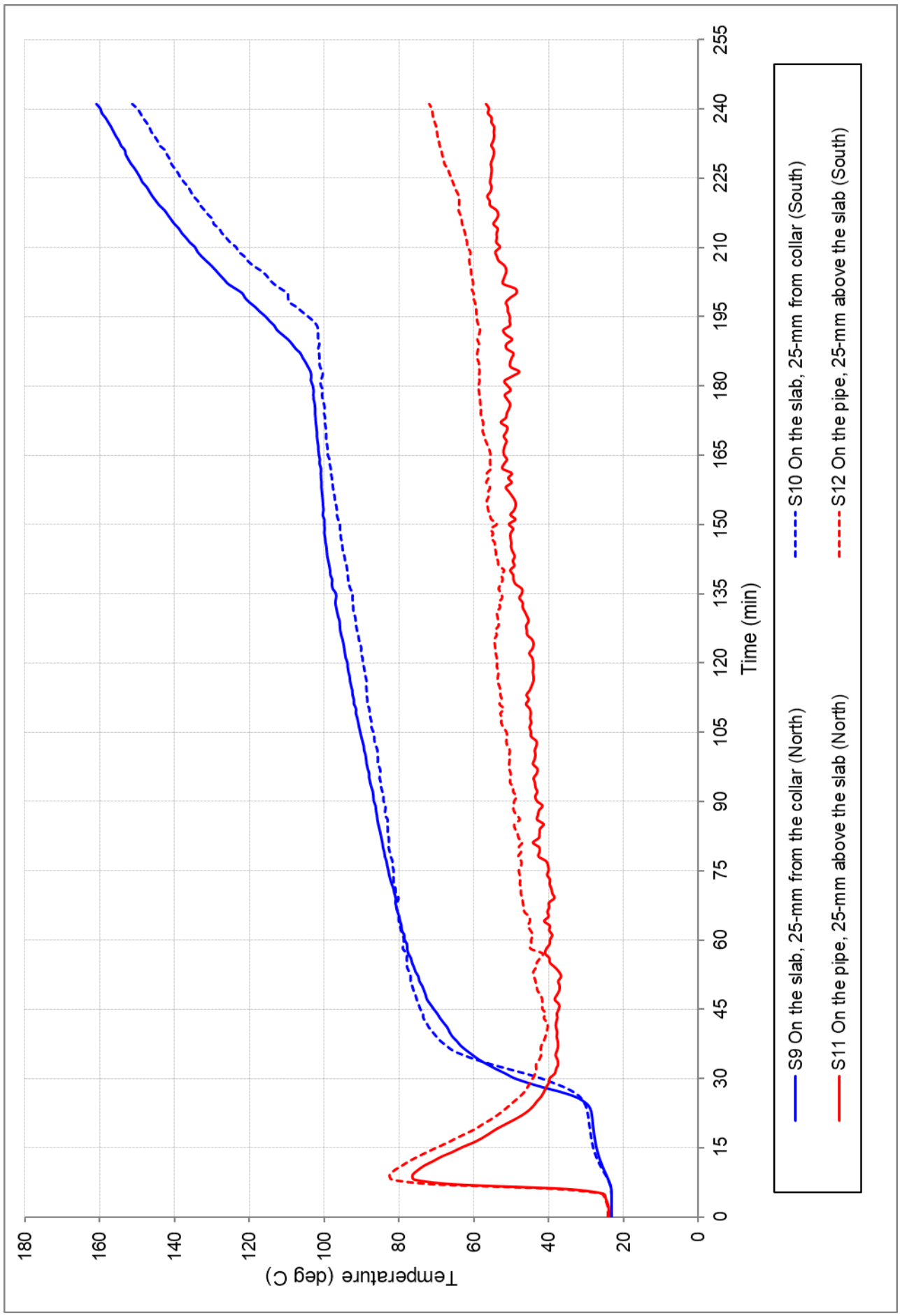


FIGURE 6 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 3

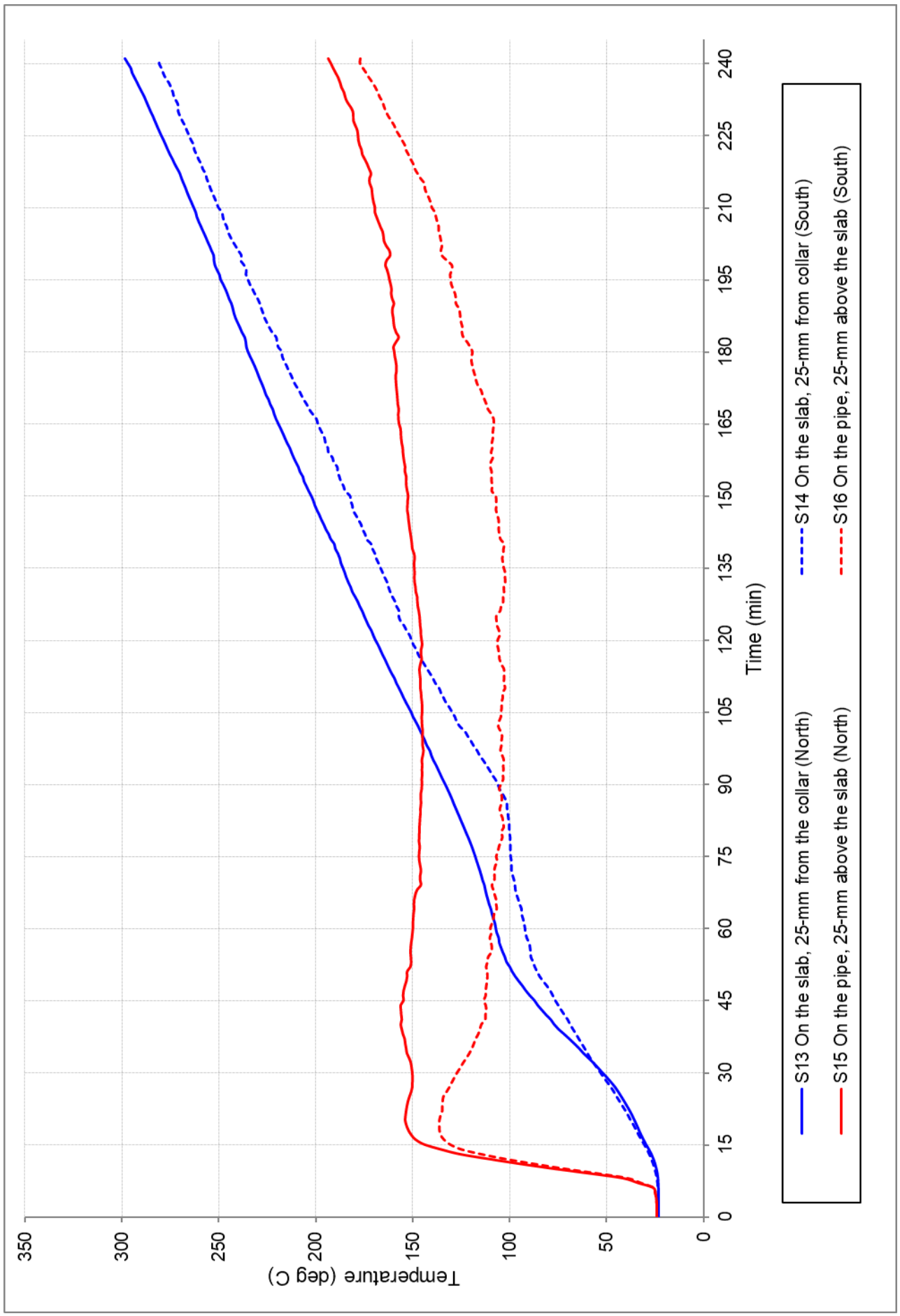


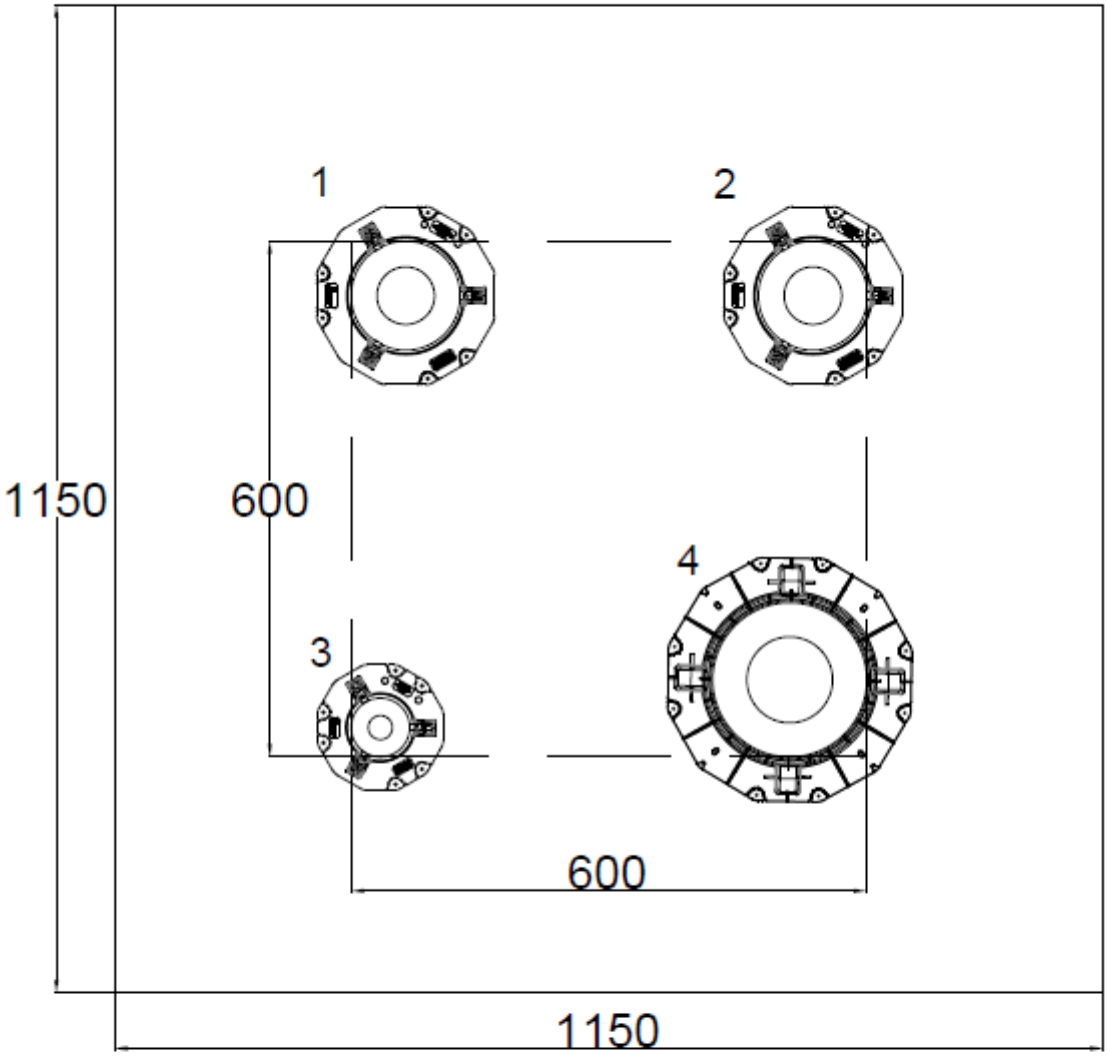
FIGURE 7 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 4

Appendix D – Installation drawings

Snap Fire Systems Pty Ltd

Test Slab S-22-D Layout

Date: 18 JAN 2022



Penetration	Collar Code	Pipe Type	Pipe Diameter
1	H100FWS-RR & LP100R-D	Fuseal	110
2	H100S-RR	Fuseal	110
3	H50S-RR	Fuseal	50
4	H150S-RR	Fuseal	160

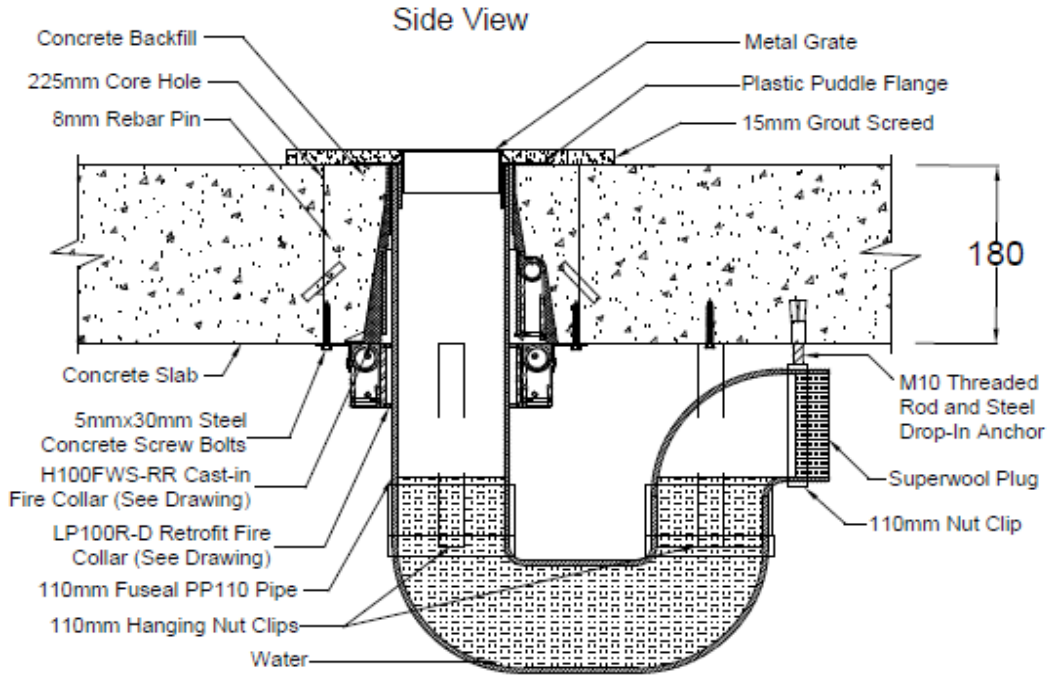
DRAWING TITLED "TEST SLAB S-22-D LAYOUT", DATED 18 JANUARY 2022, BY SNAP FIRE SYSTEMS PTY LTD

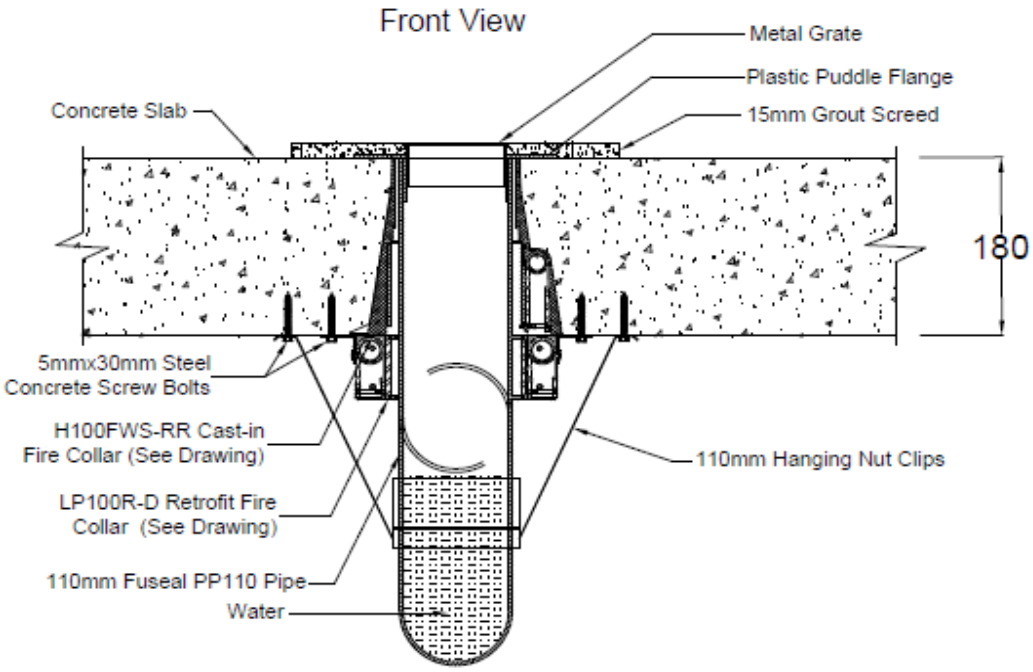
Snap Fire Systems Pty Ltd

Specimen #1

110 Fuseal PP110 Floor Waste & LP100R-D over H100FWS-RR

09 MAR 2022





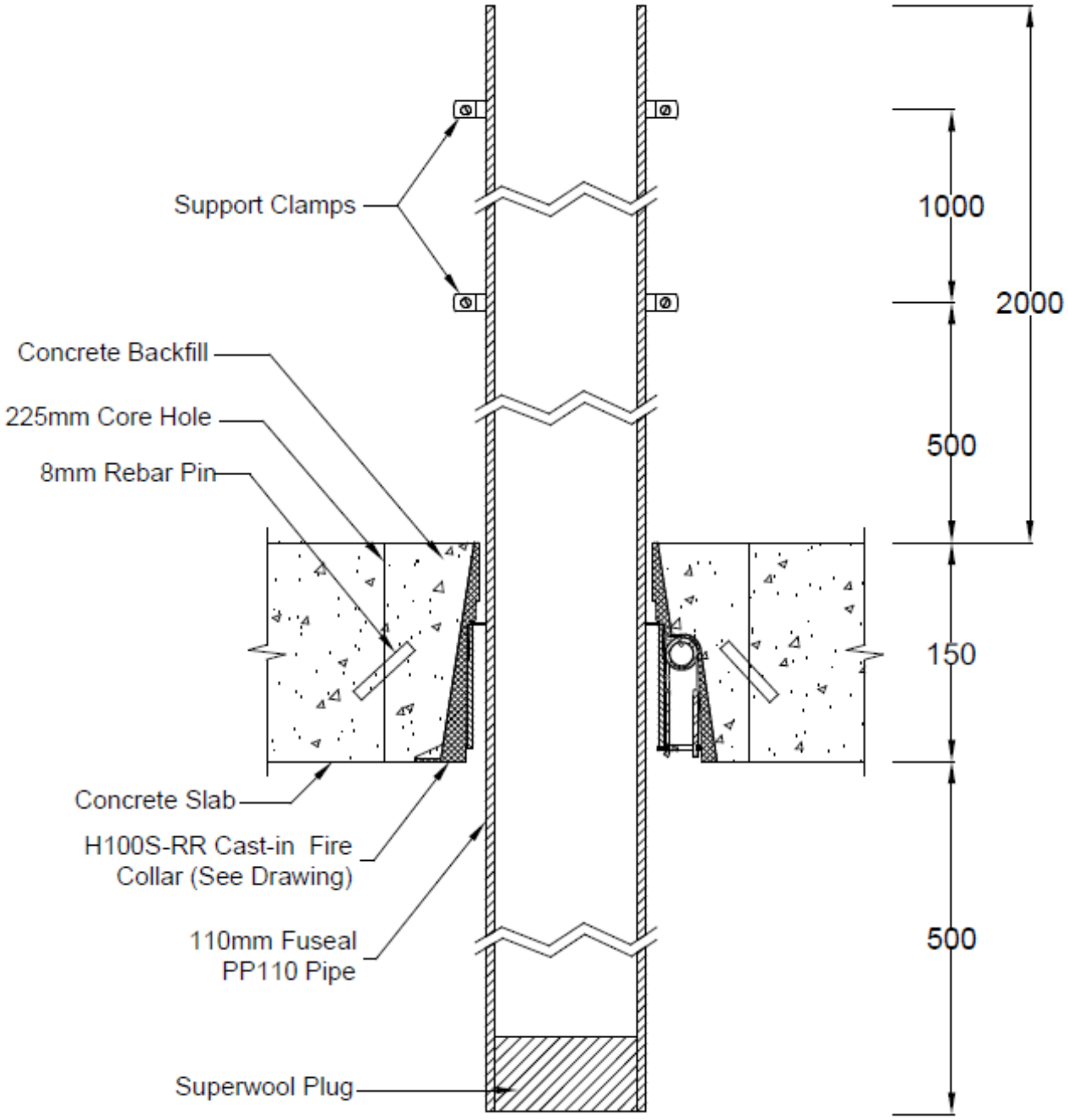
DRAWING TITLED 'SPECIMEN #1 '110 FUSEAL PP110 FLOORWASTE & LP100R-D OVER H100FWS-RR', DATED 24 FEB 2022, BY SNAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd

Specimen #2

110 Fuseal PP110 Stack & H100S-RR

Date: 09 MAR 2023



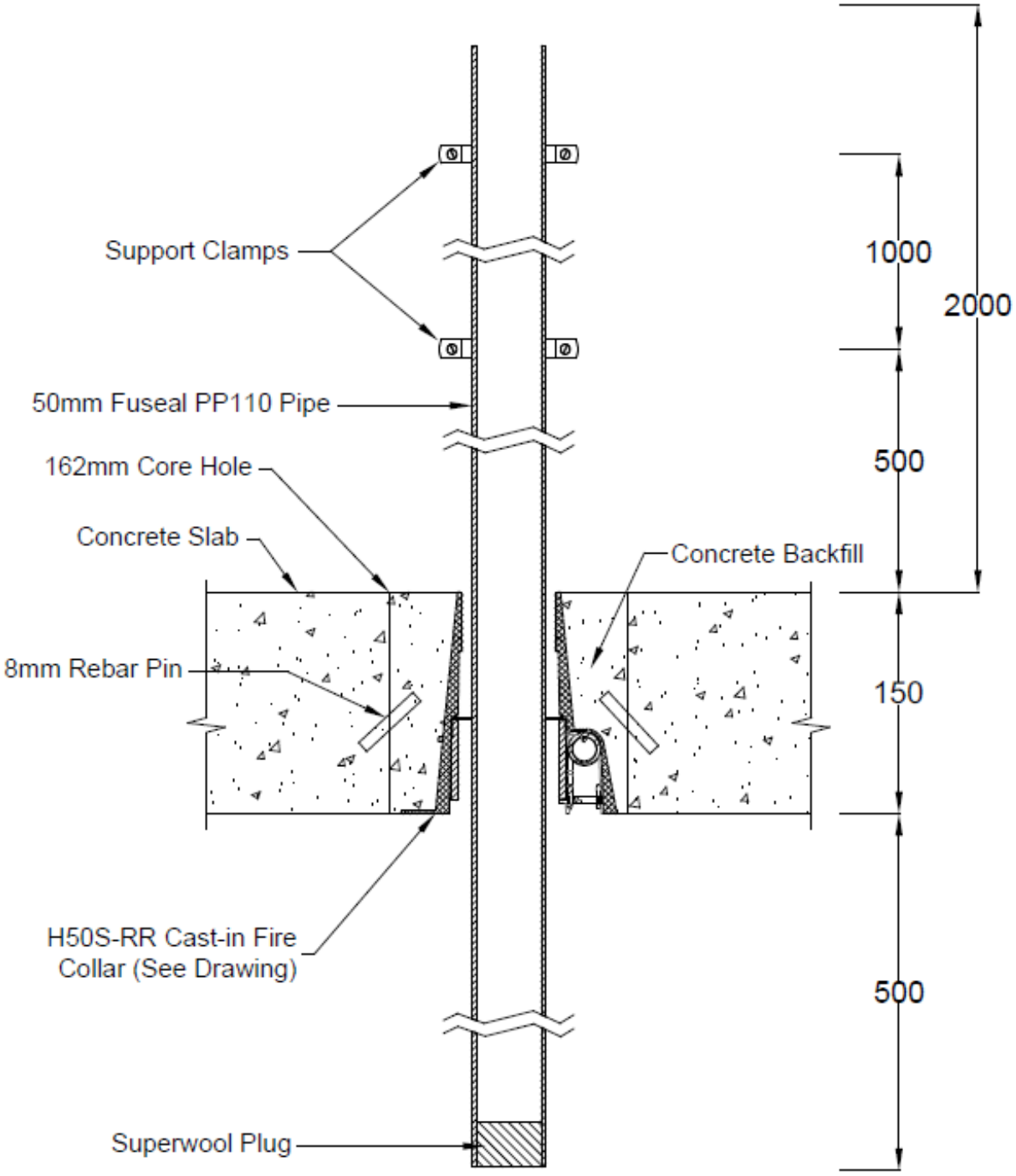
DRAWING TITLED 'SPECIMEN #2, 110 FUSEAL PP110 STACK & H100S-RR', DATED 9 MARCH 2022 BY SNAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd

Specimen #3

50 Fuseal PP110 Stack & H50S-RR

Date: 09 MAR 2022



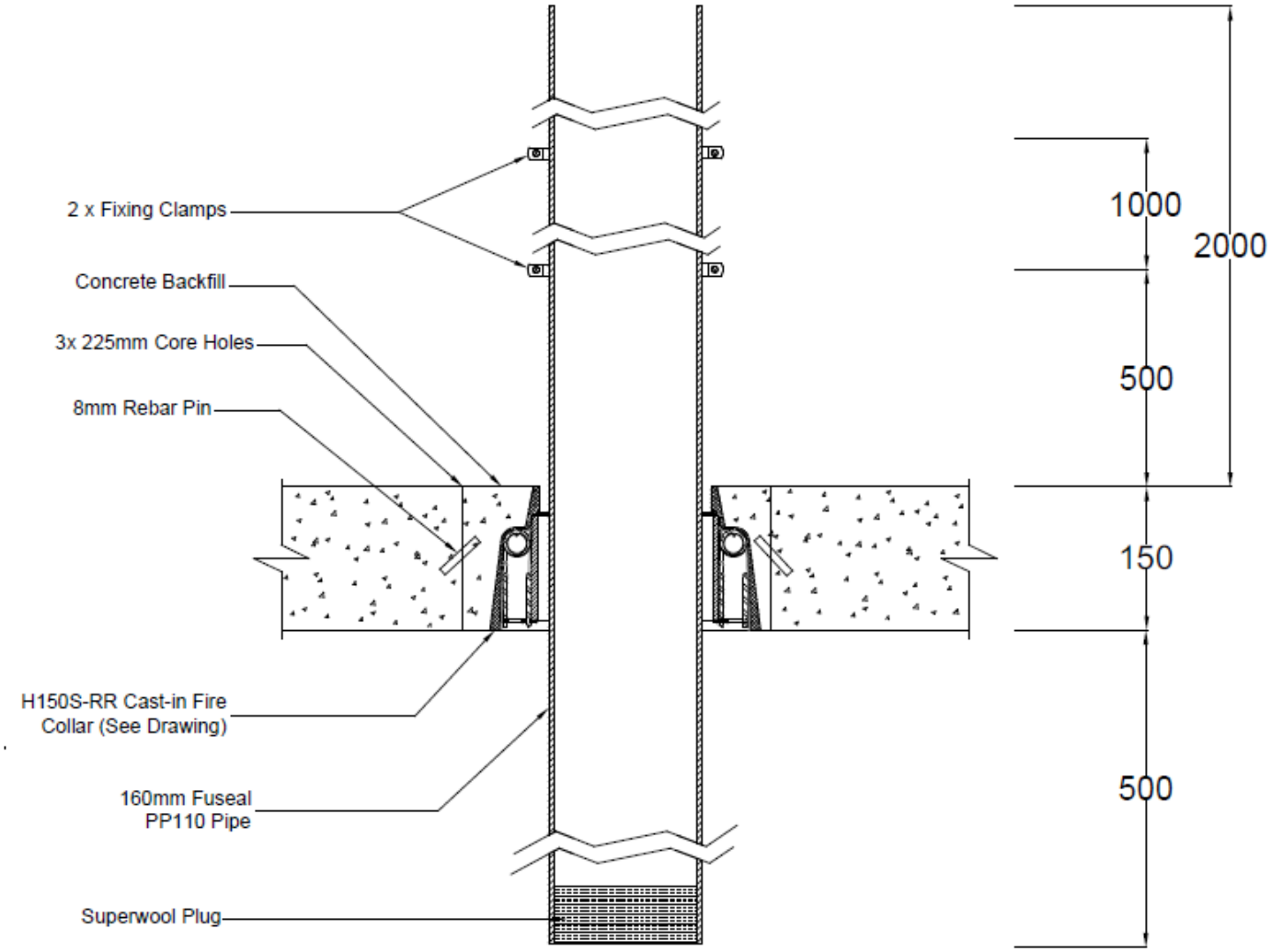
DRAWING TITLED 'SPECIMEN #3 50 FUSEAL PP110 STACK & H50S-RR', DATED 9 MARCH 2022 BY SNAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd

Specimen #4

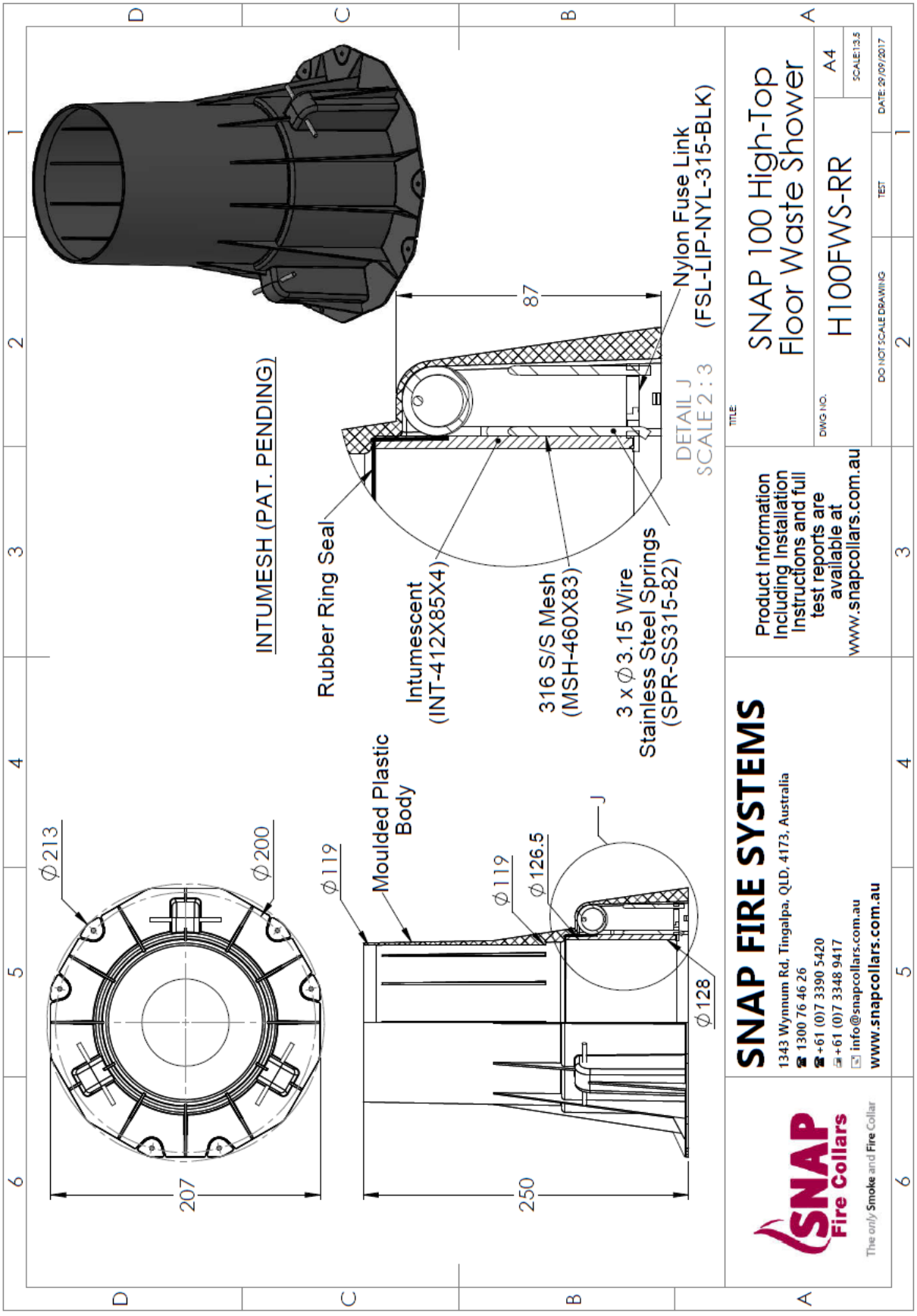
160 Fuseal PP110 Stack & H150S-RR

Date: 09 MAR 2022

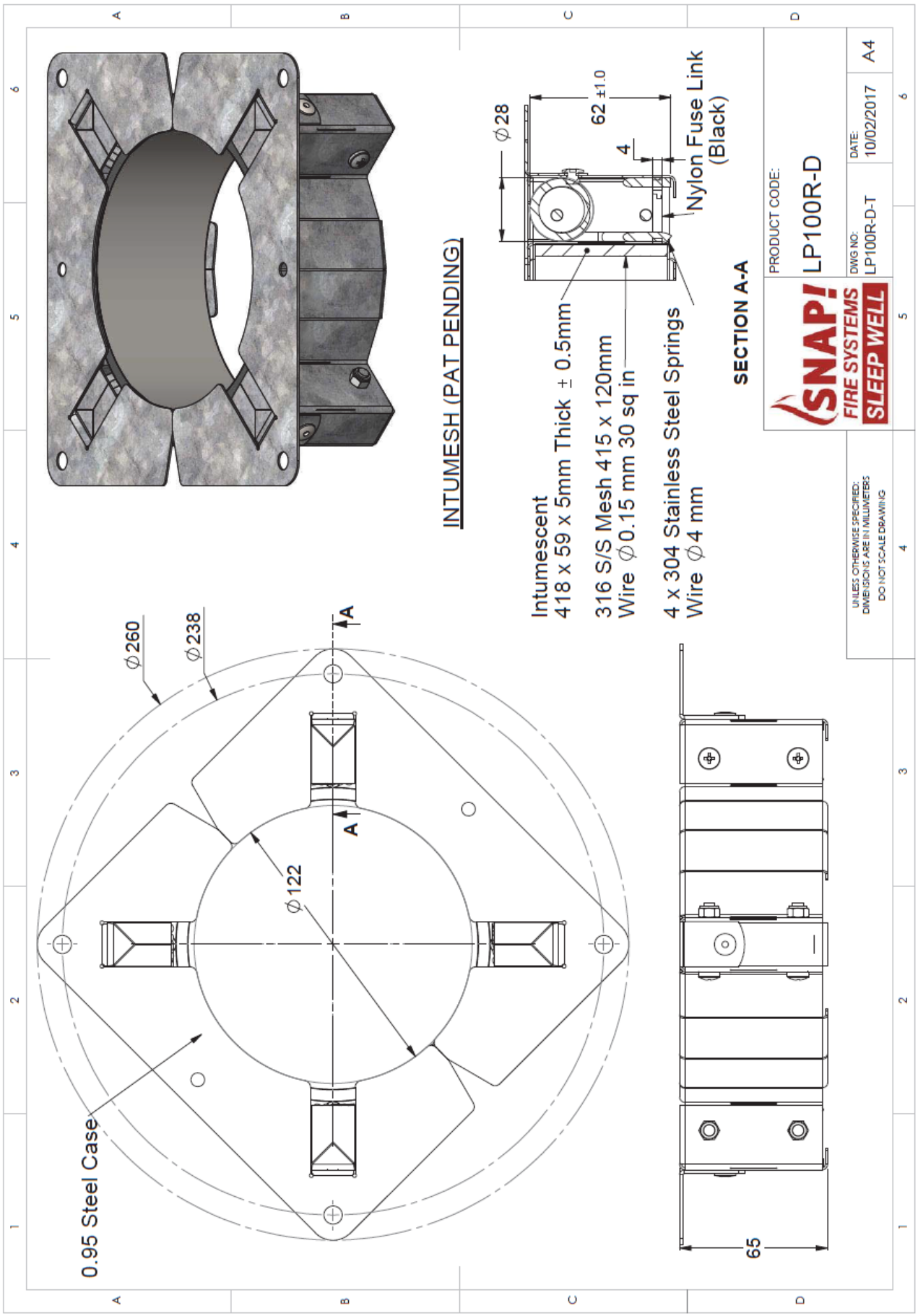


DRAWING TITLED 'SPECIMEN #4 160 FUSEAL PP110 STACK & H150S-RR', DATED 9 MARCH 2022 BY SNAP FIRE SYSTEMS PTY LTD

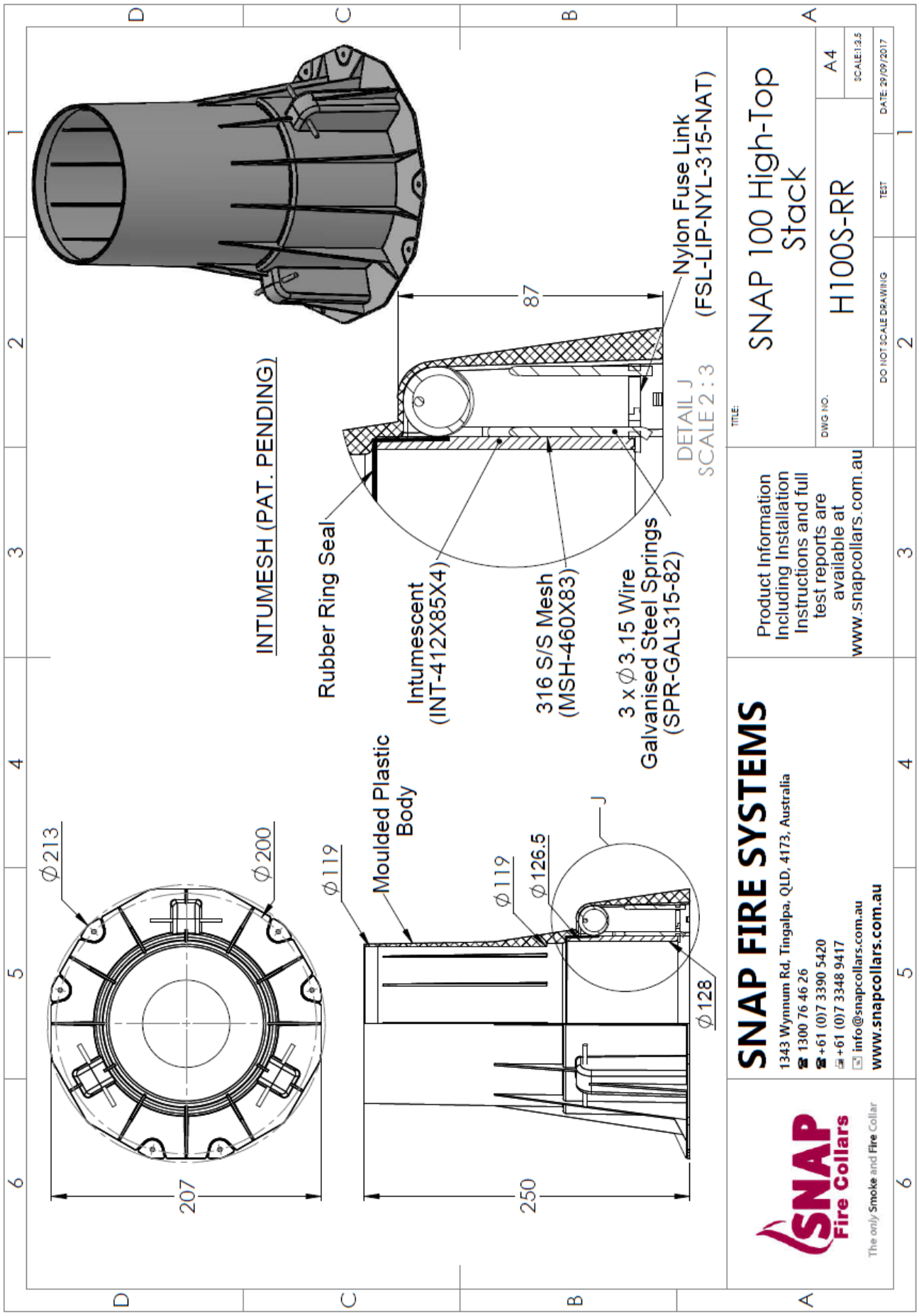
Appendix E – Specimen Drawings



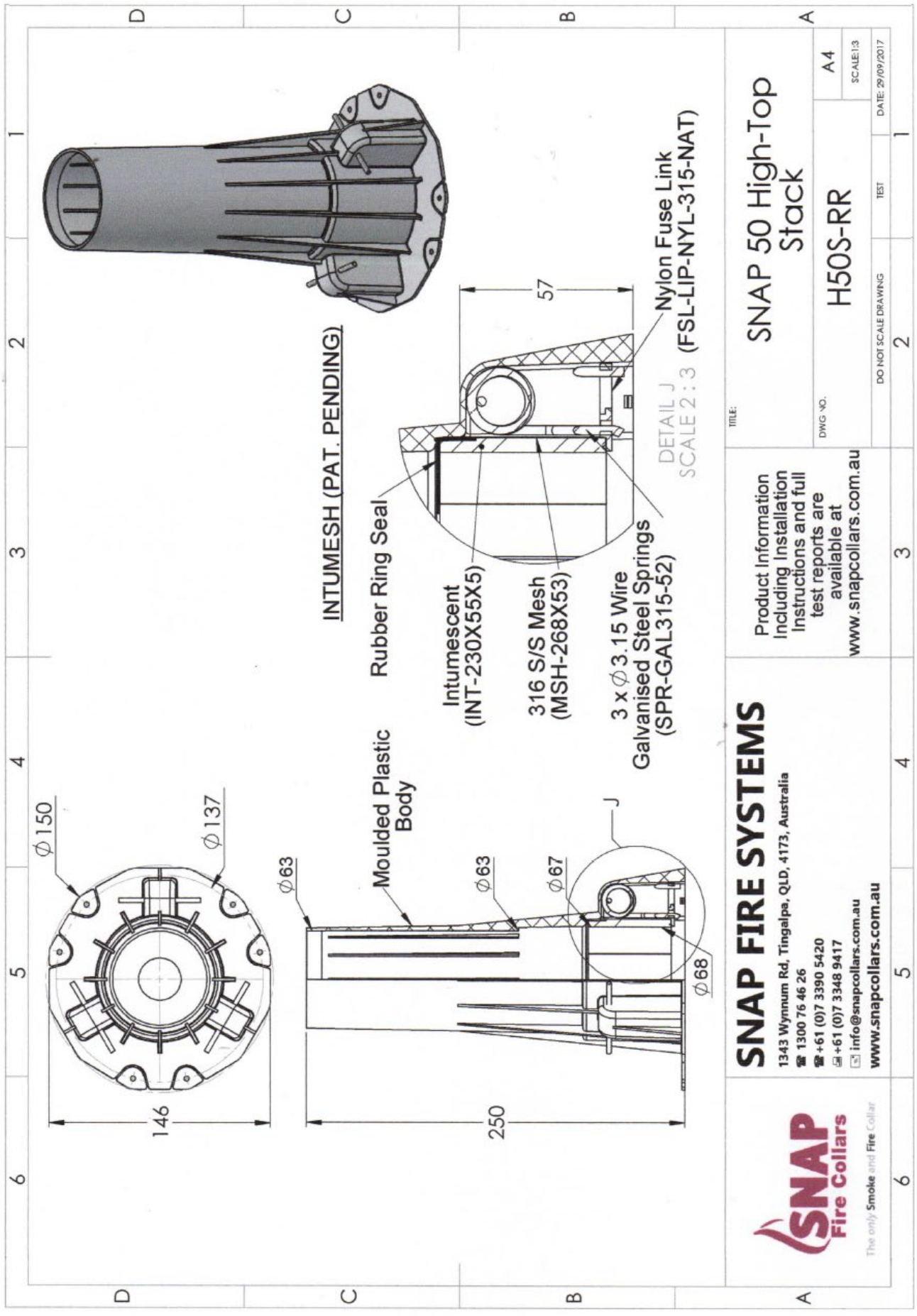
DRAWING TITLED 'SNAP 100 HIGH-TOP FLOOR WASTE SHOWER' DATED 29 SEPTEMBER 2017, BY SNAP FIRE SYSTEMS PTY LTD.



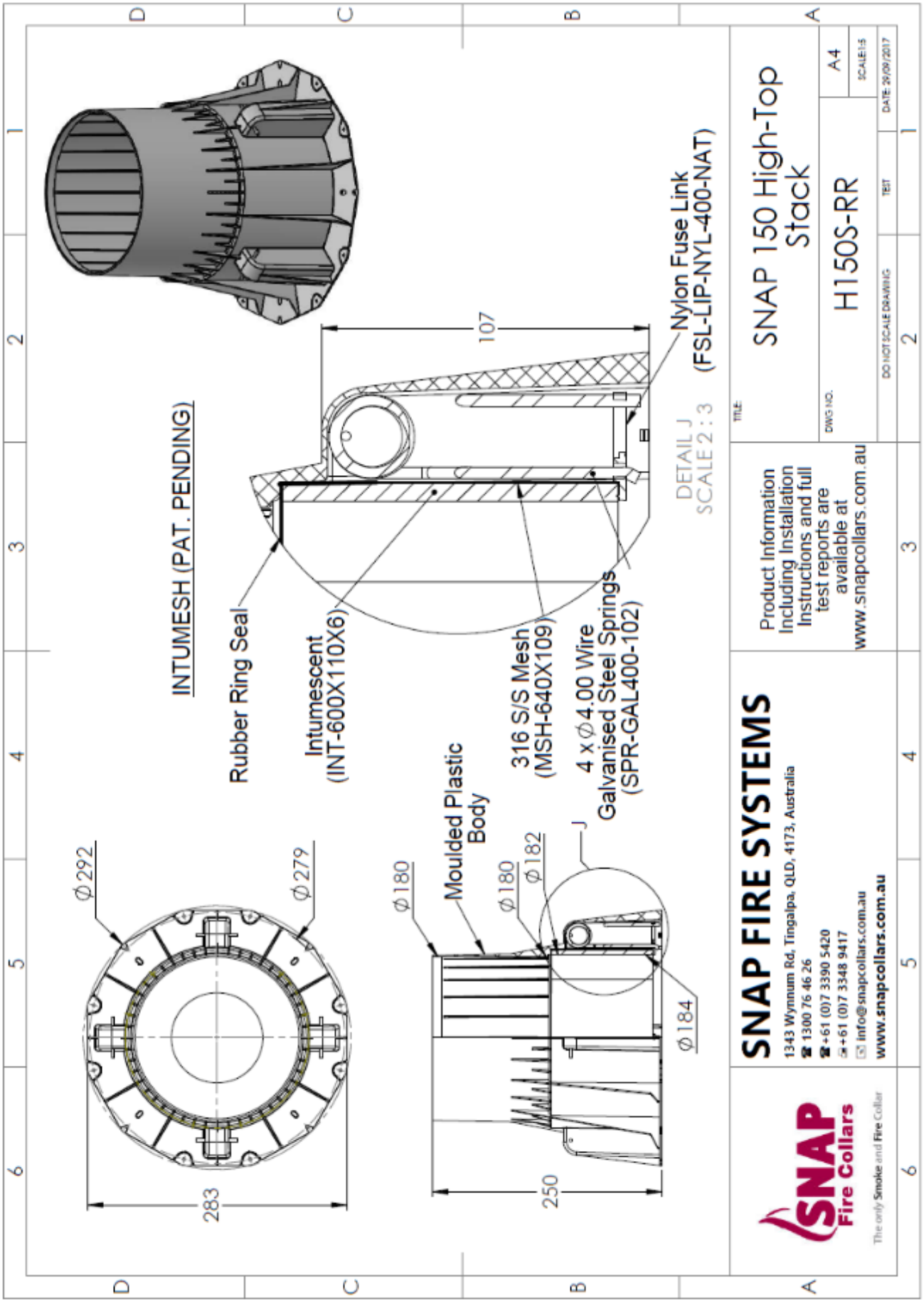
DRAWING NUMBERED LP100R-D-T, DATED 10 FEBRUARY 2017, BY SNAP FIRE SYSTEMS PTY LTD



DRAWING TITLED "SNAP 100 HIGH-TOP STACK", DATED 29 SEPTEMBER 2017, BY SNAP FIRE SYSTEMS PTY LTD



DRAWING TITLED "SNAP 50 HIGH-TOP STACK", DATED 29 SEPTEMBER 2017, BY SNAP FIRE SYSTEMS PTY LTD



DRAWING TITLED "SNAP 150 HIGH-TOP STACK", DATED 29 SEPTEMBER 2017, BY SNAP FIRE SYSTEMS PTY LTD

Appendix F – Certificate(s) of Test

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

Certificate of Test

No. 3681b

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
1343 Wynnum Road
Tingalpa QLD

A full description of the test specimen and the complete test results are detailed in the Division's report numbered FSP 2274 Revision B.

Product Name: SNAP LP100R-D Low Profile Retrofit fire collar and SNAP H100FWS-RR High-Top Floor Waste Shower Cast-in fire collar protecting a nominal 4-inch Fuseal polypropylene pipe incorporating a floor waste and a P Trap (Specimen 1)

Description: The specimen comprised an 1150-mm x 1150-mm x 150mm/180-mm concrete slab which was penetrated by a total of four (4) polypropylene pipes protected with SNAP retrofit and cast-in fire collars. For the purpose of the test, the penetrations were referenced as Specimen 1, 2, 3 and 4. Specimen 1 is the subject of this Certificate. The 180-mm thick section of the concrete slab used in the installation of Specimen 1 was reinforced with a single layer of steel reinforcement providing a Fire Resistance Period (FRP) for insulation of 240 minutes in accordance with table 5.5.1 of AS 3600:2018 - Concrete structures. The SNAP H100FWS-RR High-Top Floor Waste Shower Cast-in fire collar comprised a 1.6-mm thick polypropylene casing with a 119-mm inner dia. and a 213-mm base flange. The 250-mm high collar casing incorporated a layer of 412-mm x 85-mm x 4-mm thick Intumescent material and a rubber ring seal. The closing mechanism comprised three equally spaced 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. The SNAP H100FWS-RR High-Top Floor Waste Shower collar was cast into a 180-mm thick concrete slab with the collar's casing cut down to 180-mm high finishing flush with unexposed face of the concrete slab. The SNAP LP100R-D Low Profile Retrofit fire collar comprised a 0.95-mm steel casing with a 122 mm inner dia. and a 260-mm dia. base flange. The 65-mm high collar casing incorporated a closing mechanism which comprised a 5-mm thick x 59-mm wide x 418-mm long Intumesh intumescent wrap lined within internal circumference of collar casing. Closing mechanism comprised four 4-mm dia. 304 stainless steel springs with black nylon fuse links and a 415-mm long x 120-mm wide mesh with a wire dia. of 0.15 mm. The SNAP LP100R-D fire collar was centrally located over SNAP H100FWS-RR cast-in collar on exposed face of concrete slab and fixed in place through the four mounting brackets using concrete screw bolts. Penetrating service comprised a pipe with a floor waste system incorporating a P-Trap. Penetrating George Fischer Fuseal PP110 polypropylene pipe had a 114.3-mm outside dia. pipe with a wall thickness of 6.7 mm and was fitted through a sleeve on both fire collars. The top of the propylene pipe incorporated a floor waste comprising a chrome plated brass grate and a plastic puddle flange. A 15-mm thick grout screed was laid on top of concrete slab and finished flush with the floor grate. On the exposed side of the slab a Fuseal P-Trap was coupled below the SNAP LP100R-D fire collar. The end of the P-Trap was closed with a ceramic fibre (Superwool) plug. P-Trap was supported from centre coupling using double hanging side nut clips fixed to slab with concrete screw bolts and from the end of P-Trap, with a nut clip and M10 threaded rod fixed to concrete slab with a steel drop-in anchor. The Sponsor provided technical brochure 'Fuseal Corrosive Waste Piping Systems' dated May 2012 by Georg Fischer LLC, drawing 'Test Slab S-22-D' Layout', dated 18 January 2022, drawing 'Specimen #1 110 Fuseal PP110 Floor Waste & LP100R-D over H100FWS-RR', dated 9 March 2022, drawing titled 'SNAP 100 High-Top Floor Waste Shower', dated 29 September 2017, and drawing LP100R-D-T dated 10 February 2017 as a complete description of the specimen and should be read in conjunction with this Certificate.

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 -/240/240.

The fire-resistance level is applicable when the system is exposed to fire from the same direction as tested. The maximum FRL of any test specimen cannot exceed the FRL achieved by the concrete slab in which it was installed. 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: 21 March 2022

Issued on the 20th day of December 2023 without alterations or additions.

Chris Wojcik | for 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. 3681B

INFRASTRUCTURE TECHNOLOGIES
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14 Julius Avenue,
North Ryde NSW 2113 Australia
T (02) 9490 5444 • **ABN** 41 687 119 230

Certificate of Test

No. 3682a

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
1343 Wynnum Road
Tingalpa QLD

A full description of the test specimen and the complete test results are detailed in the Division's report numbered FSP 2274.

Product Name: SNAP H100S-RR High-Top Stack cast-in fire collar protecting a nominal 4-inch Fuseal polypropylene stack pipe (Specimen 2)

Description: The specimen comprised an 1150-mm x 1150-mm x 150mm/180-mm concrete slab which was penetrated by a total of four (4) polypropylene pipes protected with SNAP retrofit and cast-in fire collars. For the purpose of the test, the penetrations were referenced as Specimen 1, 2, 3 and 4. Specimen 2 is the subject of this Certificate. The 150-mm thick section of the concrete slab used in the installation of Specimens 2, 3 and 4 was 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 H100-S-RR High-Top Stack cast-in fire collar comprised a 1.6-mm thick polypropylene casing with a 119-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. The SNAP H100S-RR High-Top Stack fire collar was cast into a 150-mm thick concrete slab with the collar's casing cut down to 150-mm high finishing flush with the unexposed face of the concrete slab. The penetrating service comprised a George Fischer Fuseal PP110 polypropylene pipe with a 114.3-mm outside diameter pipe and a wall thickness of 6.7-mm fitted through the collars sleeve. The pipe projected vertically 2000-mm above the unexposed face of the concrete slab and 500 mm below into the furnace chamber. The pipe was supported at nominally 500-mm and 1500-mm from the unexposed face of the slab, left open at the unexposed end and capped with a ceramic fibre (Superwool) plug on the exposed end. On the unexposed face the annular gap between the pipe and the collars sleeve was left unprotected. The Sponsor provided technical brochure 'Fuseal Corrosive Waste Piping Systems' dated May 2012 by Georg Fischer LLC, drawing titled 'Test Slab S-22-D' Layout', dated 18 January 2022, drawing titled 'Specimen #2, 110 Fuseal PP110 Stack & H100S-RR', dated 9 March 2022 and drawing numbered SNAP 100 High-Top Stack", dated 29 September 2017 as a complete description of the specimen and should be read in conjunction with this Certificate.

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

Structural Adequacy	-	not applicable
Integrity	-	no failure at 241 minutes
Insulation	-	237 minutes

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

The fire-resistance level is applicable when the system is exposed to fire from the same direction as tested. The maximum FRL of any test specimen cannot exceed the FRL achieved by the concrete slab in which it was installed. 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: 21 March 2022

Issued on the 20th day of December 2023 without alterations or additions.

Chris Wojcik | for Manager, Fire Testing and Assessments

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Certificate of Test

No. 3683a

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
1343 Wynnum Road
Tingalpa QLD

A full description of the test specimen and the complete test results are detailed in the Division's report numbered FSP 2274.

Product Name: SNAP H50S-RR High-Top Stack cast-in fire collar protecting a nominal 2-inch Fuseal polypropylene stack pipe (Specimen 3)

Description: The specimen comprised an 1150-mm x 1150-mm x 150mm/180-mm concrete slab which was penetrated by a total of four (4) polypropylene pipes protected with SNAP retrofit and cast-in fire collars. For the purpose of the test, the penetrations were referenced as Specimen 1, 2, 3 and 4. Specimen 3 is the subject of this Certificate. The 150-mm thick section of the concrete slab used in the installation of Specimens 2, 3 and 4 was 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 H50S-RR High-Top Stack cast-in fire collar comprised a 1.6-mm thick polypropylene casing with a 63 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. The SNAP H50S-RR High-Top Stack fire collar was cast into a 150-mm thick concrete slab with the collar casing cut down to 150-mm high finishing flush with the unexposed face of the concrete slab. The penetrating service comprised a George Fischer Fuseal PP110 polypropylene pipe with a 61.2 mm outside diameter pipe and a wall thickness of 4.5-mm fitted through the collars sleeve. The pipe projected vertically 2000-mm above the unexposed face of the concrete slab and 500 mm below into the furnace chamber. The pipe was supported at nominally 500-mm and 1500-mm from the unexposed face of the slab, left open at the unexposed end and capped with a ceramic fibre (Superwool) plug on the exposed end. On the unexposed face the annular gap between the pipe and the collars sleeve was left unprotected. The Sponsor provided technical brochure 'Fuseal Corrosive Waste Piping Systems' dated May 2012 by Georg Fischer LLC, drawing titled 'Test Slab S-22-D' Layout', dated 18 January 2022, drawing titled 'Specimen #3, 50 Fuseal PP110 Stack & H50S-RR', dated 9 March 2022 and drawing numbered SNAP 50 High-Top Stack', dated 29 September 2017 as a complete description of the specimen and should be read in conjunction with this Certificate.

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 -/240/180.

The fire-resistance level is applicable when the system is exposed to fire from the same direction as tested. The maximum FRL of any test specimen cannot exceed the FRL achieved by the concrete slab in which it was installed. 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: 21 March 2022

Issued on the 20th day of December 2023 without alterations or additions.

Chris Wojcik | for Manager, Fire Testing and Assessments

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North Ryde NSW 2113 Australia
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Certificate of Test

No. 3684a

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
1343 Wynnum Road
Tingalpa QLD

A full description of the test specimen and the complete test results are detailed in the Division's report numbered FSP 2274.

Product Name: SNAP H150S-RR High-Top Stack cast-in fire collar protecting a nominal 6-inch Fuseal polypropylene stack pipe (Specimen 4)

Description: The specimen comprised an 1150-mm x 1150-mm x 150mm/180-mm concrete slab which was penetrated by a total of four (4) polypropylene pipes protected with SNAP retrofit and cast-in fire collars. For the purpose of the test, the penetrations were referenced as Specimen 1, 2, 3 and 4. Specimen 4 is the subject of this Certificate. The 150-mm thick section of the concrete slab used in the installation of Specimens 2, 3 and 4 was 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 H150S-RR High Top Stack fire collar comprised a white 2-mm thick polypropylene casing with a 180 mm inner diameter sleeve and a 292-mm diameter base flange. The 250-mm high collar casing incorporated a 600-mm wide x 110-mm wide x 6-mm thick intumescent material and a rubber ring seal. The closing mechanism comprised four x 4-mm diameter galvanised steel springs, four nylon fuse links and a 640 mm x 109-mm 316 stainless steel mesh. The H150S-RR collar was cast into a 150-mm thick concrete slab with the collar casing cut down to 150-mm high finishing flush with the unexposed face of the concrete slab. The penetrating service comprised a George Fischer Fuseal PP110 polypropylene pipe with a 168.2 mm outside diameter pipe and a wall thickness of 7.58-mm fitted through the collars sleeve. The pipe projected vertically 2000-mm above the unexposed face of the concrete slab and 500 mm below into the furnace chamber. The pipe was supported at nominally 500-mm and 1500-mm from the unexposed face of the slab, left open at the unexposed end and capped with a ceramic fibre (Superwool) plug on the exposed end. On the unexposed face the annular gap between the pipe and the collars sleeve was left unprotected. The Sponsor provided technical brochure 'Fuseal Corrosive Waste Piping Systems' dated May 2012 by Georg Fischer LLC, drawing titled 'Test Slab S-22-D' Layout', dated 18 January 2022, drawing titled 'Specimen #4, 160 Fuseal PP110 Stack & H150S-RR', dated 9 March 2022 and drawing numbered SNAP 150 High-Top Stack', dated 29 September 2017 as a complete description of the specimen and should be read in conjunction with this Certificate.

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

Structural Adequacy	-	not applicable
Integrity	-	no failure at 241 minutes
Insulation	-	151 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/240/120.

The fire-resistance level is applicable when the system is exposed to fire from the same direction as tested. The maximum FRL of any test specimen cannot exceed the FRL achieved by the concrete slab in which it was installed. 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: 21 March 2022

Issued on the 20th day of December 2023 without alterations or additions.

Chris Wojcik | for Manager, Fire Testing and Assessments

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COPY OF CERTIFICATE OF TEST – NO. 3684A

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 for 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.

*** end of report ***

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