

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

Test Report

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Report number: FSP 1986
Date: 7 May 2019

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

Commercial-in-confidence




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

Sponsored Investigation No. FSP 1986

1 Introduction

1.1 Identification of specimen

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

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 4845/4337

1.7 Test date

The fire-resistance test was conducted on 28 February 2019.

2 Description of specimen

2.1 General

The specimen comprised of an 1150-mm x 1150-mm x 150-mm thick reinforced concrete slab penetrated by one (1) HDPE stack pipe and one (1) HDPE Floor waste protected by cast in fire collars.

The penetrated slab comprised of a 150-mm thick concrete slab reinforced with a single layer of steel reinforcement.

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

- AS/NZS 5065:2005 'Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications'.

For the purpose of the test, the specimens were referenced as Specimen 1, 2 and 3.

Specimen 1 – SNAP 250 Cast-in fire collar protecting a nominal 250 HDPE stack pipe.

The SNAP 250C cast-in fire collar comprised of a 3-mm ABS cover attached to a 0.75-mm thick steel casing with a 288-mm inner diameter and a 460-mm diameter base flange. The 187-mm high casing incorporated a 930-mm x 179-mm x 10-mm thick Intumesh intumescent material. The closing mechanism comprised five stainless steel springs, black nylon fuse links and a 1020-mm x 174-mm 316 stainless steel mesh, as shown in drawing number 250C, titled "SNAP 250 Cast-In", dated 22 October 2018, by Snap Fire Systems Pty Ltd.

The penetrating service comprised a 250-mm HDPE stack pipe with a wall thicknesses of 8.3-mm. An 80-mm high x 100-mm wide concrete hob was formed over the collar on the unexposed face. The pipe projected vertically 2000-mm above the concrete and 500-mm into the furnace chamber. The pipe was supported at 500-mm and 1500-mm from the unexposed face of the concrete slab as shown in Drawing titled "Specimen #1, 250 HDPE stack and 250C", dated 10 December 2018, provided by Snap Fire Systems Pty Ltd. The exposed end of the pipe was plugged with Superwool ceramic fibre.

Specimen 2 – SNAP 50 High-Top Floor Water Shower Cast-in fire collar protecting a nominal 32-mm HDPE floor waste system incorporating a P-trap.

The SNAP 50 High-Top Floor Waste Shower cast in 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 intumescent material. The closing mechanism incorporated three stainless steel springs, with nylon fuse links and a 268-mm x 53-mm 316 stainless steel mesh as shown in drawing number H50FWF-RR, titled “SNAP 50 High-Top Floor Waste Shower”, dated 29 September 2017, by Snap Fire Systems Pty Ltd.

The penetrating service comprised a 40-mm diameter HDPE pipe, with a wall thickness of 3.8-mm. The floor waste system was fitted with a chrome brass grate and an 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, an M10 threaded rod was connected to the penetrating pipe, fixed to the concrete slab with M10 Steel Drop-In Anchor. The exposed end of the pipe was plugged with Superwool ceramic fibre.

The floor waste was charged with water to the level shown in drawing titled “Specimen #2, 40 HDPE Floor waste & H50FWS”, dated 28 February 2019, provided by Snap Fire Systems Pty Ltd.

Specimen 3 – A 2.65-kg Steel weight attached to the exposed face with Drillcut Steel Wedge Anchors.

A 2.65-kg weight was attached to the exposed face of the concrete slab with three 6-mm x 35-mm Drillcut Steel Wedge Anchors as shown in drawing titled “W-18-D Specimen 3”, received 13 March 2019 from Snap Fire Systems Pty Ltd.

2.2 Dimensions

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

2.3 Orientation

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

2.4 Conditioning

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

3 Documentation

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

Drawing number 250C, titled “SNAP 250 Cast-In”, dated 22 October 2018, by Snap Fire Systems Pty Ltd.

Drawing number H50FWF-RR, titled “SNAP 50 High-Top Floor Waster Shower”, dated 29 September 2017, by Snap Fire Systems Pty Ltd.

Drawing titled “Test Slab S-18-D Layout”, dated 10 December 2018, by Snap Fire Systems Pty Ltd.

Drawing titled “Specimen #1, 250 HDPE stack and 250C”, dated 10 December 2018, provided by Snap Fire Systems Pty Ltd.

Drawing titled “Specimen #2, 40 HDPE Floor waste & H50FWS”, dated 28 February 2019, provided by Snap Fire Systems Pty Ltd.

Drawing titled “W-18-D Specimen 3”, received 13 March 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 28°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 |
|---------------|--|
| 3 minutes - | Light smoke emitted from the floor waste of Specimen 2. |
| 4 minutes - | Smoke is being emitted from the furnace flues. |
| 5 minutes - | Smoke has ceased being emitted from the floor waste of Specimen 2. |
| 6 minutes - | The smoke level being emitted from the furnace flues has increased. Smoke has started fluing from the pipe of Specimen 1. |
| 8 minutes - | The smoke level emitted from the furnace flues continues to increase. |
| 11 minutes - | Black smoke emitting from the pipe of Specimen 1. |
| 12 minutes - | The amount of smoke fluing from Specimen 1 has reduced. |
| 14 minutes - | The black pipe above the collar in Specimen 1 has deformed. |
| 15 minutes - | The smoke fluing from Specimen 1 has almost ceased. |
| 23 minutes - | The smoke from Specimens 1 and 2 as well as the furnace flues has now ceased. |
| 34 minutes - | A small volume of smoke has resumed fluing from Specimen 1. |
| 50 minutes - | Moisture is pooling at the top of the slab. |
| 135 minutes - | The moisture pooling on the top of the slab has all evaporated. |
| 140 minutes - | A small volume of smoke continues to flue from Specimen 1. |
| 180 minutes - | No further visible change from both specimens. |
| 220 minutes - | Steam and smoke emitted from the hob of specimen 1. |
| 241 minutes - | <u>Insulation Failure Specimen 1</u> – maximum temperature rise of 180K is exceeded on the hob. |

Test terminated.

Post Test Observations - The 2.65-Kg steel weight from Specimen 3 had remained attached to the underside of the slab for the duration of the test. Refer Photograph 11.

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.

8.5 Performance

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

Specimen 1 – SNAP 250 Cast-in fire collar protecting a nominal 250 HDPE stack pipe.

| | | |
|---------------------|---|---------------------------|
| Structural adequacy | - | not applicable |
| Integrity | - | No failure at 241 minutes |
| Insulation | - | 241 minutes |

Specimen 2 – SNAP 50 High-Top Floor Water Shower Cast-in fire collar protecting a nominal 40-mm HDPE floor waste system incorporating a P-trap.

| | | |
|---------------------|---|---------------------------|
| 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 -/240/240

Specimen 2 -/240/240

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

11 Tested by



Glenn Williams
Testing Officer

Appendices

Appendix A – Measurement location

| Specimen Description | T/C Position | T/C designation |
|---|--|-----------------|
| SPECIMEN 1 – Mueller Pipelines HDPE stack pipe 250-mm OD x 8.3-mm wall thickness, pipe protected with a 250C cast-in fire collar. | On top of the slab, 25-mm from the hob (N/E) | S1 |
| | On top of the slab, 25-mm from the hob (S/E) | S2 |
| | On concrete hob, 25-mm from the pipe (East) | S3 |
| | On concrete hob, 25-mm from the pipe (South) | S4 |
| | On the pipe, 25-mm from the hob (North) | S5 |
| | On the pipe, 25-mm from the hob (East) | S6 |
| SPECIMEN 2 – Geberit HDPE pipe 32-mm OD x 3.8-mm wall thickness pipe with P-trap protected with a H50FWS cast-in fire collar. | On the pipe, 25-mm from the hob (West) | S7 |
| | On top of the slab – 25-mm from screed (North) | S8 |
| | On top of the slab – 25-mm from screed (East) | S9 |
| | On Screed 25-mm from Grate (N/E) | S10 |
| | On Screed 25-mm from Grate (S/W) | S11 |
| | On centre of the Grate | S12 |
| Rover | Rover | S13 |
| Ambient | Ambient | S14 |

Appendix B – Photographs



PHOTOGRAPH 1 – EXPOSED FACE OF SPECIMENS PRIOR TO TESTING



PHOTOGRAPH 2 – UNEXPOSED FACE OF SPECIMENS PRIOR TO TESTING



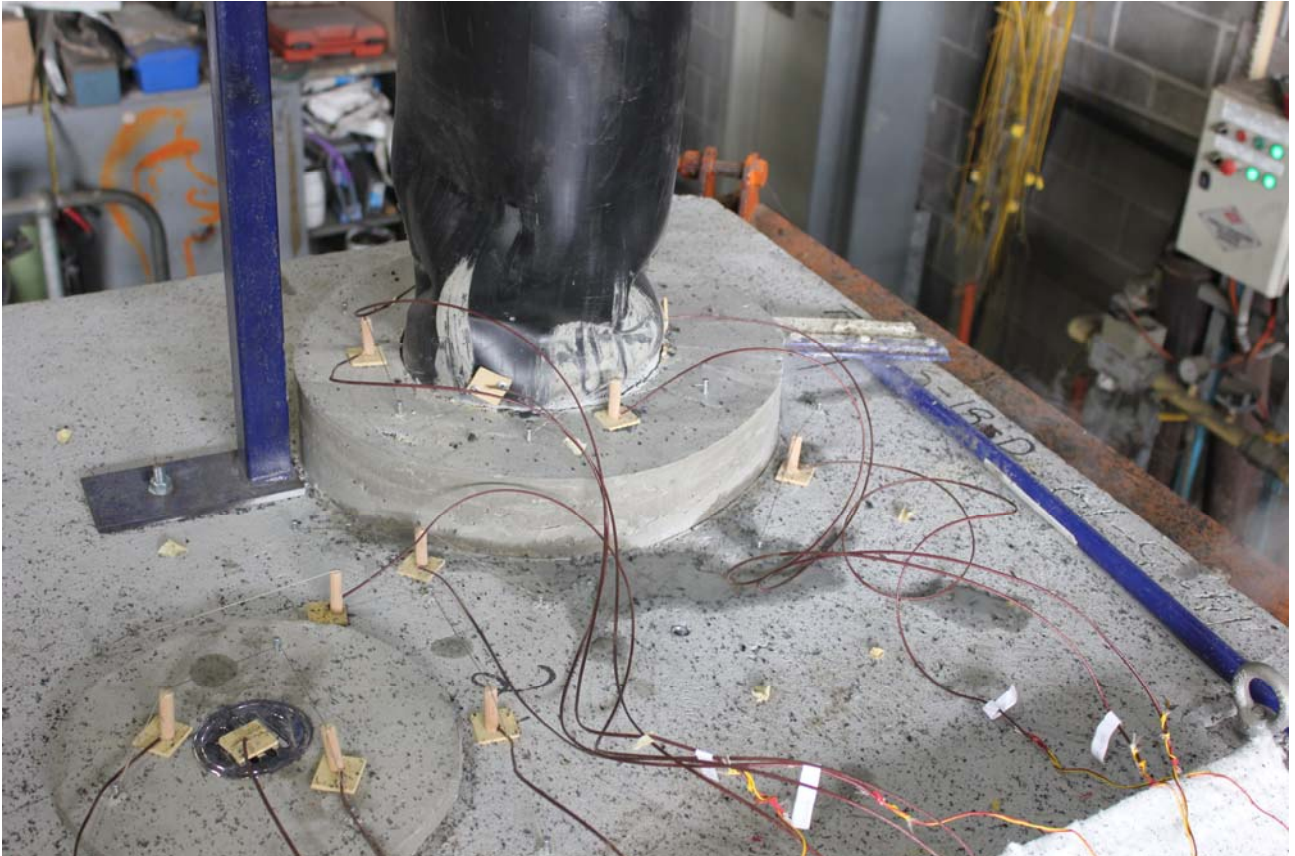
PHOTOGRAPH 3 – SPECIMEN 1 AFTER 6 MINUTES OF TESTING



PHOTOGRAPH 4 – BASE OF SPECIMEN 1 AFTER 14 MINUTES OF TESTING



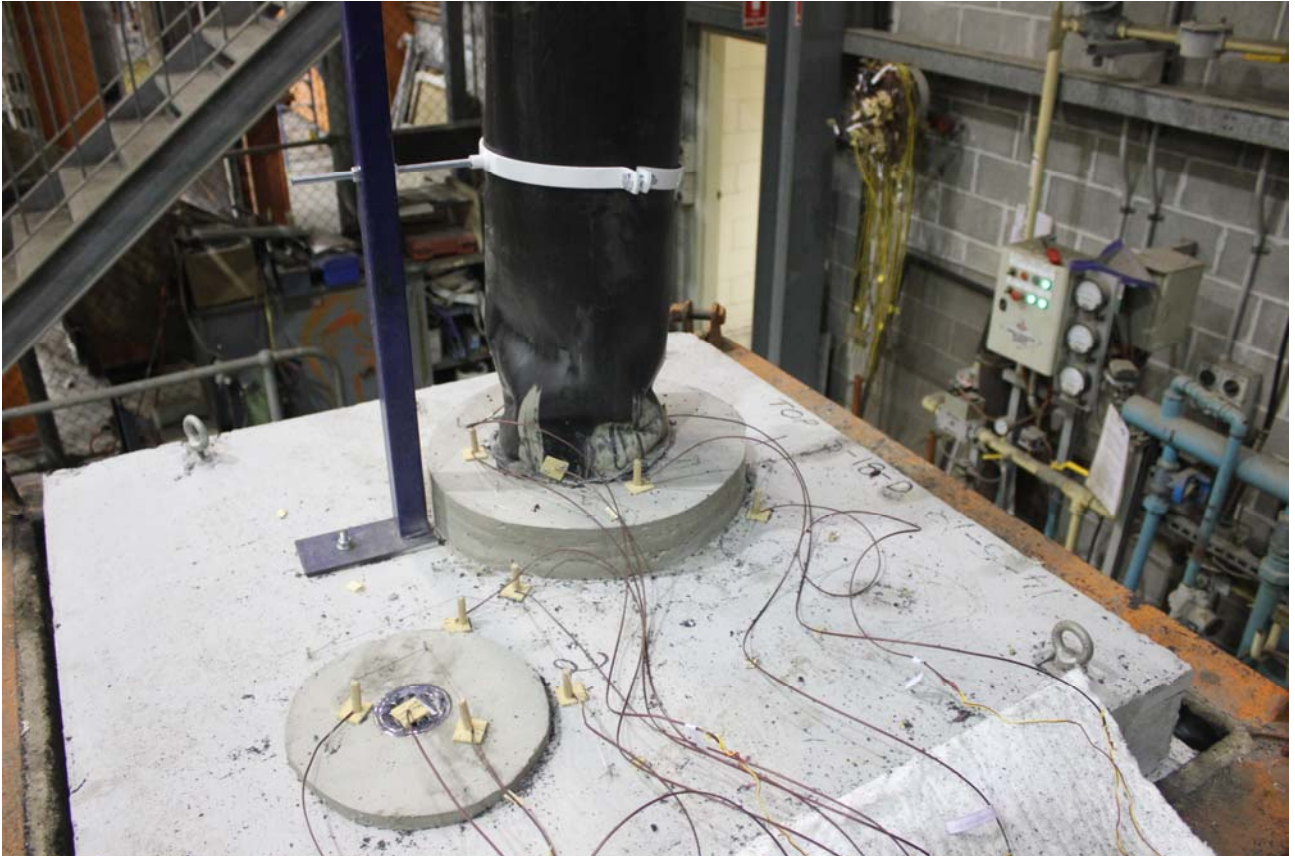
PHOTOGRAPH 5 – SPECIMENS AFTER 30 MINUTES OF TESTING



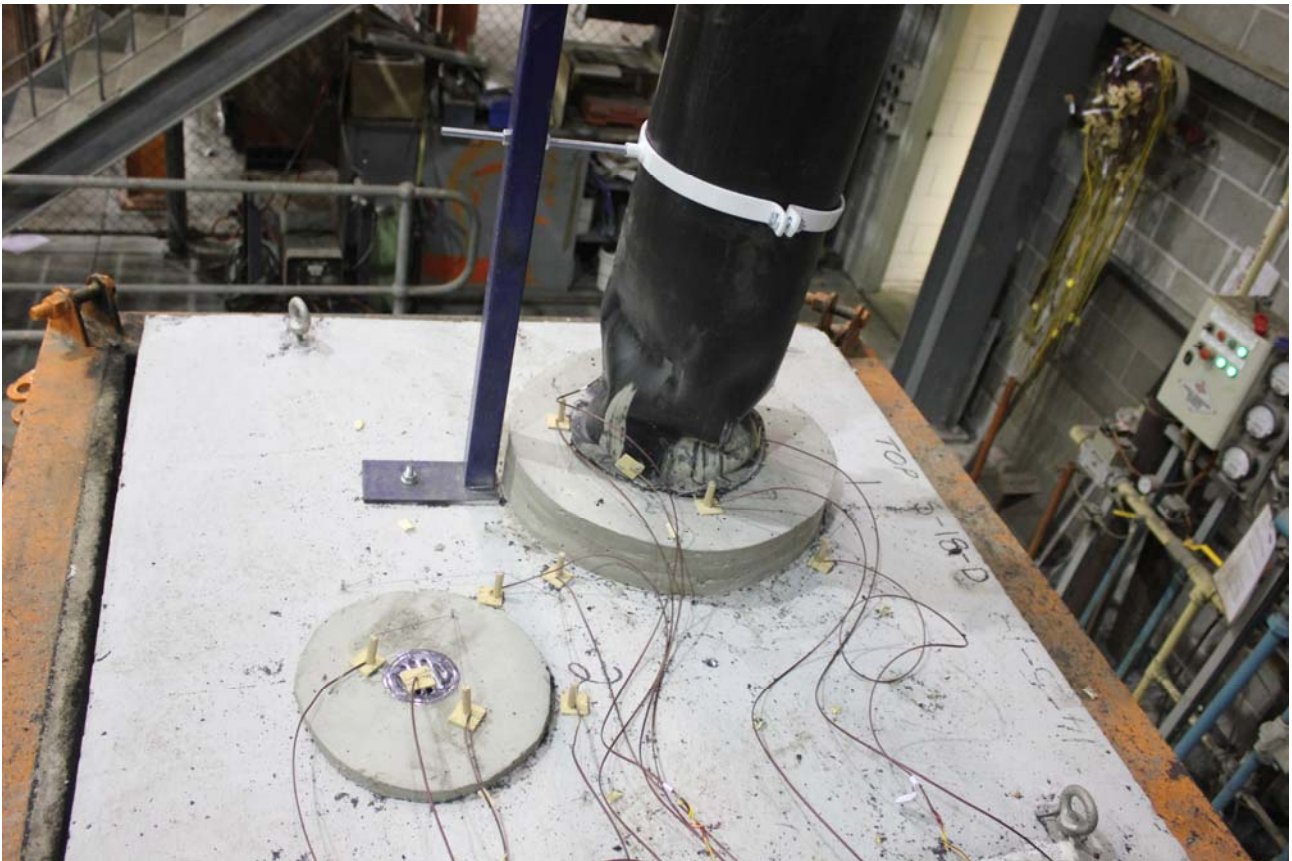
PHOTOGRAPH 6 – SPECIMENS AFTER 60 MINUTES OF TESTING



PHOTOGRAPH 7 – SPECIMENS AFTER 120 MINUTES OF TESTING



PHOTOGRAPH 8 – SPECIMENS AFTER 180 MINUTES OF TESTING



PHOTOGRAPH 9 – SPECIMENS 1 AFTER 240 MINUTES OF TESTING



PHOTOGRAPH 10 – UNEXPOSED FACE OF SPECIMEN AT CONCLUSION OF TESTING



PHOTOGRAPH 11 – EXPOSED FACE OF SPECIMENS AT CONCLUSION OF TESTING

Appendix C – Furnace Temperature

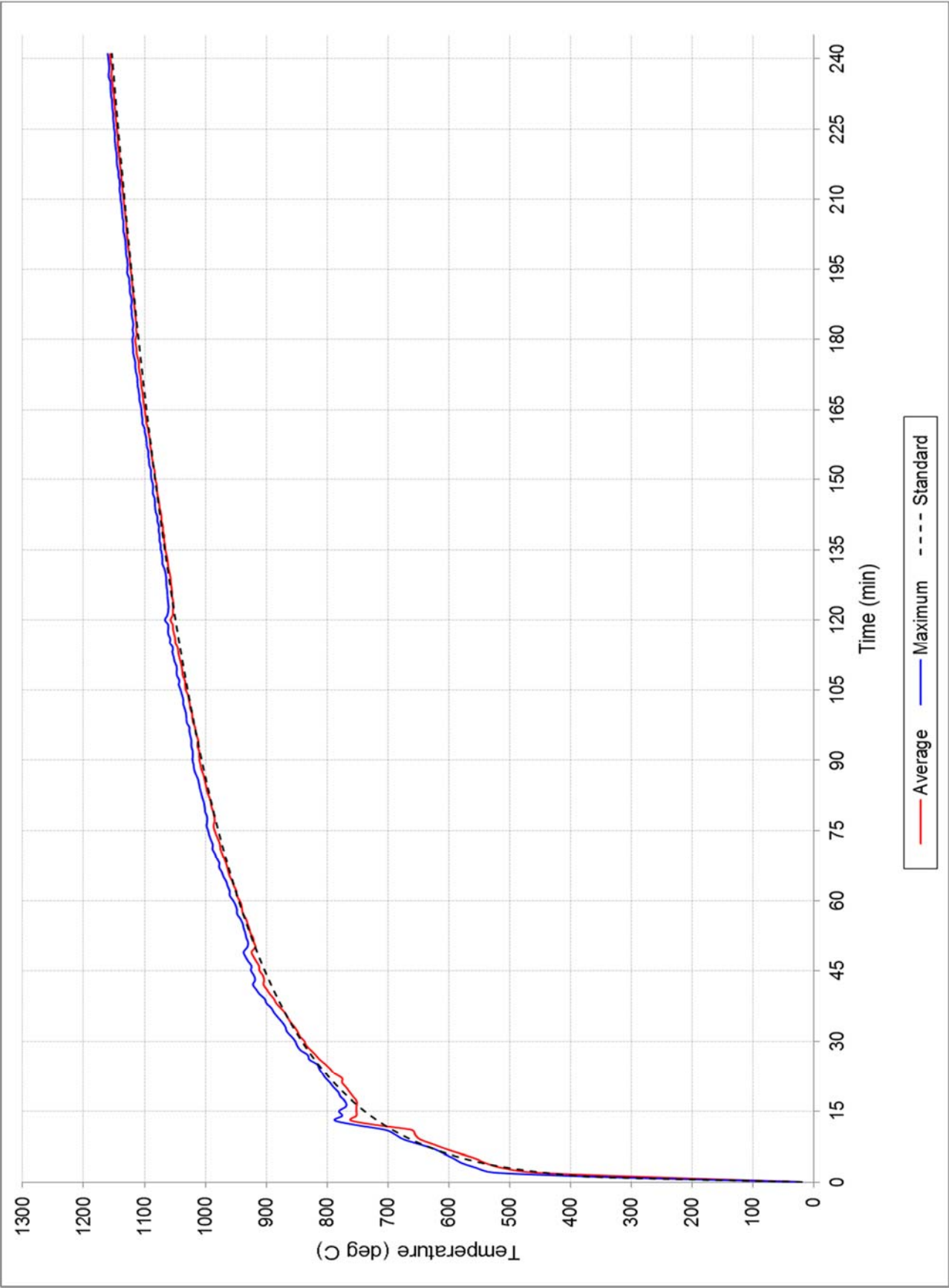


FIGURE 1 – FURNACE TEMPERATURE

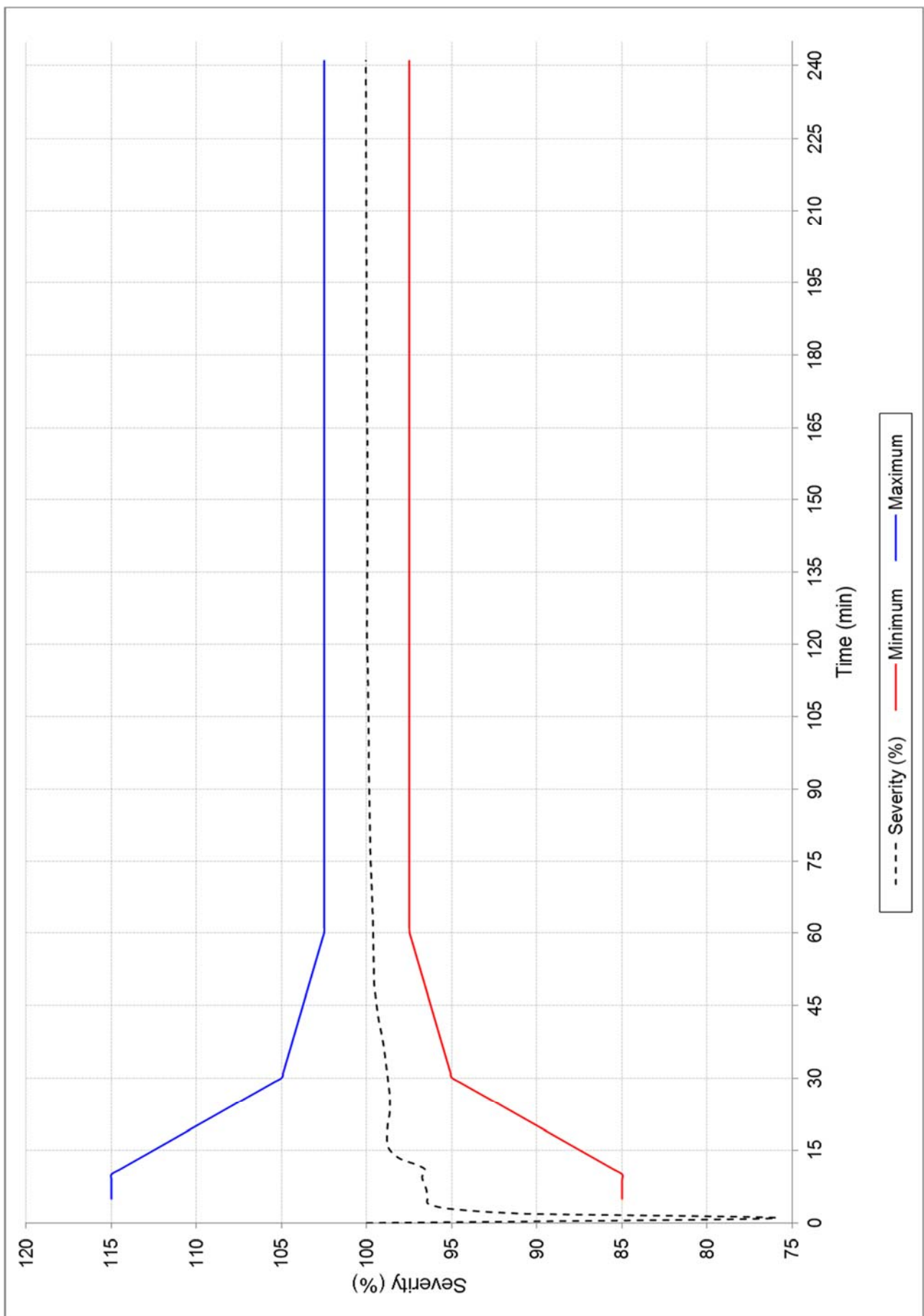


FIGURE 2 – FURNACE SEVERITY

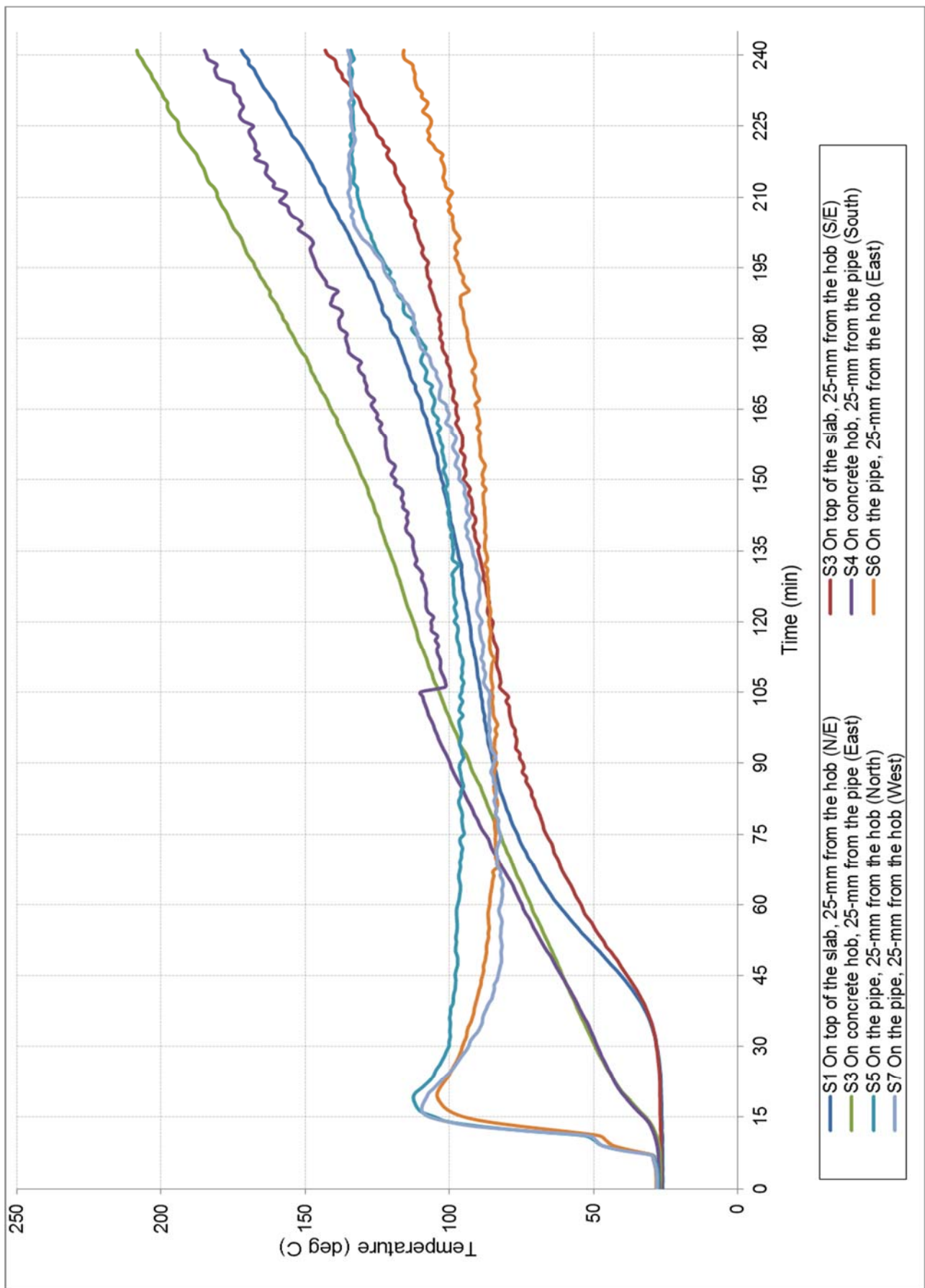


FIGURE 3 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN # 1

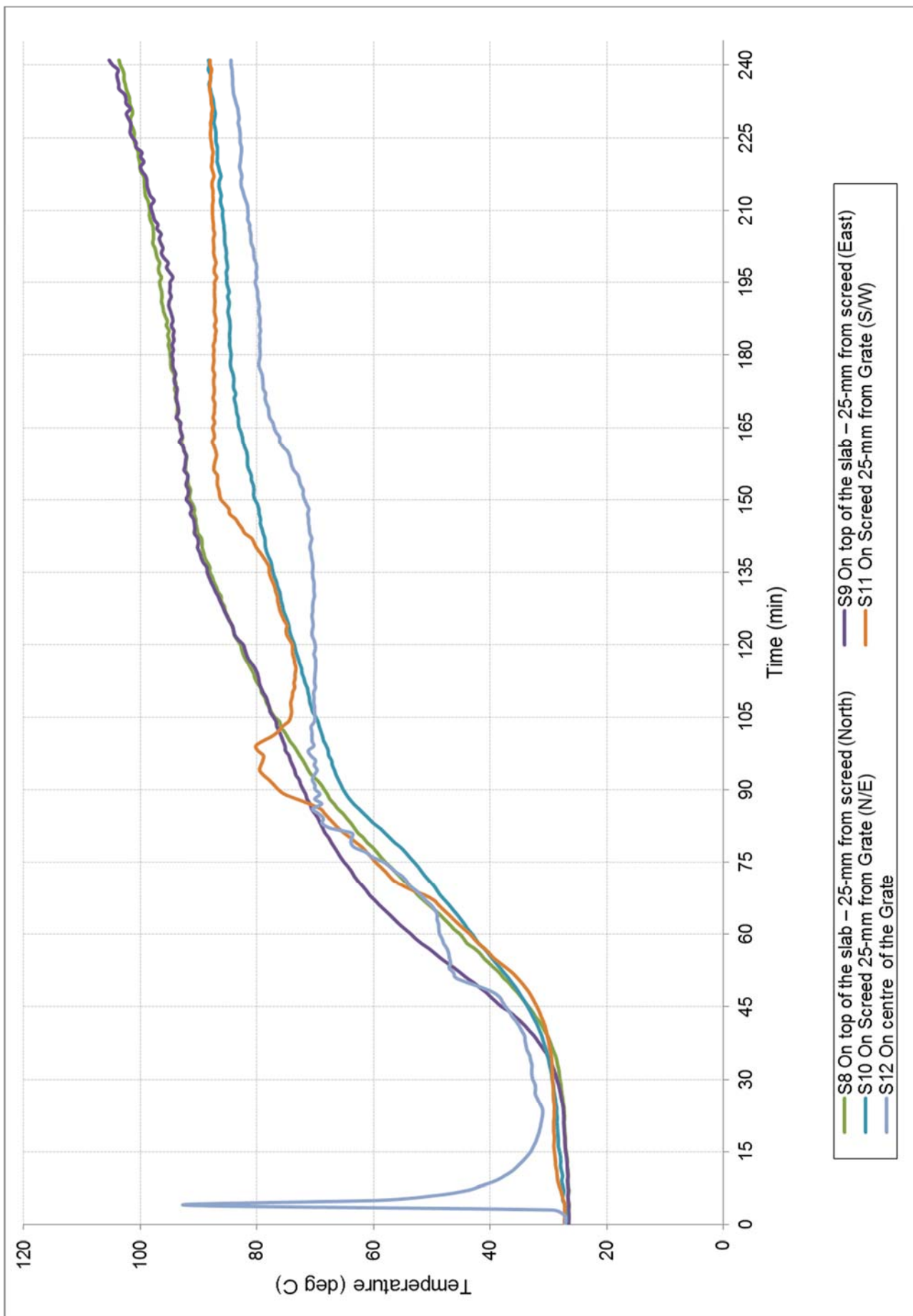
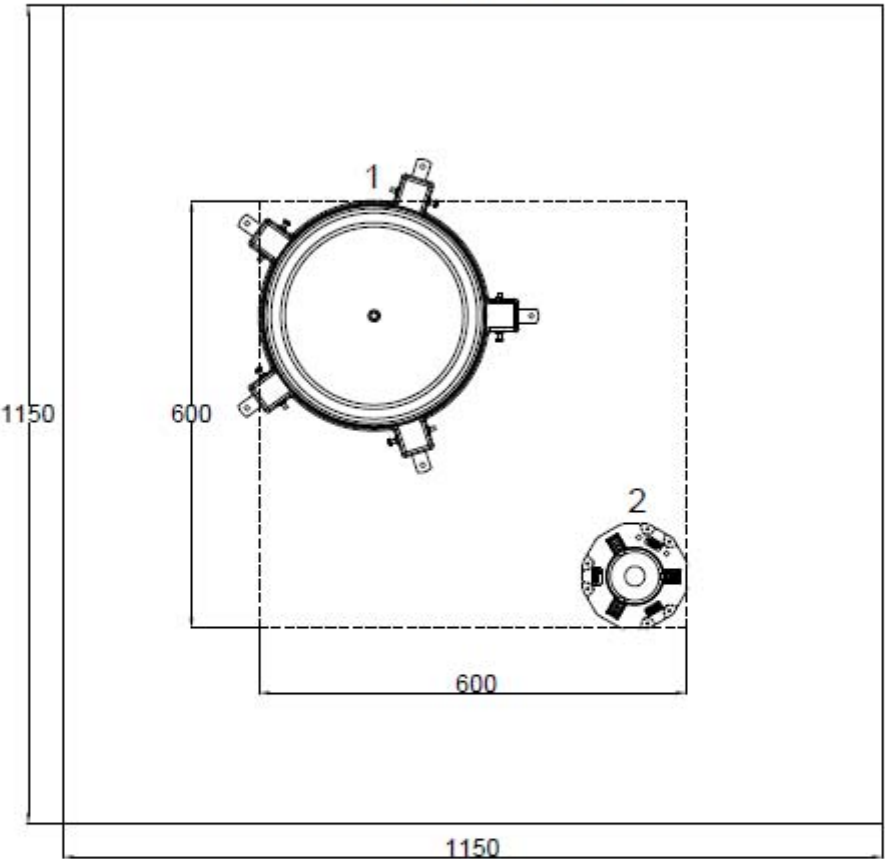


FIGURE 4 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN # 2

Appendix D – Installation drawings

Snap Fire Systems Pty Ltd
Test Slab S-18-D Layout
Date: 10 DEC 2018



| Penetration | Collar Code | Pipe Type | Pipe Diameter (mm) | Fitting |
|-------------|-------------|-----------|--------------------|---------|
| 1 | 250C | HDPE | 250 | N/A |
| 2 | H50FWS | HDPE | 40 | N/A |

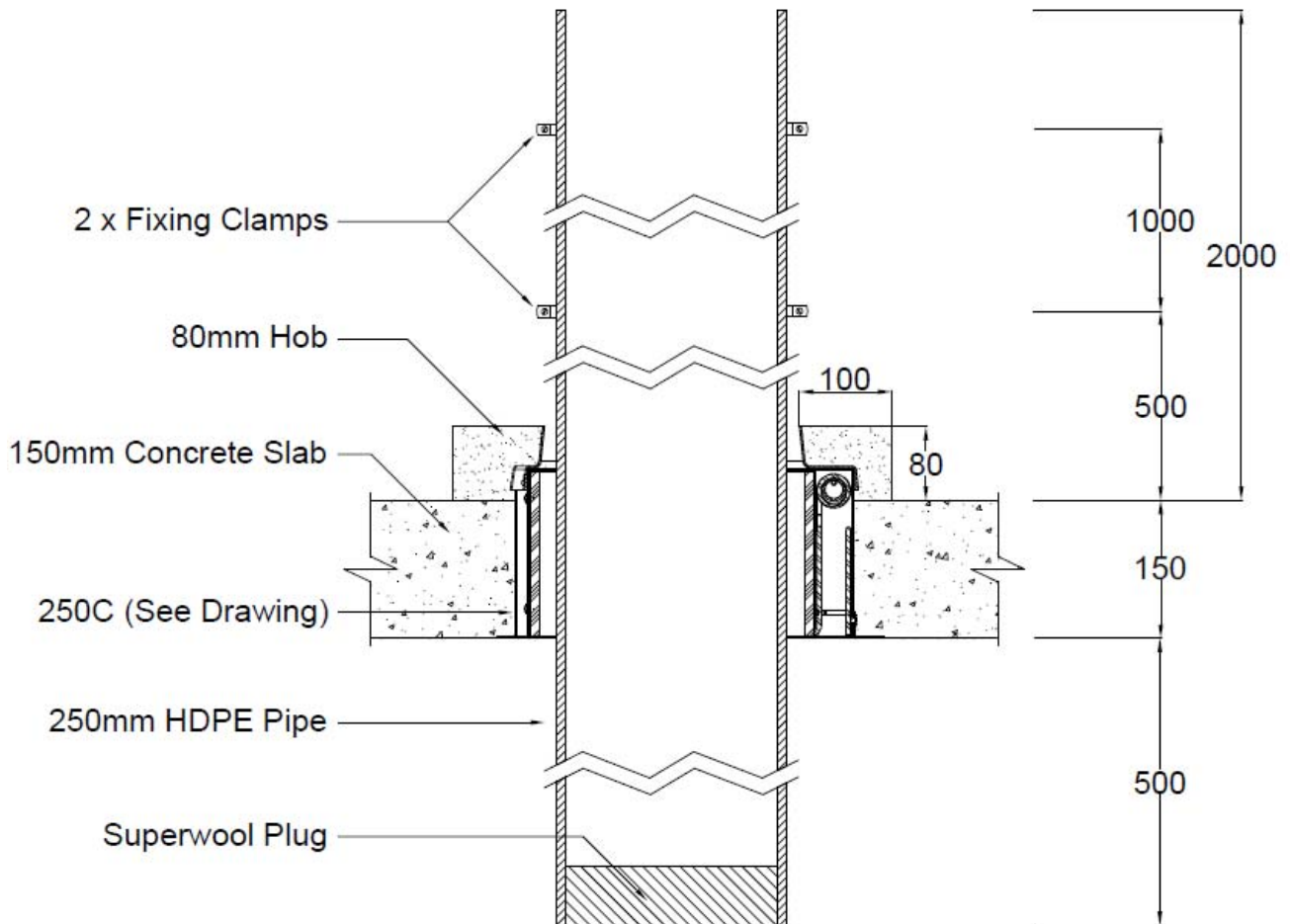
DRAWING TITLED “TEST SLAB S-18-D LAYOUT”, DATED 10 DECEMBER 2018, BY SNAP FIRE SYSTEMS PTY LTD.

Snap Fire Systems Pty Ltd

Specimen #1

250 HDPE Stack & 250C

Date: 10 DEC 2018



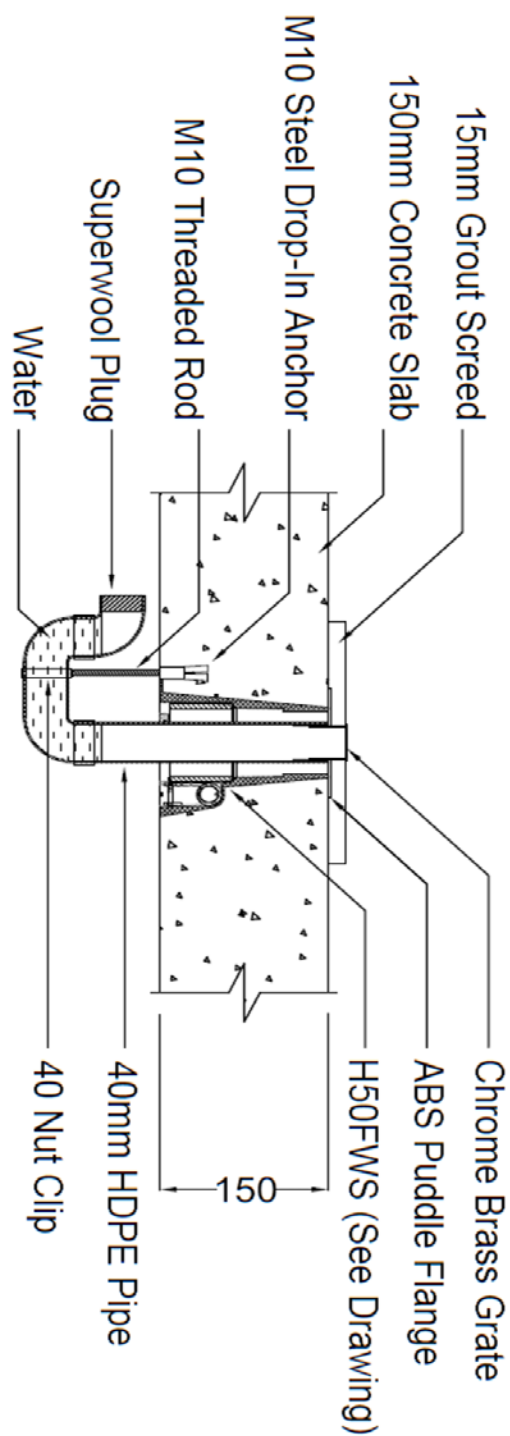
**DRAWING TITLED "SPECIMEN #1, 250 HDPE STACK & 250C", DATED 10 DECEMBERR 2018, PROVIDED BY
SNAP FIRE SYSTEMS PTY LTD.**

Snap Fire Systems Pty Ltd

Specimen #2

40 HDPE Floorwaste & H50FWS

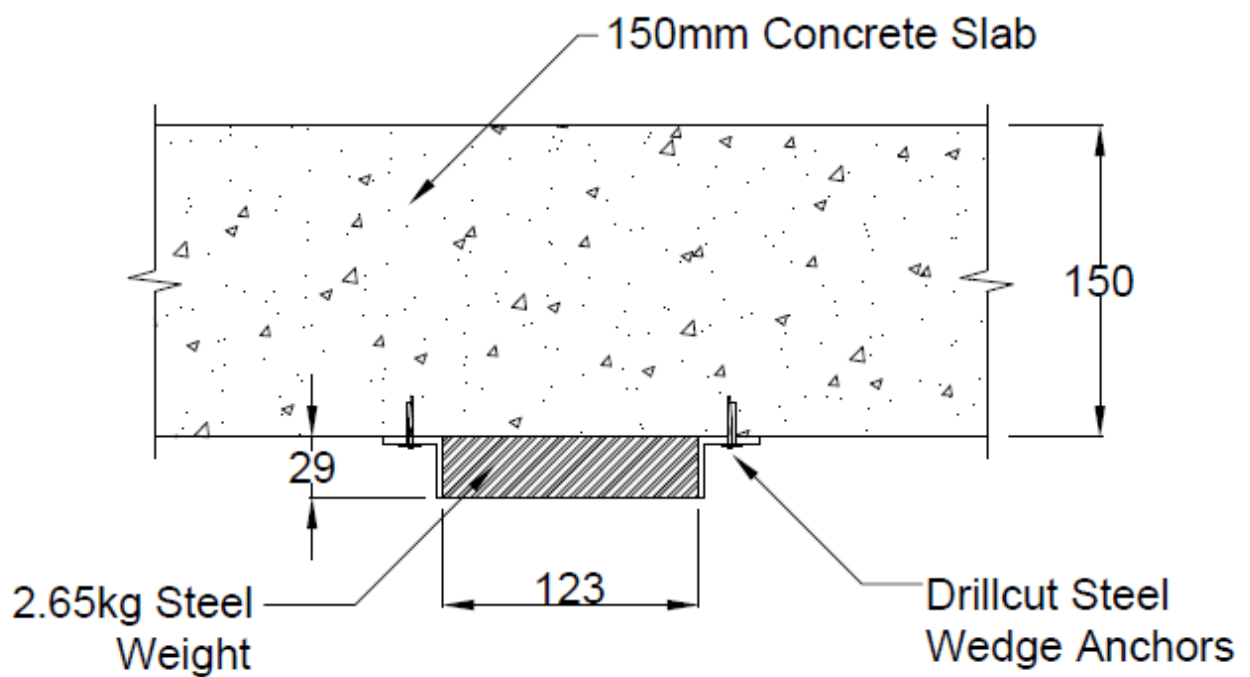
Date: 28 FEB 2019



DRAWING TITLED "SPECIMEN #2, 40 HDPE FLOORWASTE & H50FWS", DATED 28 FEBRUARY 2019,
PROVIDED BY SNAP FIRE SYSTEMS PTY LTD.

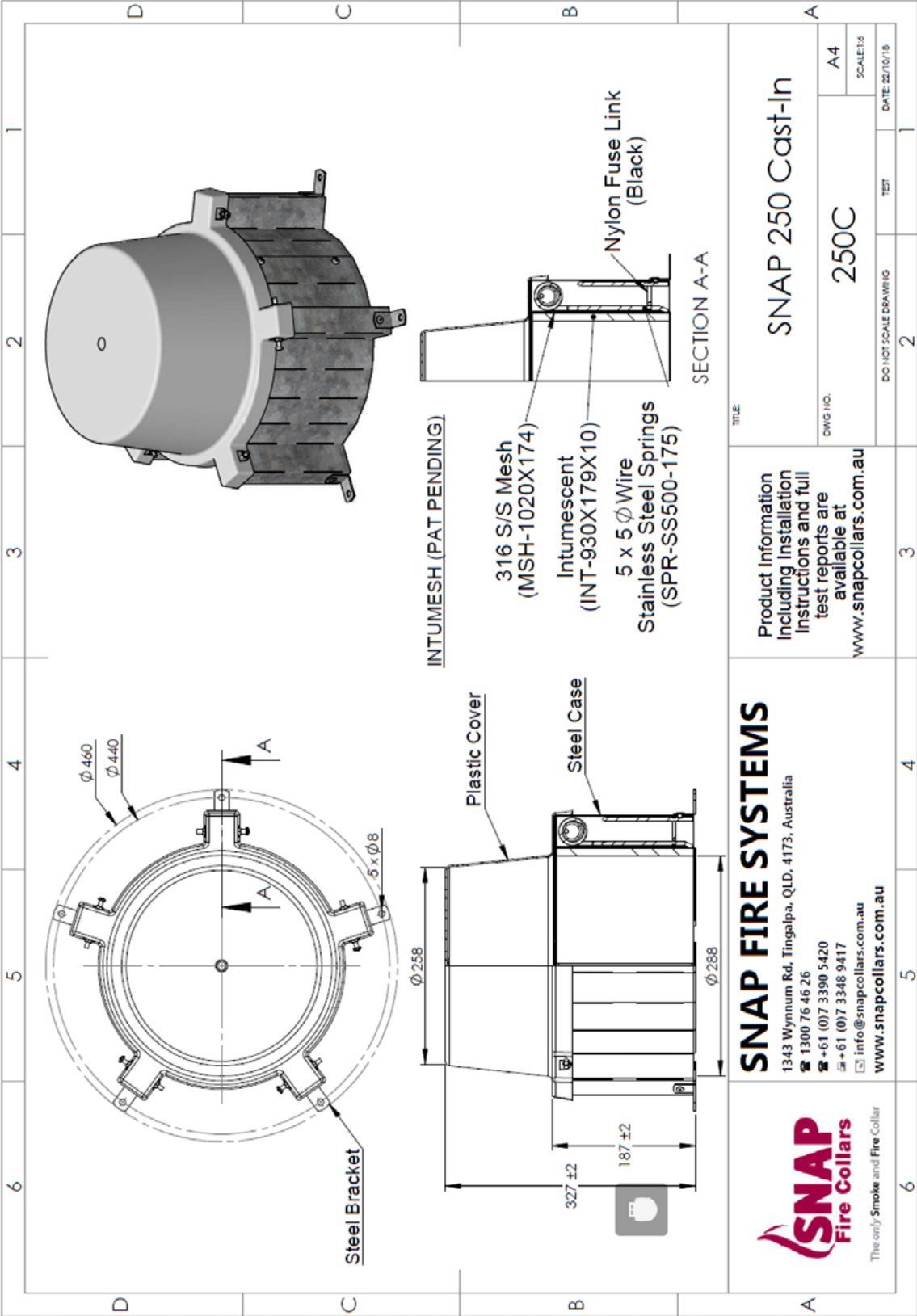
Snap Fire Systems Pty Ltd

W-18-D Specimen 3

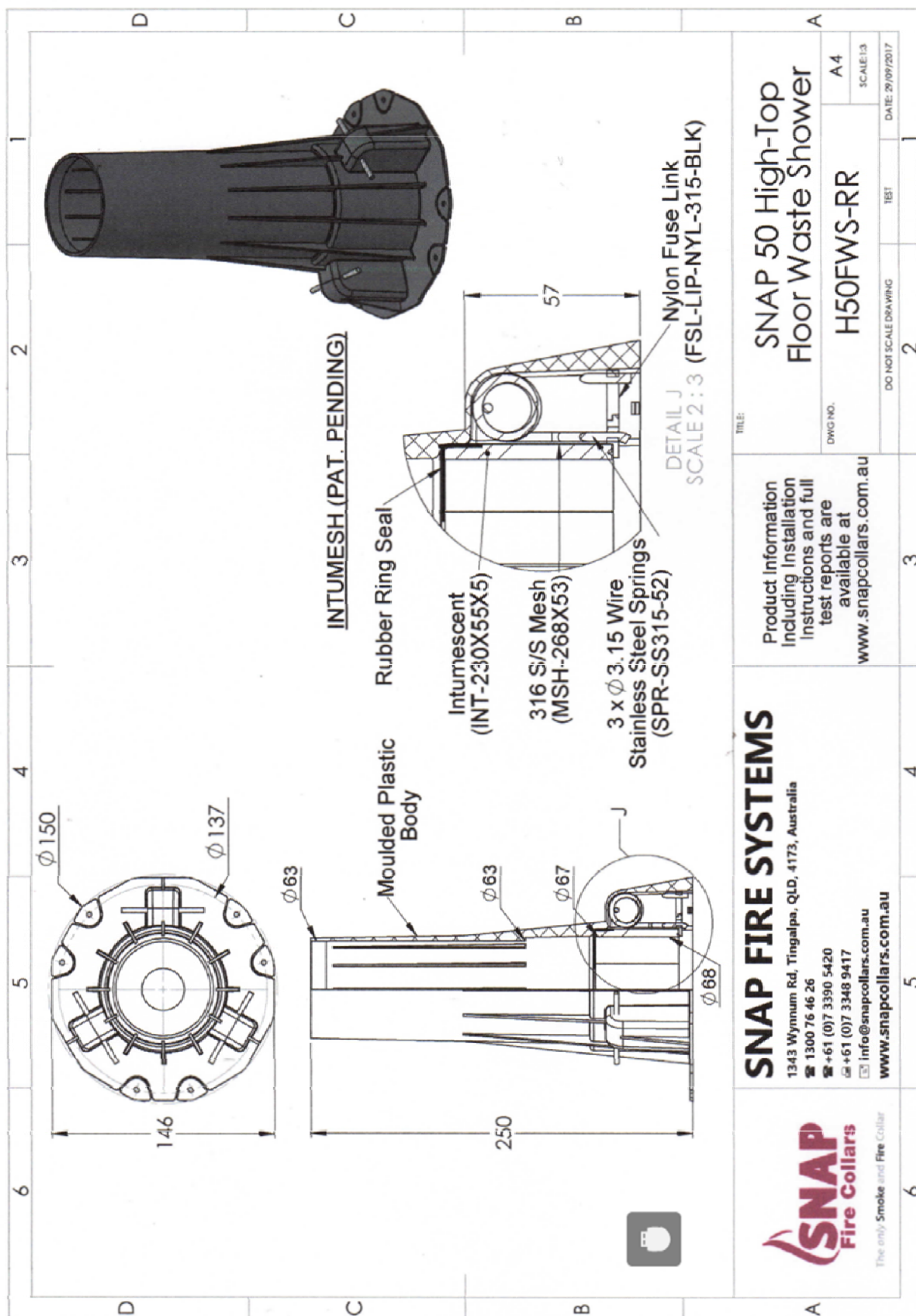


DRAWING TITLED "W-18-D SPECIMEN 3", RECEIVED 13 MARCH 2019 BY SNAP FIRE SYSTEMS PTY LTD.

Appendix E – Specimen Drawings






DRAWING NUMBERED 250C, TITLE “SNAP 250 CAST-IN” DATED 10 DECEMBER 2018, BY SNAP FIRE SYSTEMS PTY LTD



DRAWING NUMBERED H50FWS-RR, TITLE "SNAP 50 HIGH-TOP FLOOR WASTE SHOWER" DATED 10 DECEMBER 2018, 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 | | |
| <h3>Certificate of Test</h3> | | |
| | | No. 3244 |
| <p>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:</p> | | |
| 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 1986. | | |
| Product Name: SNAP 250 Cast-in fire collar protecting a nominal 250 HDPE stack pipe | | |
| Description: | <p>The specimen comprised of an 1150-mm x 1150-mm x 150-mm thick reinforced concrete slab penetrated by a nominal 250 HDPE stack pipe protected by a SNAP 250 Cast-in fire collar. The penetrated slab comprised of a 150-mm thick concrete slab reinforced with a single layer of steel reinforcement. The SNAP 250C cast-in fire collar comprised of a 3-mm ABS cover attached to a 0.75-mm thick steel casing with a 288 mm inner diameter and a 460-mm diameter base flange. The 187 mm high casing incorporated a 930 mm x 179-mm x 10-mm thick Intumescent intumescent material. The closing mechanism comprised five stainless steel springs, black nylon fuse links and a 1020-mm x 174-mm 316 stainless steel mesh, as shown in drawing number 250C, titled "SNAP 250 Cast-In", dated 22 October 2018, by Snap Fire Systems Pty Ltd. The penetrating service comprised a 250-mm HDPE stack pipe with a wall thicknesses of 8.3 mm. An 80-mm high x 100-mm wide concrete hob was formed over the collar on the unexposed face. The pipe projected vertically 2000-mm above the concrete and 500 mm into the furnace chamber. The pipe was supported at 500-mm and 1500 mm from the unexposed face of the concrete slab as shown in Drawing titled "Specimen #1, 250 HDPE stack and 250C", dated 10 December 2018, provided by Snap Fire Systems Pty Ltd. The exposed end of the pipe was plugged with Superwool ceramic fibre.</p> | |
| Performance observed in respect of the following AS 1530.4-2014 criteria: | | |
| Structural Adequacy | not applicable | |
| Integrity | no failure at 241 minutes | |
| Insulation | 241 minutes | |
| and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of /240/240. | | |
| <p>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. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.</p> | | |
| Testing Officer: | Peter Gordon | Date of Test: 28 February 2019 |
| Issued on the 7 th day of May 2019 without alterations or additions. | | |
|  Brett Roddy Manager, Fire Testing and Assessments | | |
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Certificate of Test

No. 3245

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 1986.

Product Name: SNAP 50 High-Top Floor Water Shower Cast-in fire collar protecting a nominal 32 mm HDPE floor waste system incorporating a P-trap

Description: The specimen comprised of an 1150-mm x 1150-mm x 150-mm thick reinforced concrete slab penetrated by a nominal 32 mm HDPE floor waste system incorporating a P-trap protected by a SNAP 50 High-Top Floor Water Shower Cast-in fire collar. The penetrated slab comprised of a 150-mm thick concrete slab reinforced with a single layer of steel reinforcement. The SNAP 50 High-Top Floor Waste Shower cast in 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 intumescent material. The closing mechanism incorporated three stainless steel springs, with nylon fuse links and a 268 mm x 53-mm 316 stainless steel mesh as shown in drawing number H50FWF-RR, titled "SNAP 50 High-Top Floor Waste Shower", dated 29 September 2017, by Snap Fire Systems Pty Ltd. The penetrating service comprised a 40-mm diameter HDPE pipe, with a wall thickness of 3.8-mm. The floor waste system was fitted with a chrome brass grate and an 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, an M10 threaded rod was connected to the penetrating pipe, fixed to the concrete slab with M10 Steel Drop-In Anchor. The exposed end of the pipe was plugged with Superwool ceramic fibre. The floor waste was charged with water to the level shown in drawing titled "Specimen #2, 40 HDPE Floor waste & H50FWS", dated 28 February 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 | 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 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. 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: 28 February 2019

Issued on the 7th day of May 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. |

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FOR FURTHER INFORMATION

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