Fire-resistance test on fire collars protecting a floor/ceiling system penetrated by services

Test Report

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Contents

1 Introduction 5
1.1 Identification of specimen 5
1.2 Sponsor 5
1.3 Manufacturer 5
1.4 Test standard 5
1.5 Reference standard 5
1.6 Test number 5
1.7 Test date 6
2 Description of specimen 6
2.1 General 6
2.2 Dimensions 8
2.3 Orientation 8
2.4 Conditioning 8
2.5 Selection, construction and installation of the specimen and the supporting construction 8
3 Documentation 9
4 Equipment 9
4.1 Furnace 9
4.2 Temperature 9
4.3 Measurement system 9
5 Ambient temperature 10
6 Departure from standard 10
7 Termination of test 10
8 Test results 10
8.1 Critical observations 10
8.2 Furnace temperature 11
8.3 Furnace severity 11
8.4 Specimen temperature 11
8.5 Performance 12
9 Fire-resistance level (FRL) 13
10 Field of direct application of test results 13
11 Tested by 13
Appendices 14
Appendix A – Measurement location 14
Appendix B – Photographs 16
Appendix C – Test Data charts 21
Appendix D – Installation drawings 31
Appendix E – Specimen Drawings 37
Appendix F – Certificate(s) of Test 40
References 44

Fire-resistance test on fire collars protecting a floor/ceiling system penetrated by services

Sponsored Investigation No. FSP 2097

1 Introduction

1.1 Identification of specimen

The sponsor identified the specimen as four (4) retrofit fire collars protecting a 237-mm thick floor/ceiling system penetrated by two (2) floor wastes and two (2) 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 (Incorporating Amendment No.1) Reconfirmed 2016, Service penetrations and control joints.

1.6 Test number

CSIRO Reference test number: FS 4977/4502

1.7 Test date

The fire-resistance test was conducted on 16 April 2020.

2 Description of specimen

2.1 General

The specimen comprised an 1150-mm x 1150-mm x 237-mm thick plasterboard lined floor/ceiling system penetrated by two (2) floor wastes and two (2) stack pipes protected by retrofit Snap Fire Systems fire collars.

The floor/ceiling system comprised, 35-mm x 190 mm Treated Pine floor joists supporting 2 layers of 16-mm thick CSR Fyrechek plasterboard on the exposed face and with one layer of 15-mm thick HardiePanel CFC floor sheeting (with a stated density of 27.25 kg/m^2) on the top. The CSR 6134 floor/ceiling system as described in report by EWFA numbered 26162 has an established FRL of 90/90/90 and a Resistance to Incipient Spread of Fire (RISF) of 60 minutes.

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 2492:2007/Amdt 1:2018: Cross-linked polyethylene (PE-X) pipes for pressure applications.

For the purpose of the test, the specimens 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.

Specimen 1 – SNAP LP100R-D Retrofit fire collar protecting a nominal 100-mm diameter Polyvinyl Chloride sandwich construction (PVC-SC) floor waste and PVC 4-way riser.

The SNAP Retrofit LP100R-D 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 with a mesh 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 collar was surface mounted around the pipe on the exposed face and fixed through 4 mounting brackets using 4 x M4 expandable metal anchors after applying a thin layer of Fullers Firesound mastic over the collar's flange plate and on the head of the fixings.

The penetrating service comprised a 110.6-mm diameter Iplex PVC-SC pipe with a wall thickness of 3.41-mm fitted through the collar's sleeve. A 114-mm diameter opening was cut into the floor/ceiling linings and the collar fixed centrally over the hole. The annular gap around the pipe on the exposed side was sealed with a bead of Fullers Firesound mastic. The floor waste system was fitted with a chrome brass grate and PVC Puddle Flange. On the exposed side of the ceiling lining, a M10 threaded rod was connected to the penetrating pipe couplings, fixed to the plasterboard with two M4 expandable metal anchors and a T-bracket. On the exposed face, the 4-way riser was capped with PVC end cap.

The floor waste was charged with water (600 mL) to the level shown in drawing titled "Specimen #1 100 PVC-SC Floor waste & LP100R-D", dated 11 March 2020, provided by Snap Fire Systems Pty Ltd.

Specimen 2 – SNAP LP100R-D Retrofit fire collar protecting a nominal 100-mm diameter Polyvinyl Chloride sandwich construction (PVC-SC) pipe.

The SNAP Retrofit LP100R-D 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 with a mesh 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 collar was surface mounted around the pipe on the exposed face and fixed through 4 mounting brackets using 4 x M4 expandable metal anchors after applying a thin layer of Fullers Firesound mastic over the collar's flange plate and on the head of the fixings.

The penetrating service comprised a 110.6-mm outside diameter Iplex PVC-SC stack pipe with a wall thickness of 3.41-mm. The pipe penetrated the floor/ceiling system through a 114-mm diameter cut-out hole, projected vertically 2000-mm above the floor and 500-mm below into the furnace and was supported at 500-mm and 1500-mm above from the unexposed face of the floor. The annular gap around the pipe on the exposed side was sealed with a bead of Fullers Firesound mastic as shown in drawing titled "Specimen #2 100 PVC-SC Stack & LP100R-D", dated 11 March 2020, provided by Snap Fire Systems Pty Ltd. On the exposed face, the pipe was capped with PVC end cap.

Specimen 3 – SNAP LP50R Retrofit fire collar protecting a nominal 50-mm diameter Polyvinyl Chloride (PVC) floor waste and P-trap.

The SNAP Retrofit LP50R fire collar comprised a 0.75-mm steel casing with a 69-mm inner diameter and a 203-mm diameter base flange. The 62-mm high collar casing incorporated a closing mechanism which comprised a 255-mm x 58-mm x 4-mm thick Intumesh intumescent wrap lined within the internal circumference of the collar casing. The closing mechanism comprised three stainless steel springs, with black nylon fuse links and a 260-mm x 58-mm stainless steel mesh, as shown in drawing number "LP50R-T" dated 6 October 2017, by Snap Fire Systems Pty Ltd. The Snap collar was surface mounted around the pipe on the exposed face and fixed through 3 x M4 expandable metal anchors after applying a thin layer of Fullers Firesound mastic over the collar's flange plate and on the heads head of the fixings.

The penetrating service comprised a 56.3-mm diameter Iplex PVC pipe with a wall thickness of 2.25-mm fitted through the collar's sleeve. A 60-mm diameter opening was cut into the floor/ceiling linings and the collar fixed centrally over the hole. The annular gap around the pipe on the exposed side was sealed with a bead of Fullers Firesound mastic. The floor waste system was fitted with a chrome brass grate and PVC Puddle Flange. On the exposed side of the ceiling lining, a M10 threaded rod was connected to the penetrating pipe couplings, fixed to the plasterboard with 4 x 8 Hollow wall anchors and a T-bracket. On the exposed face, the P-trap was capped with PVC end cap.

The floor waste was charged with water to the level shown in drawing titled "Specimen #3 50 PVC Floor waste & LP50R", dated 25 February 2020, provided by Snap Fire Systems Pty Ltd.

Specimen 4 – SNAP 32R Retrofit fire collar protecting a nominal 20-mm diameter PE-Xa Rehau Rautitan pipe.

The 32R Retrofit fire collar comprised a 0.75-mm steel casing with a 40-mm inner diameter and a 106-mm diameter base flange. The 32-mm high collar casing incorporated a closing mechanism that comprised two soft Intumesh intumescent strips lined within the internal circumference of the collar casing. The inner and outer strips were 4-mm thick x 26-mm wide x 135-mm long and 4-mm thick x 26-mm wide x 154-mm long respectively. Between the strips was a layer of 316 stainless steel mesh 135 mm long x 25-mm wide with wire mesh diameter of 0.15- mm, as shown in drawing titled "SNAP 32 Retro", dated 5 October 2017, by Snap Fire Systems Pty Ltd. The Snap collar was surface mounted around the pipe on the exposed face and fixed through 3 x M4 expandable metal anchors after applying a thin layer of Fullers Firesound mastic over the collar's flange plate and on the heads head of the fixings.

The penetrating service comprised a 20-mm outside PE-Xa Rehau Rautitan stack pipe with a wall thickness of 3.17-mm. The pipe penetrated the floor/ceiling system through a 25-mm diameter cut-out hole, projected vertically 2000 mm above the floor and 500-mm below into the furnace and was supported at 500-mm and 1500-mm above from the unexposed face of the floor. The annular gap around the pipe on the exposed side was sealed with a bead of Fullers Firesound mastic as shown in drawing titled "Specimen #4 20 Pex-a Stack & 32R", dated 25 February 2020, provided by Snap Fire Systems Pty Ltd. On the exposed face, the pipe was plugged with ceramic fibre.

2.2 Dimensions

The overall dimension of the floor/ceiling specimen was 1150-mm wide x 1150-mm long x 237-mm thick, to suit the opening in the specimen containing frame.

2.3 Orientation

The floor/ceiling system was placed horizontally on top of the furnace chamber and subjected to fire exposure from the underside.

2.4 Conditioning

The specimen installation was completed on 6 April 2020 and left under standard laboratory atmospheric conditions prior to the test.

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:

- Document Titled “The Red Book – Fire, acoustic and thermal design guide” dated February 2017, by CSR Building Products.
- Drawing titled “Test Slab S-20-B Layout”, dated 26 February 2020 provided by Snap Fire Systems Pty Ltd.
- Drawing titled “Test Slab S-20-B Sections”, dated 26 February 2020 provided by Snap Fire Systems Pty Ltd.
- Drawing titled “Specimen #1 100 PVC-SC Floorwaste & LP100R-D”, dated 11 March 2020, provided by Snap Fire Systems Pty Ltd.
- Drawing titled “Specimen #2 100 PVC-SC Stack & LP100R-D”, dated 11 March 2020, provided by Snap Fire Systems Pty Ltd.
- Drawing titled “Specimen #3 50 PVC Floorwaste & LP50R”, dated 25 February 2020, provided by Snap Fire Systems Pty Ltd.
- Drawing titled “Specimen #4 20 Pex-a Stack & 32R”, dated 25 February 2020, provided by Snap Fire Systems Pty Ltd.
- Drawing titled “SNAP 32 Retro”, dated 5 October 2017, by Snap Fire Systems Pty Ltd.
- Drawing number LP50R-T, dated 6 October 2017, by Snap Fire Systems Pty Ltd.
- Drawing numbered LP100R-D-T dated 10 February 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 and within the ceiling cavity 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 24°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 115 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
1 minute -	Smoke has begun fluing from the grate of the Specimen 1 floor waste and the annual gap between the pipe and CFC floor at the base of Specimen 4.
2 minutes -	Cotton pad test applied above the grate of Specimen 1 – no ignition noted at this time.
3 minutes -	Smoke has begun fluing from the grate of Specimen 3 floor waste. Smoke is fluing from the end of the pipes of Specimens 2 and 4.
4 minutes -	The level of smoke fluing from the grate of Specimens 1 and 3 has increased. Smoke has ceased fluing from Specimens 2 and 4.
6 minutes -	The puddle flange on both floor waste systems have risen with Specimen 1 and Specimen 2 rising 30-mm and 40-mm, respectively above the CFC floor. Smoke has ceased fluing through the grates of Specimens 1 and 3 (photograph 3).
11 minutes -	Smoke is venting from the annual gap between the pipe and CFC floor at the base of Specimen 4. Smoke has resumed fluing from the grate of the Specimen 1 floor waste (photograph 4).
13 minutes -	Both puddle flanges continue to rise upwards with Specimen 1 and Specimen 2 rising 50 mm and 30-mm, respectively above the CFC floor panel sheet.
19 minutes -	Smoke continues to flue from the grate of the Specimen 1 floor waste.
21 minutes -	Light smoke has resumed fluing from the grate of the Specimen 3 floor waste.
32 minutes -	Light smoke has begun venting from the perimeter of the specimen floor.
37 minutes -	The metal grate of both floor wastes of Specimen 1 and 3 have discoloured.
40 minutes -	Smoke is venting from the annual gap between the pipe and CFC floor at the base of Specimens 2 and 4.
50 minutes -	Smoke has resumed fluing from the end of the pipe of Specimens 2 and 4.

52 minutes - The puddle flange of Specimen 1 has dropped back down to the CFC floor.

60 minutes - Smoke has ceased fluing from Specimen 4.

62 minutes - Incipient Spread of Fire Failure of Specimen 1 – maximum temperature of 250°C exceeded on the unexposed face of the plasterboard ceiling membrane within the ceiling cavity 25-mm from the PVC pipe TC#19.

69 minutes - Incipient Spread of Fire Failure of Specimen 3 – maximum temperature of 250°C exceeded on the unexposed face of the plasterboard ceiling membrane within the ceiling cavity 25-mm from the PVC pipe TC#35.

71 minutes - Incipient Spread of Fire Failure of Specimen 4 – maximum temperature of 250°C exceeded on the unexposed face of the plasterboard ceiling membrane within the ceiling cavity 25-mm from the PVC pipe TC#27.

72 minutes - The puddle flange of Specimen 3 has dropped back down to the level of the CFC floor.

80 minutes - The level of smoke fluing from the grate of the Specimen 1 floor waste has increased.

82 minutes - Incipient Spread of Fire Failure of Specimen 2 – maximum temperature of 250°C exceeded on the unexposed face of the plasterboard ceiling membrane within the ceiling cavity 25-mm from the PVC pipe TC#43 and 44.

94 minutes - Smoke has ceased fluing from the grate of Specimen 1, but has resumed fluing from the grate of Specimen 3.

104 minutes - Smoke has resumed fluing from the grate of Specimen 1.

114 minutes - Smoke emitted around the perimeter of the specimen and the cavity temperature has risen rapidly above 600°C.

115 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 on the exposed face of Specimen 1.

Figure 4 shows the curve of temperature versus time on the exposed face of Specimen 2.

Figure 5 shows the curve of temperature versus time on the exposed face of Specimen 3.

Figure 6 shows the curve of temperature versus time on the exposed face of Specimen 4.

Figure 7 shows the curve of temperature versus time within the ceiling cavity of Specimen 1.

Figure 8 shows the curve of temperature versus time within the ceiling cavity of Specimen 2.

Figure 9 shows the curve of temperature versus time within the ceiling cavity of Specimen 3.

Figure 10 shows the curve of temperature versus time within the ceiling cavity of Specimen 4.

8.5 Performance

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

Specimen 1 – SNAP LP100R-D Retrofit fire collar protecting a nominal 100-mm diameter Polyvinyl Chloride sandwich construction (PVC-SC) floor waste and PVC 4-way riser.

Structural adequacy	-	not applicable
Integrity	-	no failure at 115 minutes
Insulation	-	no failure at 115 minutes
Incipient Spread of Fire	-	62 minutes

Specimen 2 – SNAP LP100R-D Retrofit fire collar protecting a nominal 100-mm diameter Polyvinyl Chloride sandwich construction (PVC-SC) pipe.

Structural adequacy	-	not applicable
Integrity	-	no failure at 115 minutes
Insulation	-	no failure at 115 minutes
Incipient Spread of Fire	-	82 minutes

Specimen 3 – SNAP LP50R Retrofit fire collar protecting a nominal 50-mm diameter Polyvinyl Chloride (PVC) floor waste and P-trap.

Structural adequacy	-	not applicable
Integrity	-	no failure at 115 minutes
Insulation	-	no failure at 115 minutes
Incipient Spread of Fire	-	69 minutes

Specimen 4 – SNAP 32R Retrofit fire collar protecting a nominal 20-mm diameter PE-Xa Rehau Rautitan pipe.

Structural adequacy	-	not applicable
Integrity	-	no failure at 115 minutes
Insulation	-	no failure at 115 minutes
Incipient Spread of Fire	-	71 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	-	-/90/90
Specimen 2	-	-/90/90
Specimen 3	-	-/90/90
Specimen 4	-	-/90/90

The fire-resistance level of the specimen is applicable when the system is exposed to fire from the same direction as tested. Incipient spread of fire is not considered in the determination of fire-resistance.

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

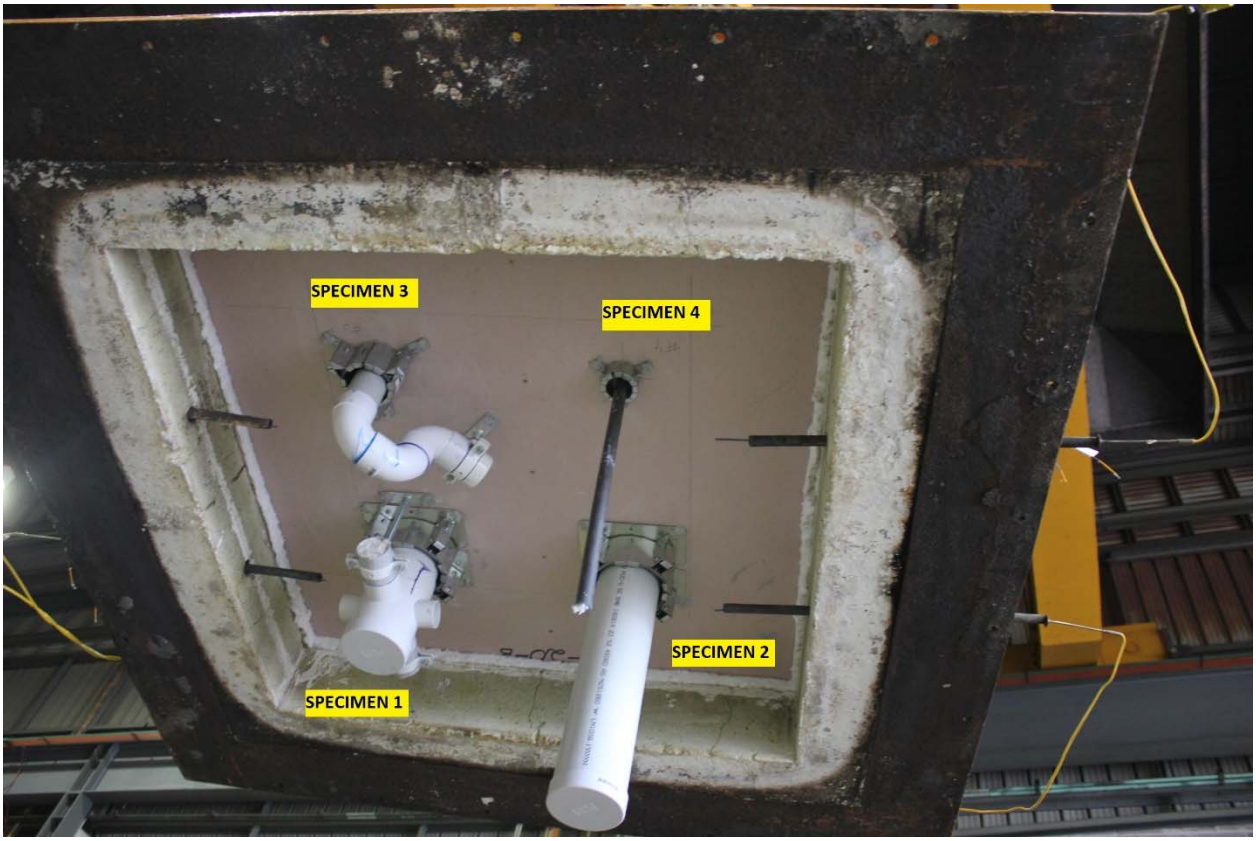
Appendices

Appendix A – Measurement location

SPECIMEN	T/C Position	T/C Designation
Specimen 1 – SNAP LP100R-D Retrofit fire collar protecting a nominal 100-mm Polyvinyl Chloride sandwich construction (PVC-SC) floor waste and PVC 4-way riser.	On CFC, 25-mm from PVC Puddle Flange N	S1
	On CFC, 25-mm from PVC Puddle Flange S	S2
	On PVC Puddle Flange,25-mm from CFC N	S3
	On PVC Puddle Flange, 25-mm from CFC S	S4
	On centre of Metal Grate	S5
Specimen 2 – SNAP LP100R-D Retrofit fire collar protecting a nominal 100-mm Polyvinyl Chloride sandwich construction (PVC-SC) pipe.	On CFC – 25-mm from pipe NW	S6
	On CFC – 25-mm from pipe SE	S7
	On the pipe - 25-mm from CFC NW	S8
	On the pipe - 25-mm from CFC SE	S9
Specimen 3 – SNAP LP50R Retrofit fire collar protecting a nominal 50-mm Polyvinyl Chloride (PVC) floor waste and P-trap.	On CFC – 25-mm from PVC Puddle Flange NW	S10
	On CFC – 25-mm from PVC Puddle Flange SE	S11
	On PVC Puddle Flange 25-mm from CFC NW	S12
	On PVC Puddle Flange 25-mm from CFC SE	S13
	On centre of Metal Grate	S14
Specimen 4 – SNAP 32R Retrofit fire collar protecting a nominal 20-mm PE-Xa Rehau Rautitan pipe.	On CFC – 25-mm from pipe NE	S15
	On CFC – 25-mm from pipe SW	S16
	On the pipe - 25-mm from CFC NE	S17
	On the pipe - 25-mm from CFC SW	S18
Incipient fire spread Specimen 1 (Temperature inside ceiling cavity)	Inside ceiling cavity on P/B, 25-mm from pipe N	S19
	Inside ceiling cavity on P/B, 25-mm from pipe W	S20
	Inside ceiling cavity on pipe, 25-mm from P/B N	S21
	Inside ceiling cavity on pipe, 25-mm from P/B W	S22
	Inside ceiling cavity on joist mid height near Specimen 1 E	S23
	Inside ceiling cavity on joist mid height near Specimen 1 S	S24
	Inside ceiling cavity on CFC, 25-mm from pipe E	S25
	Inside ceiling cavity on CFC, 25-mm from pipe S	S26

SPECIMEN	T/C Position	T/C Designation
Incipient fire spread Specimen 2 (Temperature inside ceiling cavity)	Inside ceiling cavity on P/B, 25-mm from pipe N	S27
	Inside ceiling cavity on P/B, 25-mm from pipe SE	S28
	Inside ceiling cavity on pipe, 25-mm from P/B N	S29
	Inside ceiling cavity on pipe, 25-mm from P/B SE	S30
	Inside ceiling cavity on joist mid height near Specimen 2 W	S31
	Inside ceiling cavity on joist mid height near Specimen 2 S	S32
	Inside ceiling cavity on CFC, 25-mm from pipe E	S33
	Inside ceiling cavity on CFC, 25-mm from pipe W	S34
Incipient fire spread Specimen 3 (Temperature inside ceiling cavity)	Inside ceiling cavity on P/B, 25-mm from pipe E	S35
	Inside ceiling cavity on P/B, 25-mm from pipe S	S36
	Inside ceiling cavity on pipe, 25-mm from P/B N	S37
	Inside ceiling cavity on pipe, 25-mm from P/B S	S38
	Inside ceiling cavity on joist mid height near Specimen 3 E	S39
	Inside ceiling cavity on joist mid height near Specimen 3 N	S40
	Inside ceiling cavity on CFC, 25-mm from pipe N	S41
	Inside ceiling cavity on CFC, 25-mm from pipe S	S42
Incipient fire spread Specimen 4 (Temperature inside ceiling cavity)	Inside ceiling cavity on P/B, 25-mm from pipe E	S43
	Inside ceiling cavity on P/B, 25-mm from pipe S	S44
	Inside ceiling cavity on pipe, 25-mm from P/B N	S45
	Inside ceiling cavity on pipe, 25-mm from P/B S	S46
	Inside ceiling cavity on joist mid height near Specimen 4 N	S47
	Inside ceiling cavity on joist mid height near Specimen 4 W	S48
	Inside ceiling cavity on CFC, 25-mm from pipe E	S49
	Inside ceiling cavity on CFC, 25-mm from pipe W	S50
Rover	Rover	S51
Ambient	Ambient	S52

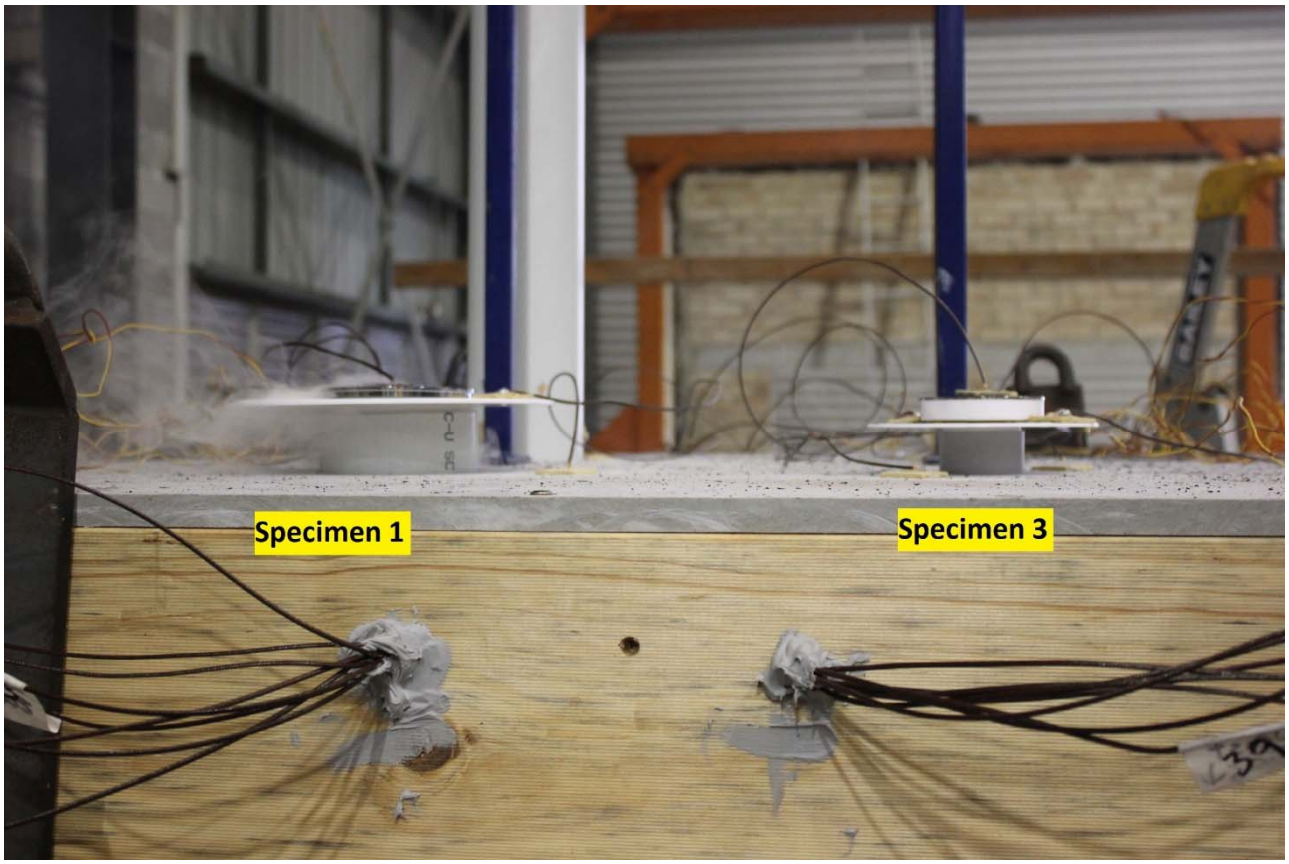
Appendix B – Photographs



PHOTOGRAPH 1 – EXPOSED FACE OF SPECIMENS PRIOR TO TESTING

PHOTOGRAPH 2 – UNEXPOSED FACE OF SPECIMENS PRIOR TO TESTING

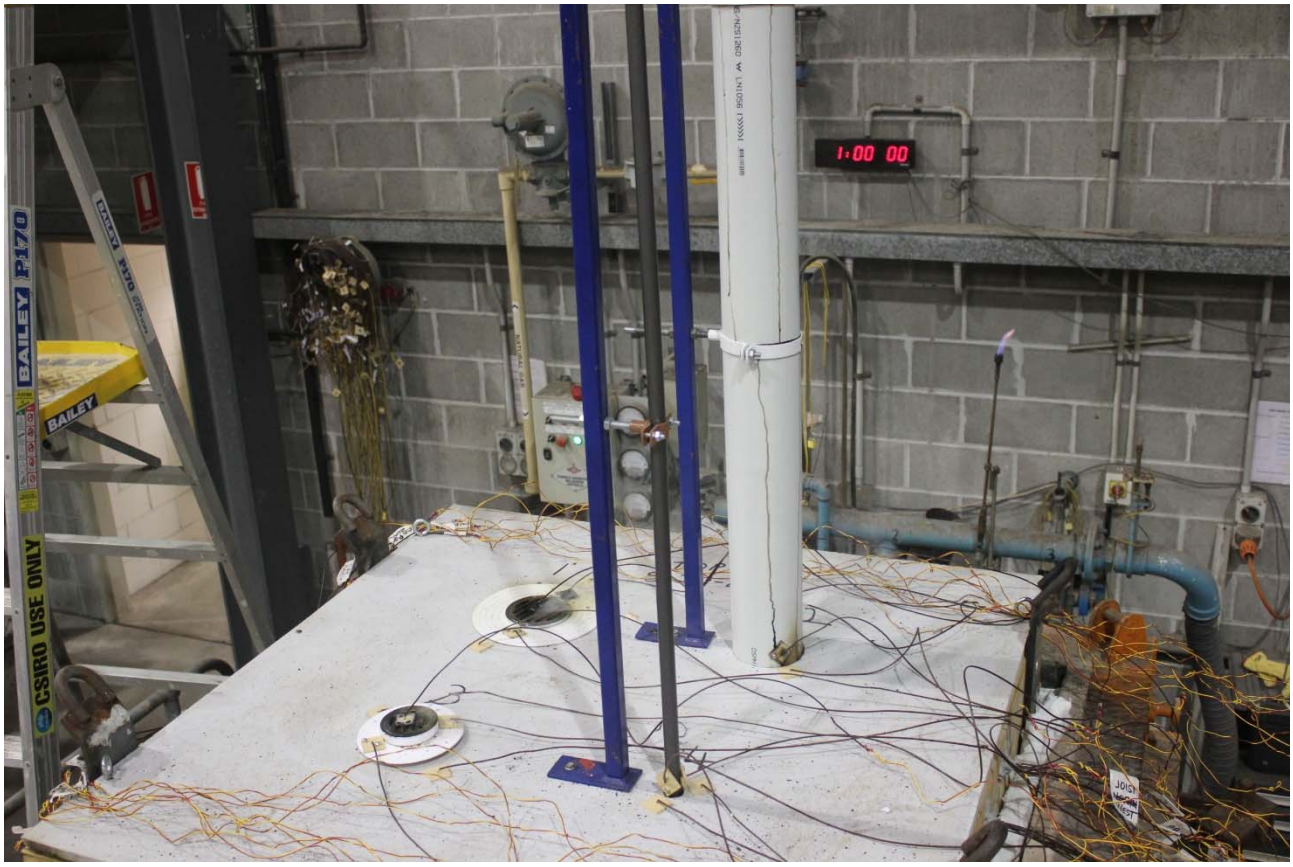
PHOTOGRAPH 3 – SPECIMENS AFTER 6 MINUTES OF TESTING



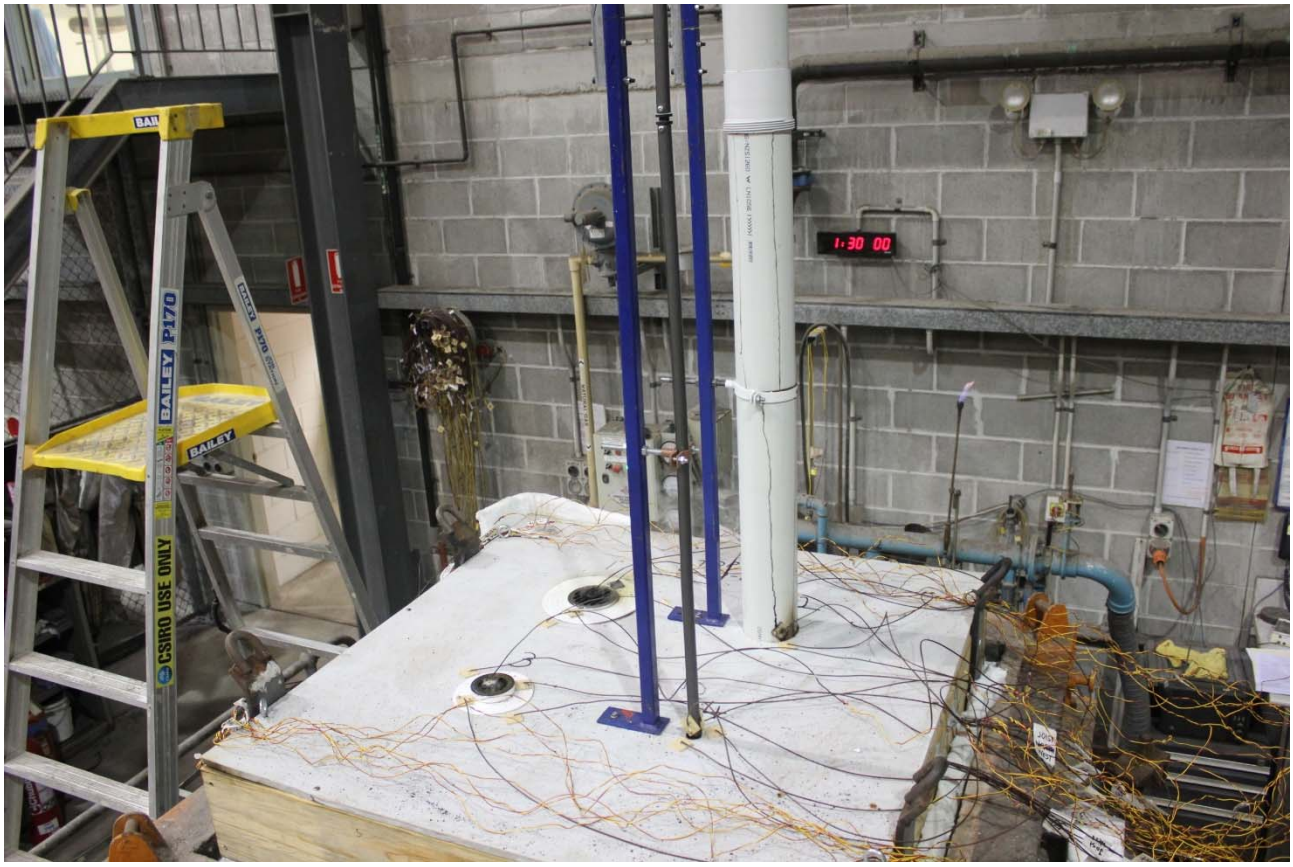
PHOTOGRAPH 4 – SPECIMENS AFTER 11 MINUTES OF TESTING

PHOTOGRAPH 5 – SPECIMENS AFTER 30 MINUTES OF TESTING

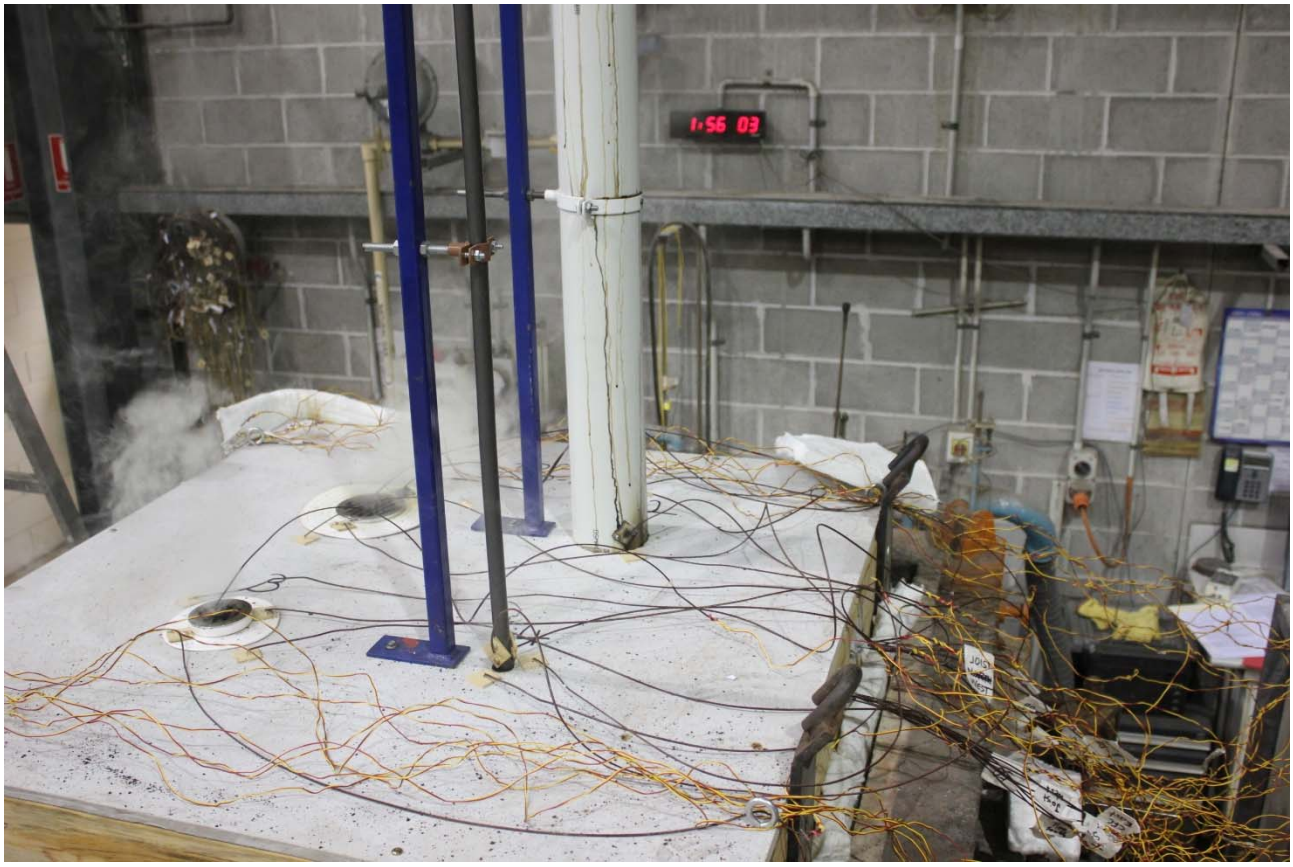
PHOTOGRAPH 6 – SPECIMENS AFTER 52 MINUTES OF TESTING



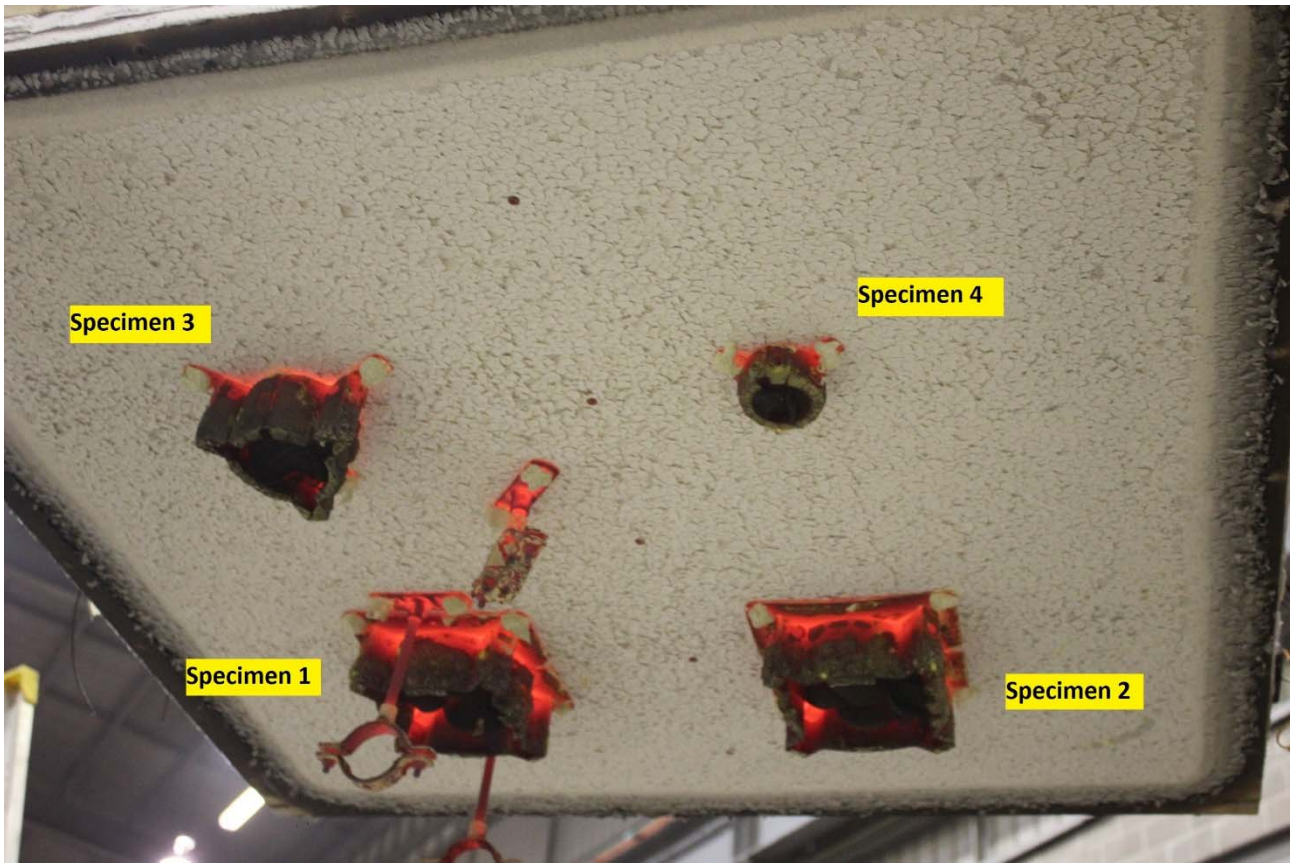
PHOTOGRAPH 7 – SPECIMENS AFTER 60 MINUTES OF TESTING



PHOTOGRAPH 8 – SPECIMENS AFTER 90 MINUTES OF TESTING



PHOTOGRAPH 9 – SPECIMENS AT THE CONCLUSION OF TESTING



PHOTOGRAPH 10 – EXPOSED FACE OF SPECIMENS AT THE CONCLUSION OF TESTING

Appendix C – Test Data charts

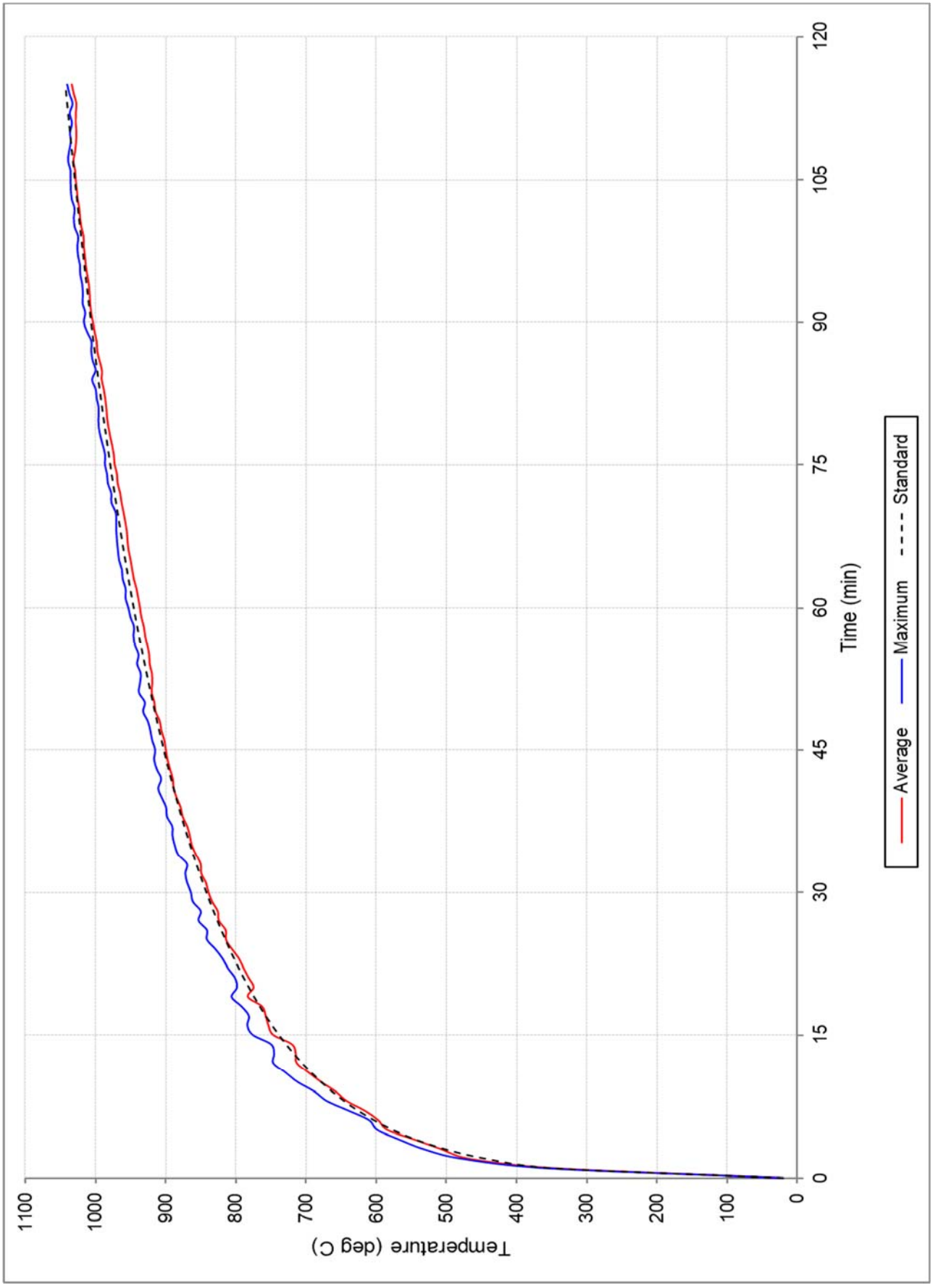


FIGURE 1 – FURNACE TEMPERATURE

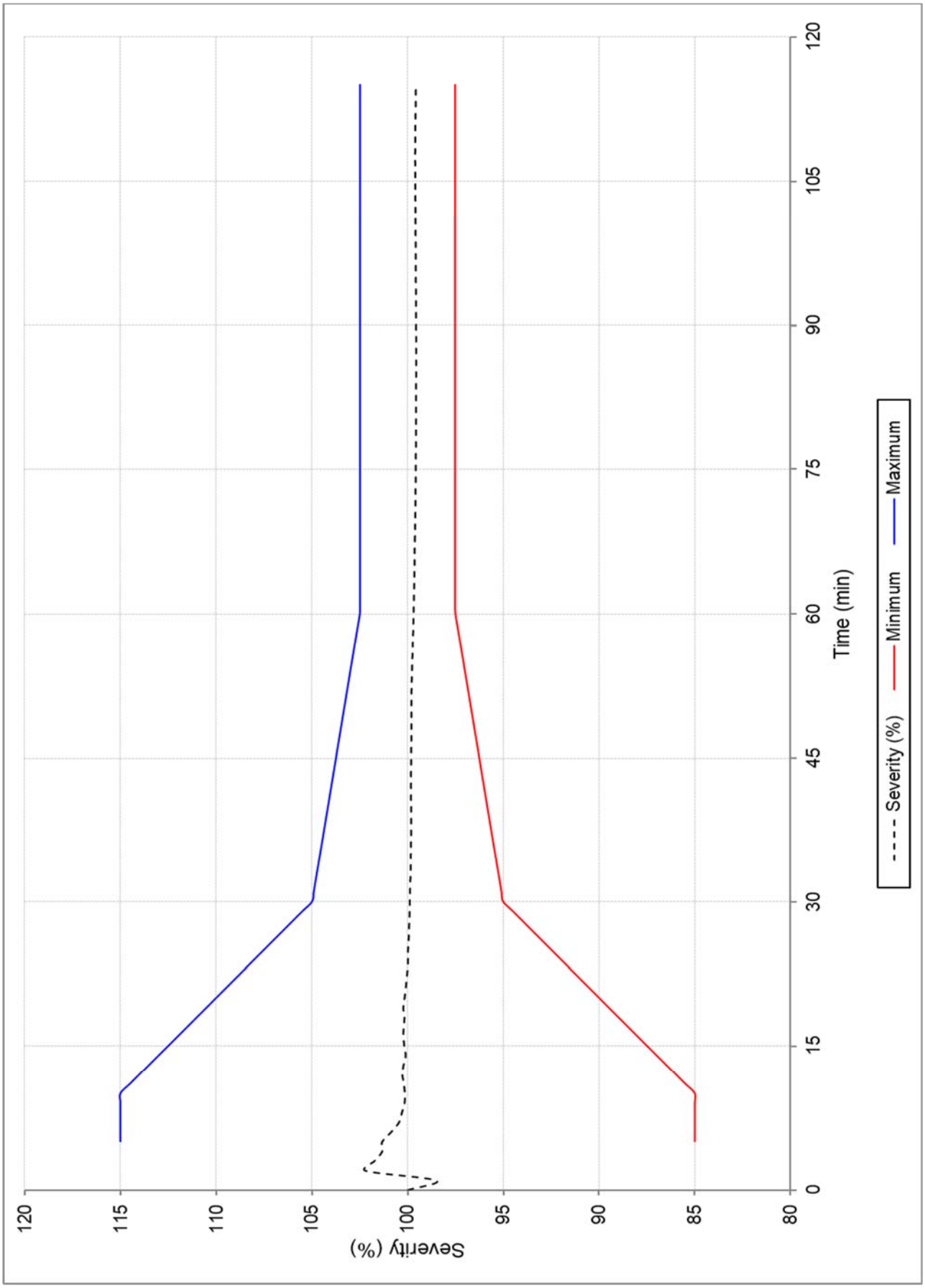


FIGURE 2 – FURNACE SEVERITY

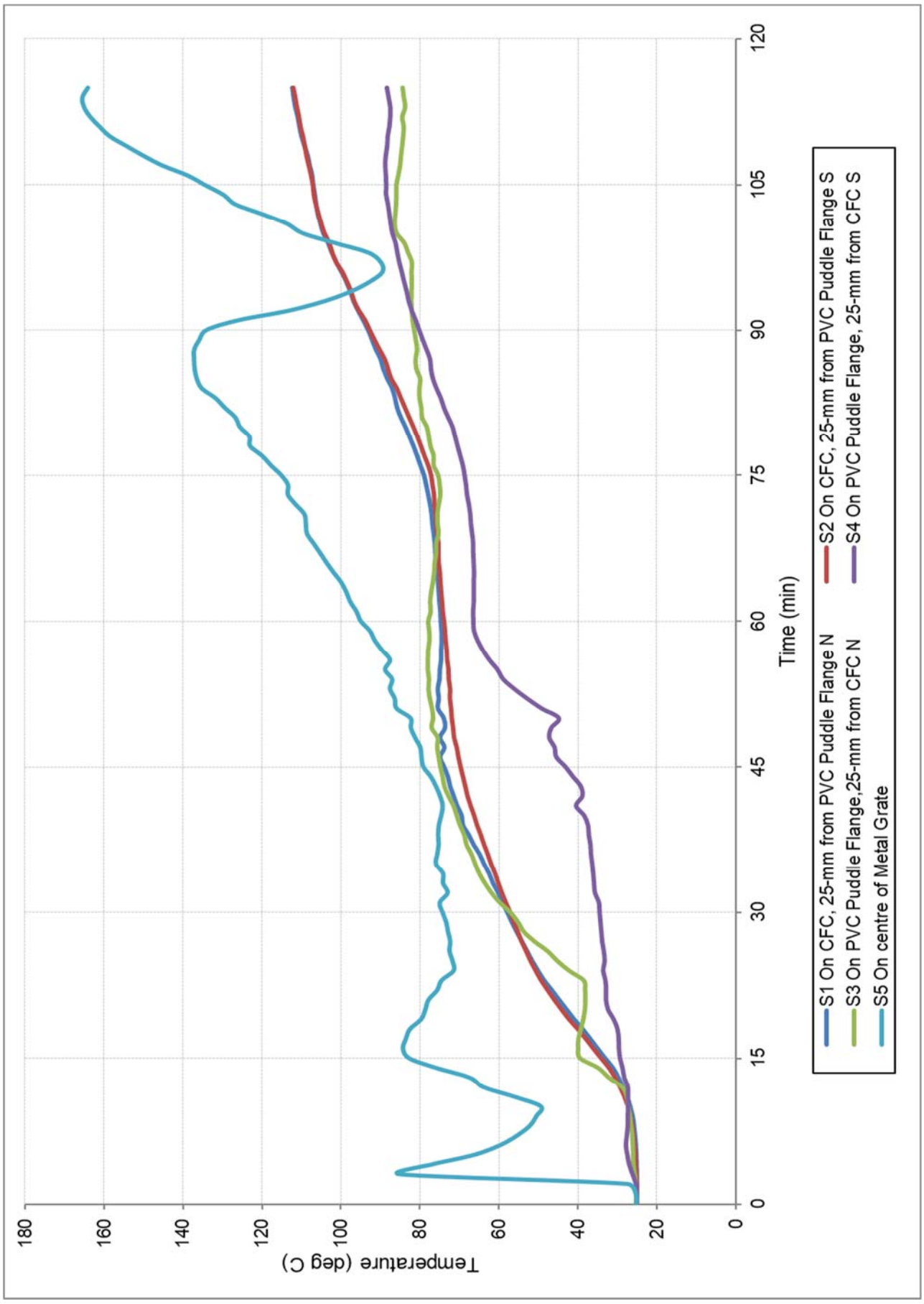


FIGURE 3 – SPECIMEN TEMPERATURE – ASSOCIATED WITH THE UNEXPOSED FACE OF SPECIMEN 1

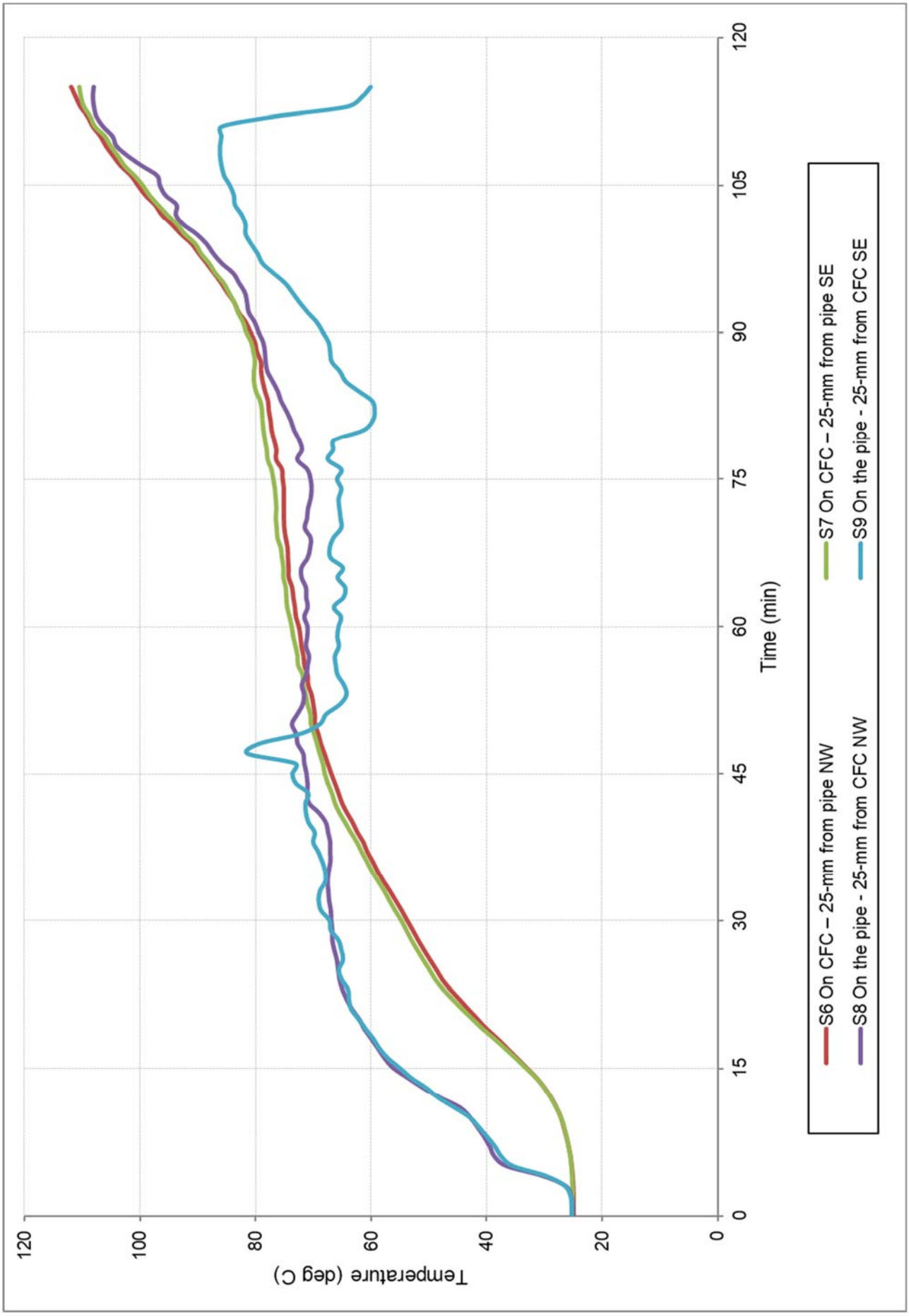


FIGURE 4 – SPECIMEN TEMPERATURE – ASSOCIATED WITH THE UNEXPOSED FACE OF SPECIMEN 2

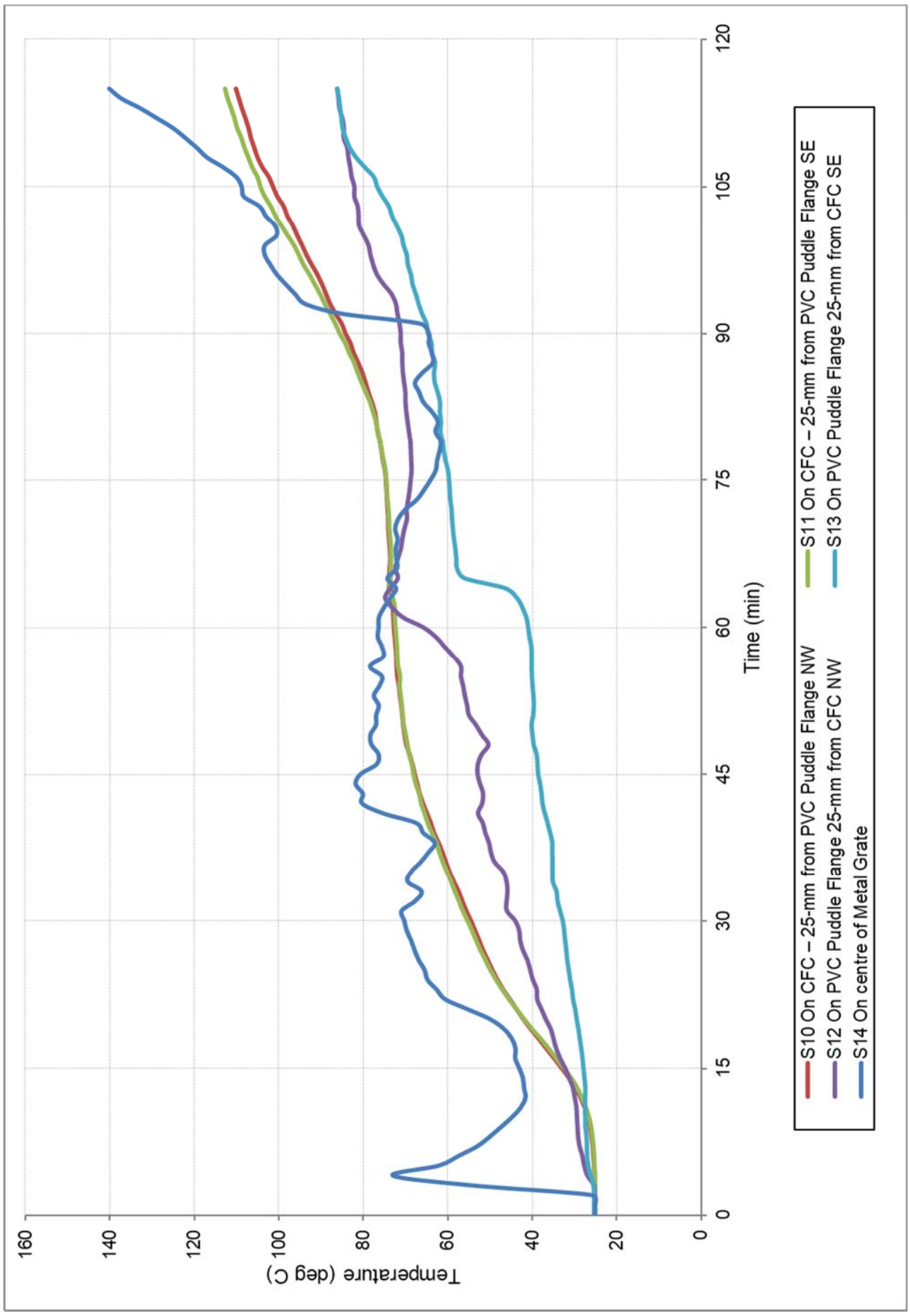


FIGURE 5 – SPECIMEN TEMPERATURE – ASSOCIATED WITH THE UNEXPOSED FACE OF SPECIMEN 3

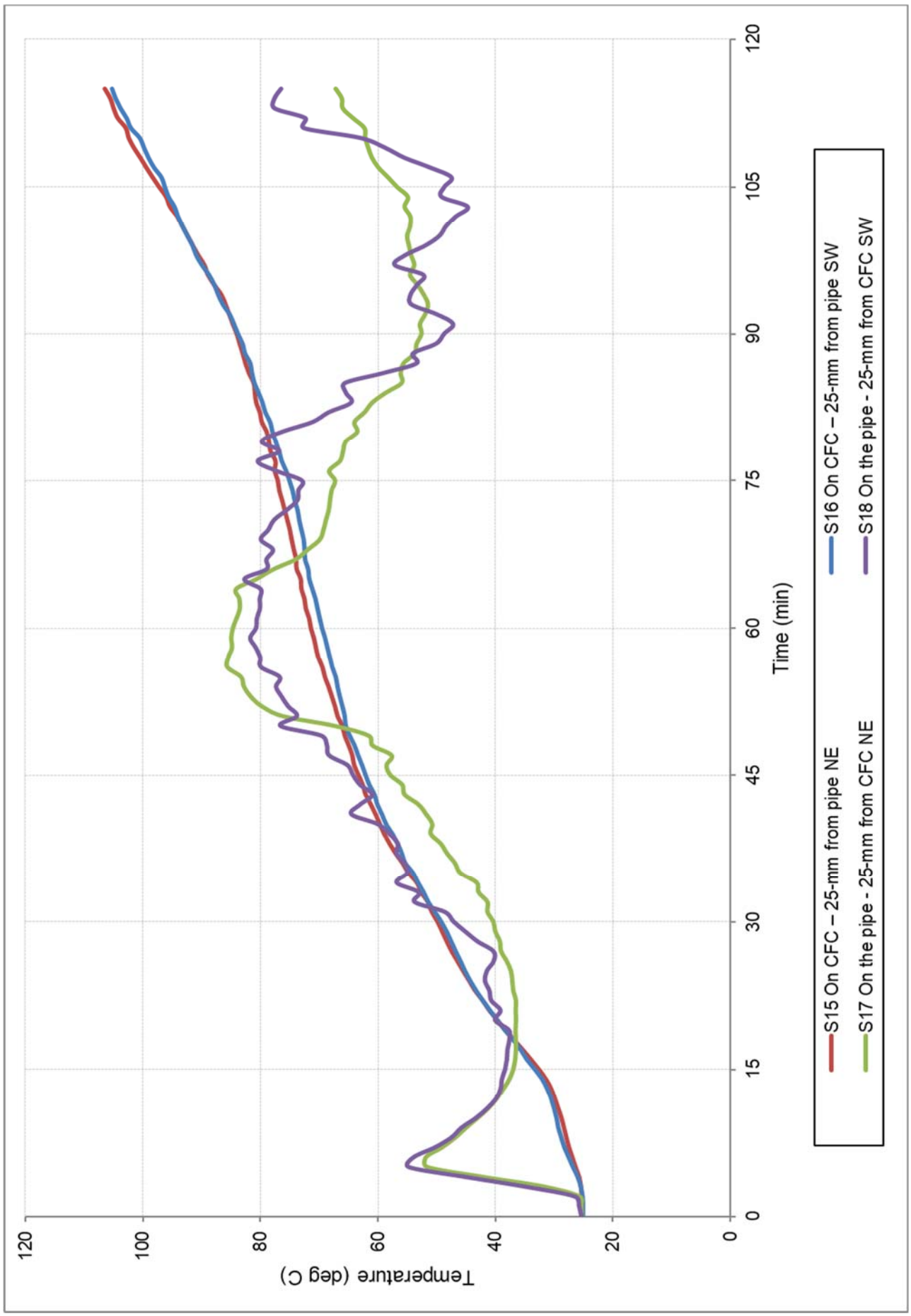


FIGURE 6 – SPECIMEN TEMPERATURE – ASSOCIATED WITH THE UNEXPOSED FACE OF SPECIMEN 4

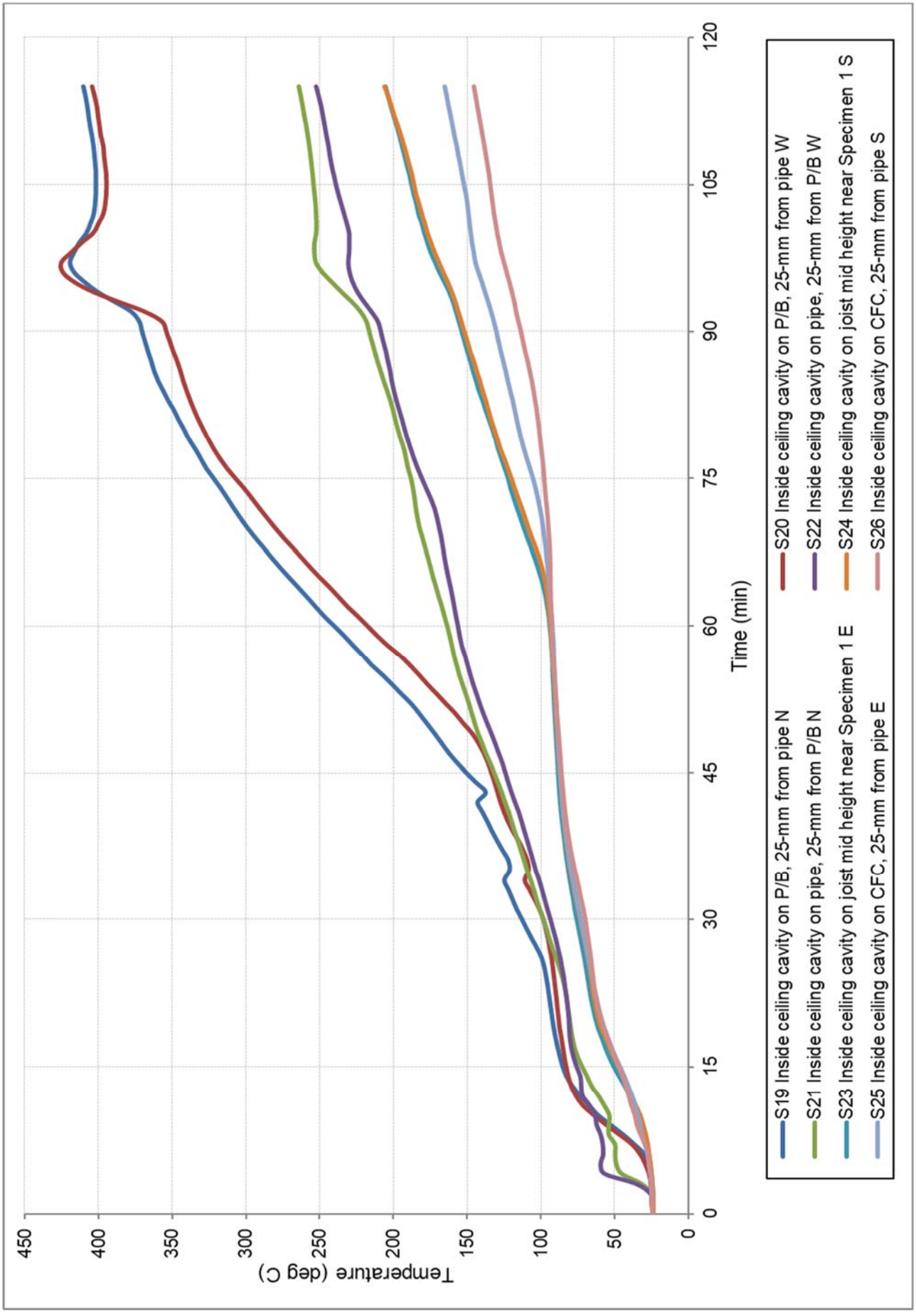


FIGURE 7 – SPECIMEN TEMPERATURE – INSIDE THE FLOOR/ CEILING CAVITY OF SPECIMEN 1

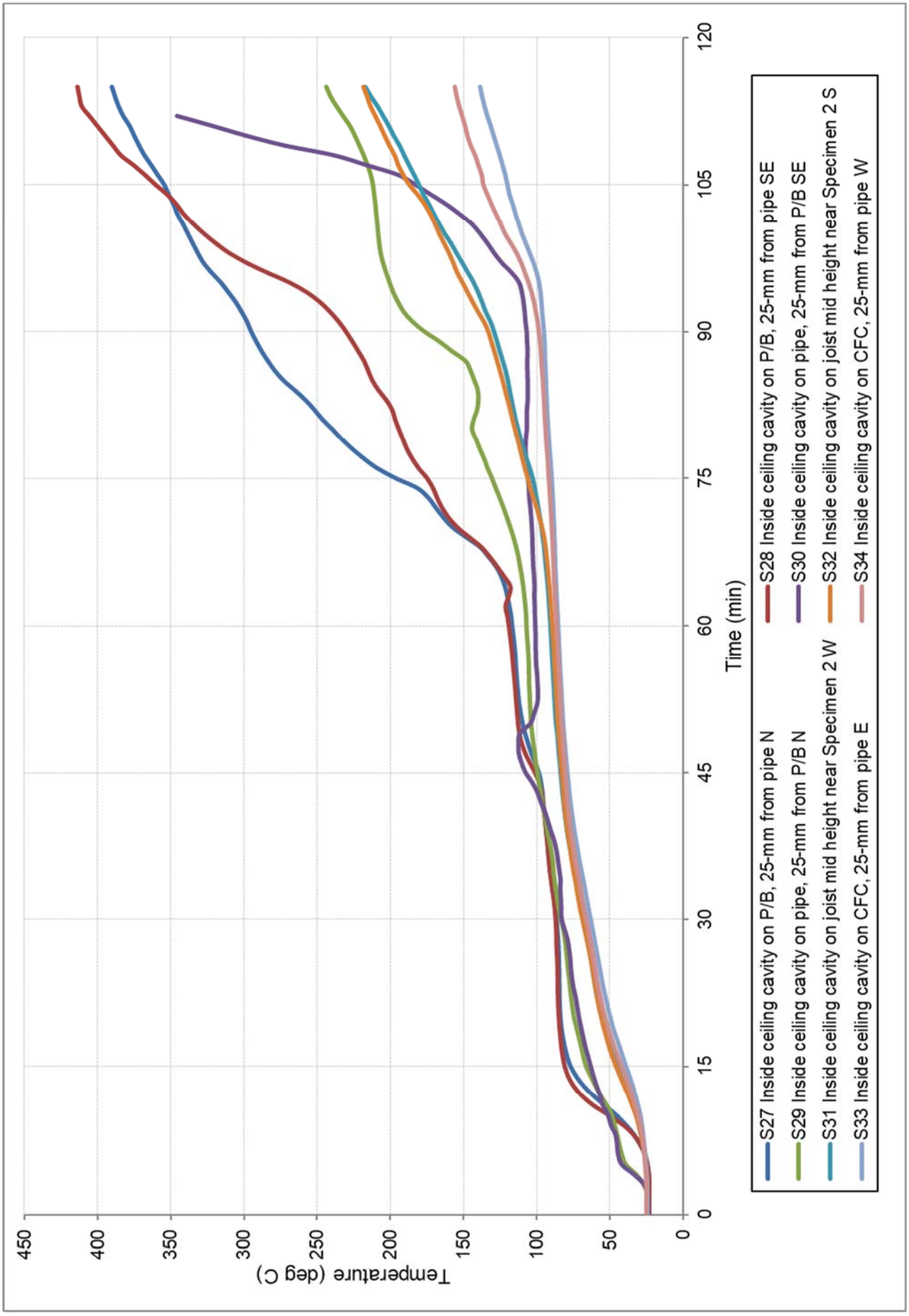


FIGURE 8 – SPECIMEN TEMPERATURE – INSIDE THE FLOOR/ CEILING CAVITY OF SPECIMEN 2

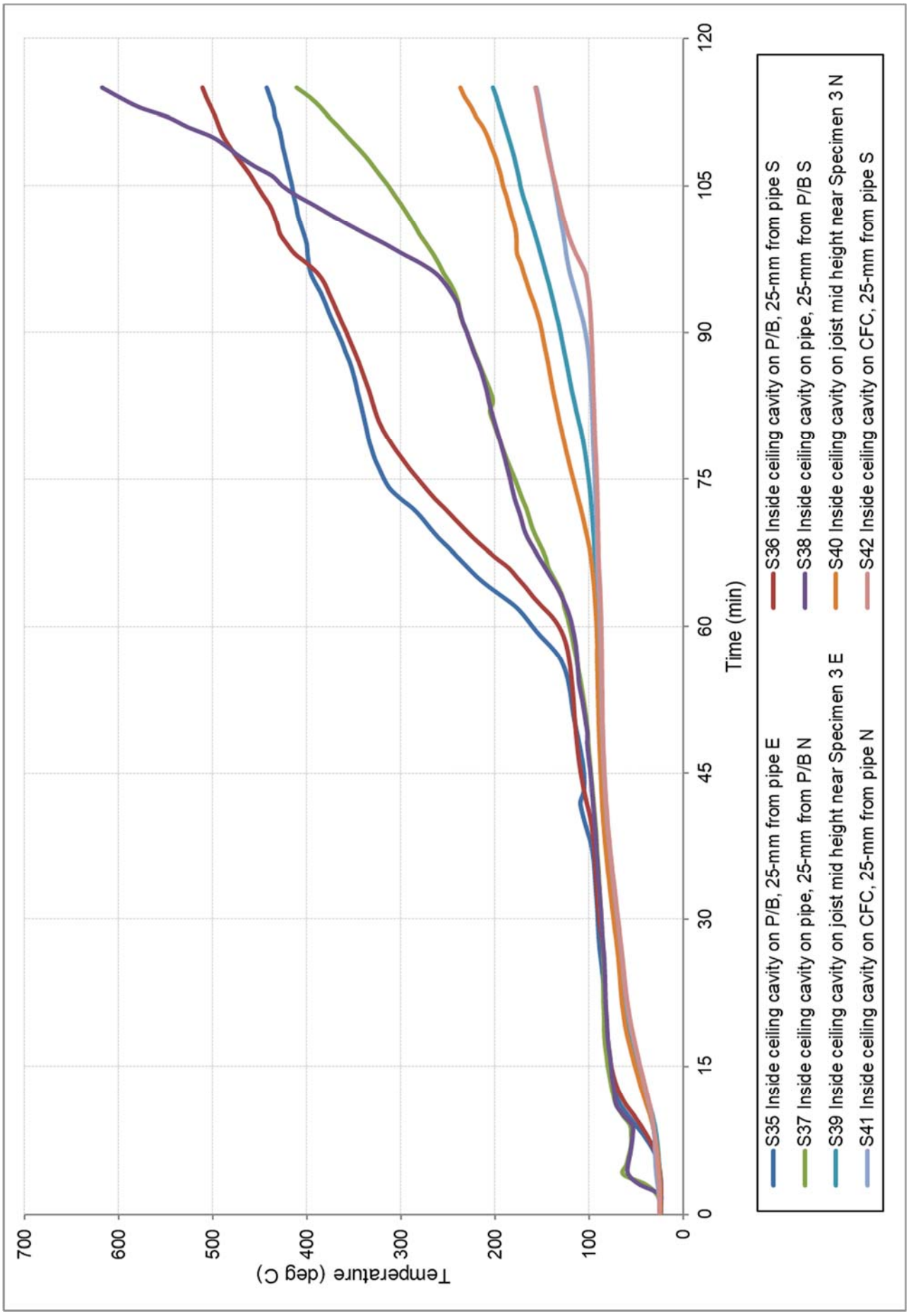


FIGURE 9 – SPECIMEN TEMPERATURE – INSIDE THE FLOOR/ CEILING CAVITY OF SPECIMEN 3

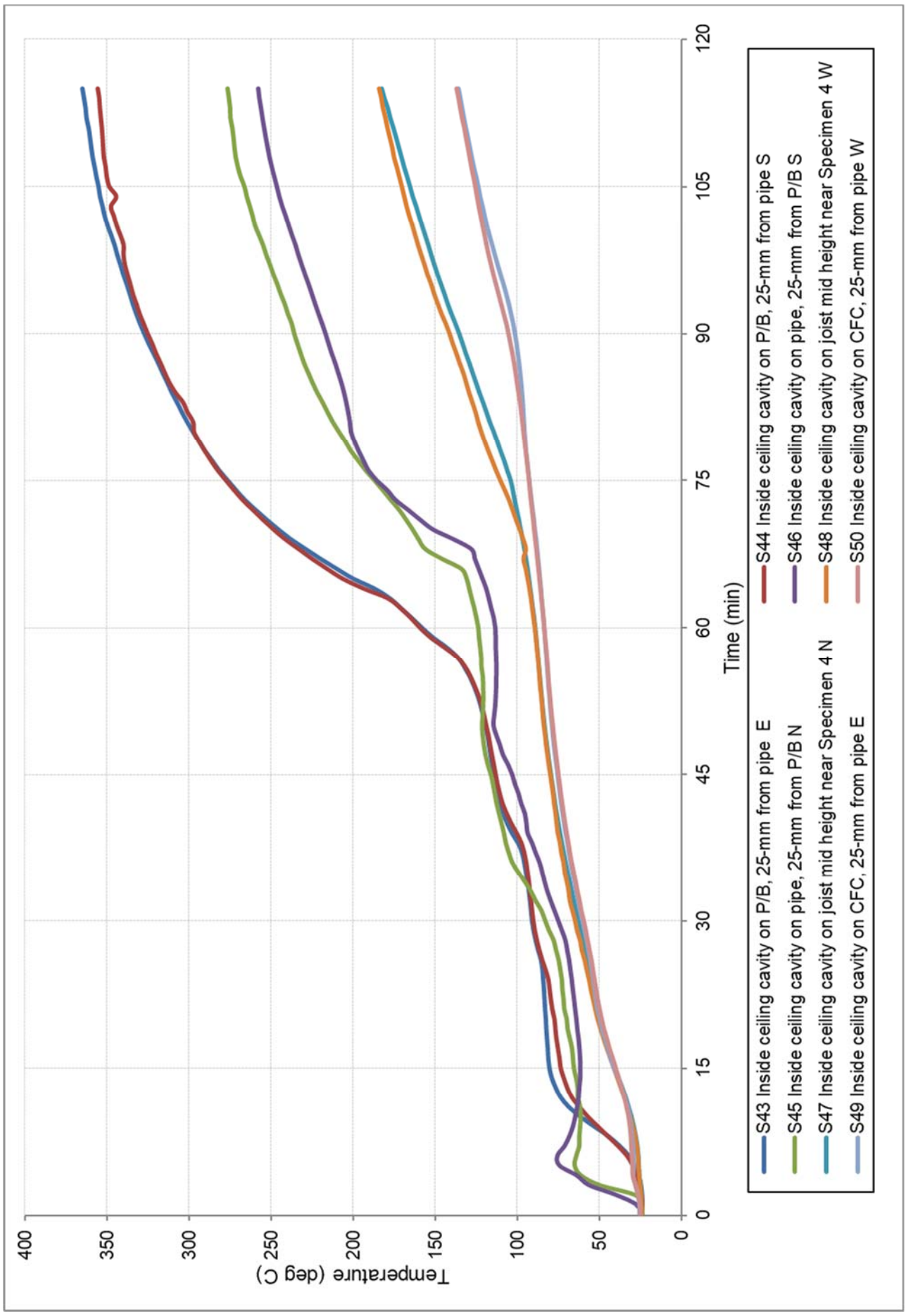
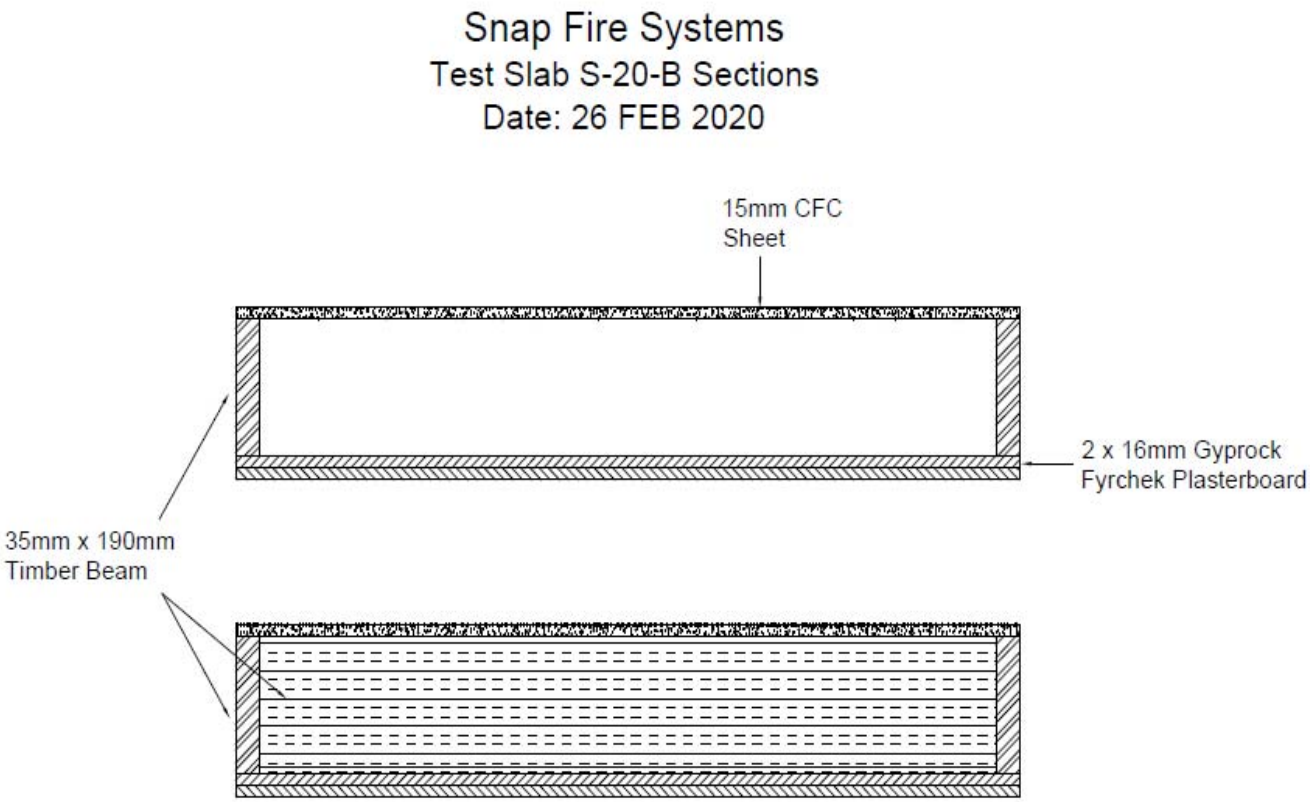


FIGURE 10 – SPECIMEN TEMPERATURE – INSIDE THE FLOOR/ CEILING CAVITY OF SPECIMEN 4

Appendix D – Installation drawings

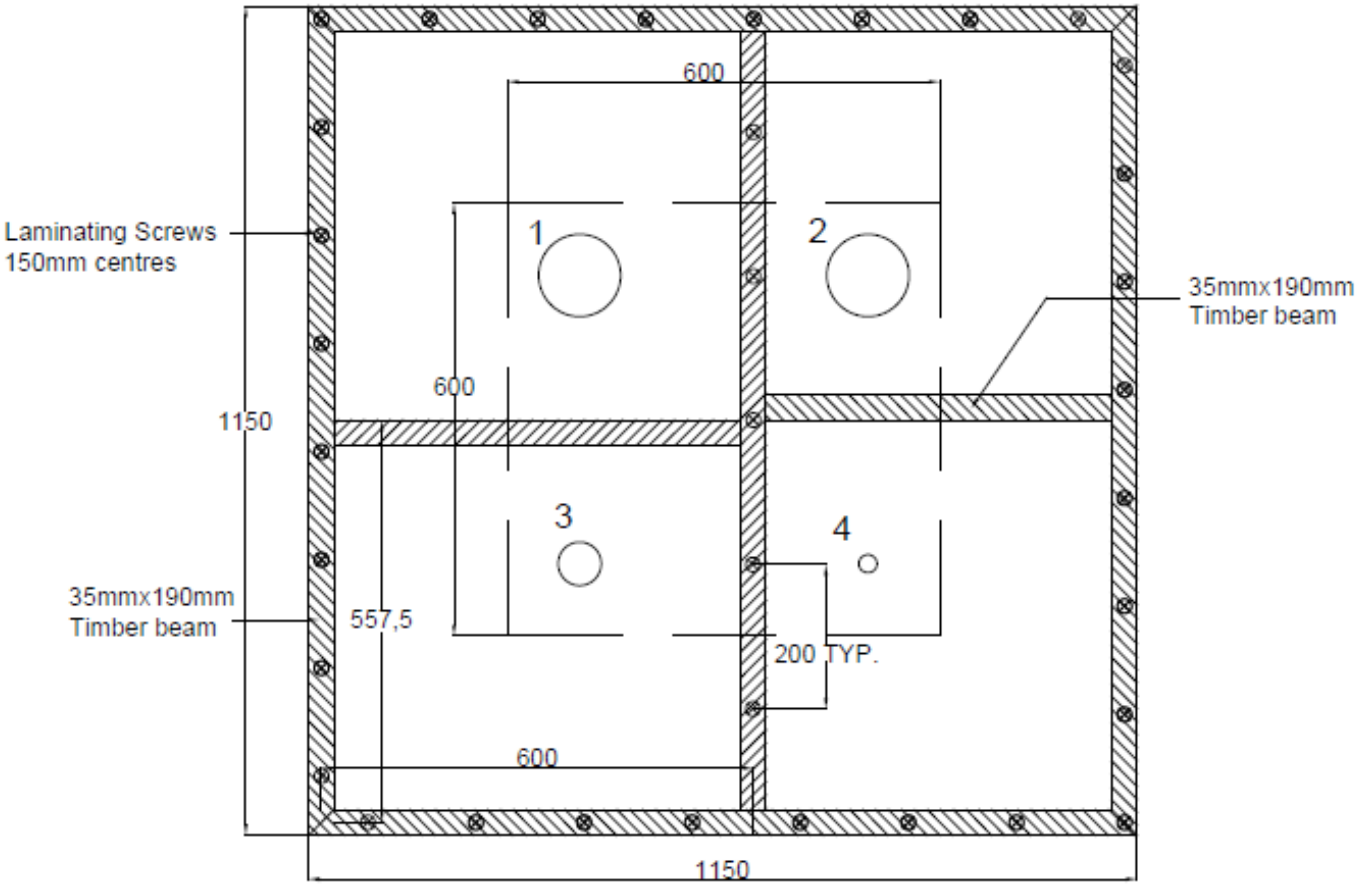


DRAWING TITLED "TEST SLAB S-20-B SECTION", DATED 26 FEBRUARY 2020 PROVIDED BY SNAP FIRE SYSTEMS PTY LTD.

Snap Fire Systems

Test Slab S-20-B Layout

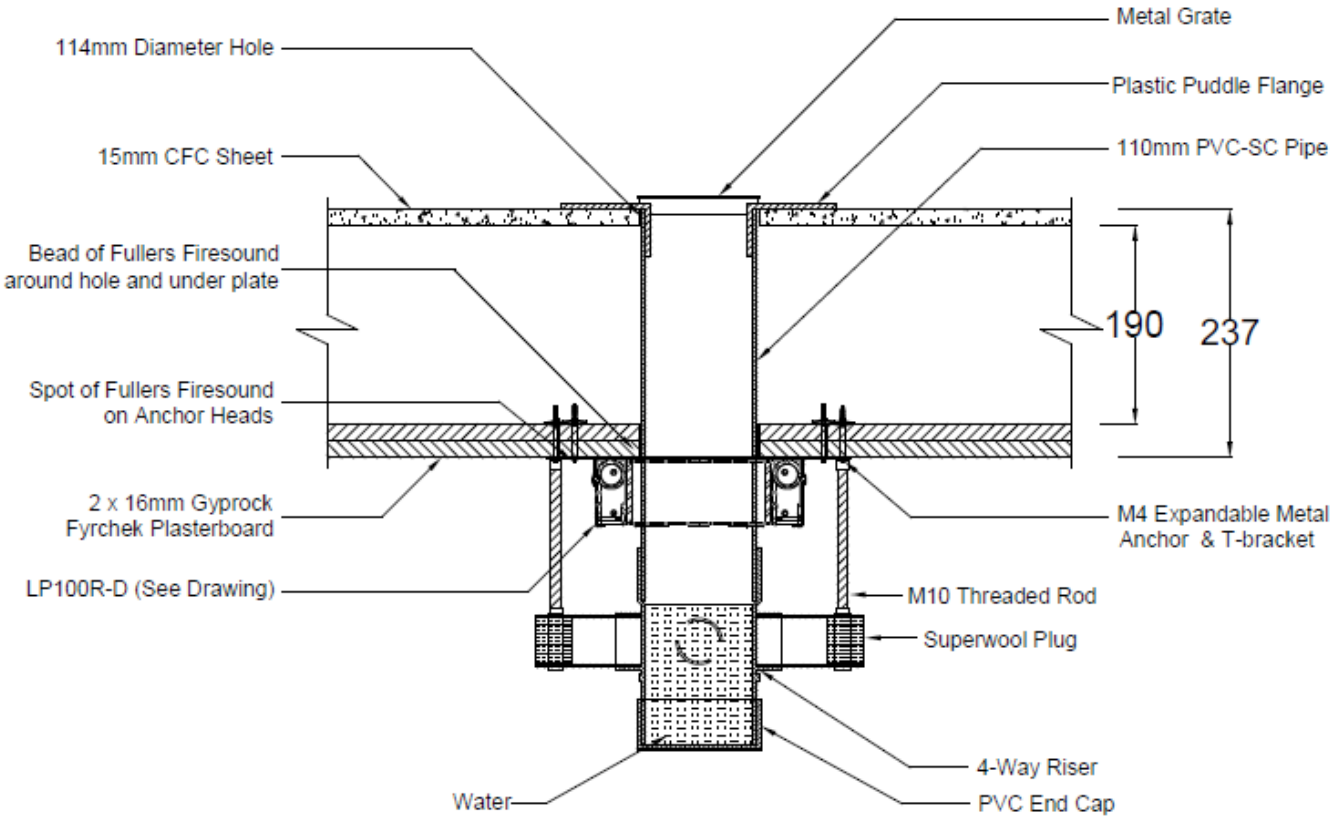
Date: 26 FEB 2020



Penetration	Collar Code	Pipe Type	Pipe Diameter (mm)	Fitting
1	LP100R-D	PVC-SC	100	N/A
2	LP100R-D	PVC-SC	100	N/A
3	LP50R	PVC	50	N/A
4	32R	Pex-a	20	N/A

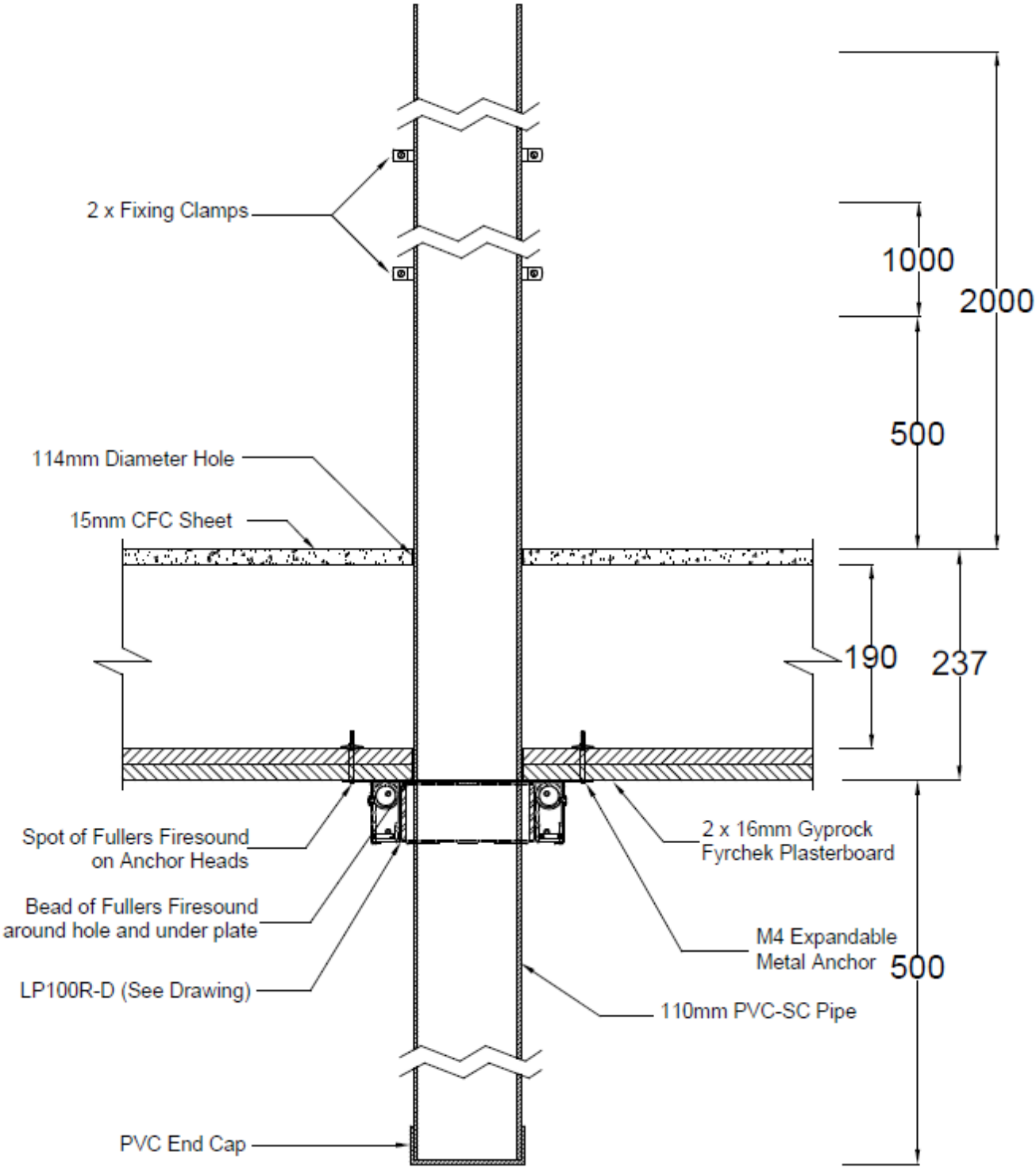
DRAWING TITLED "TEST SLAB S-20-B LAYOUT", DATED 26 FEBRUARY 2020 PROVIDED BY SNAP FIRE SYSTEMS PTY LTD.

Snap Fire Systems Pty Ltd
Specimen #1
100 PVC-SC Floorwaste & LP100R-D
Date: 11 MAR 2020



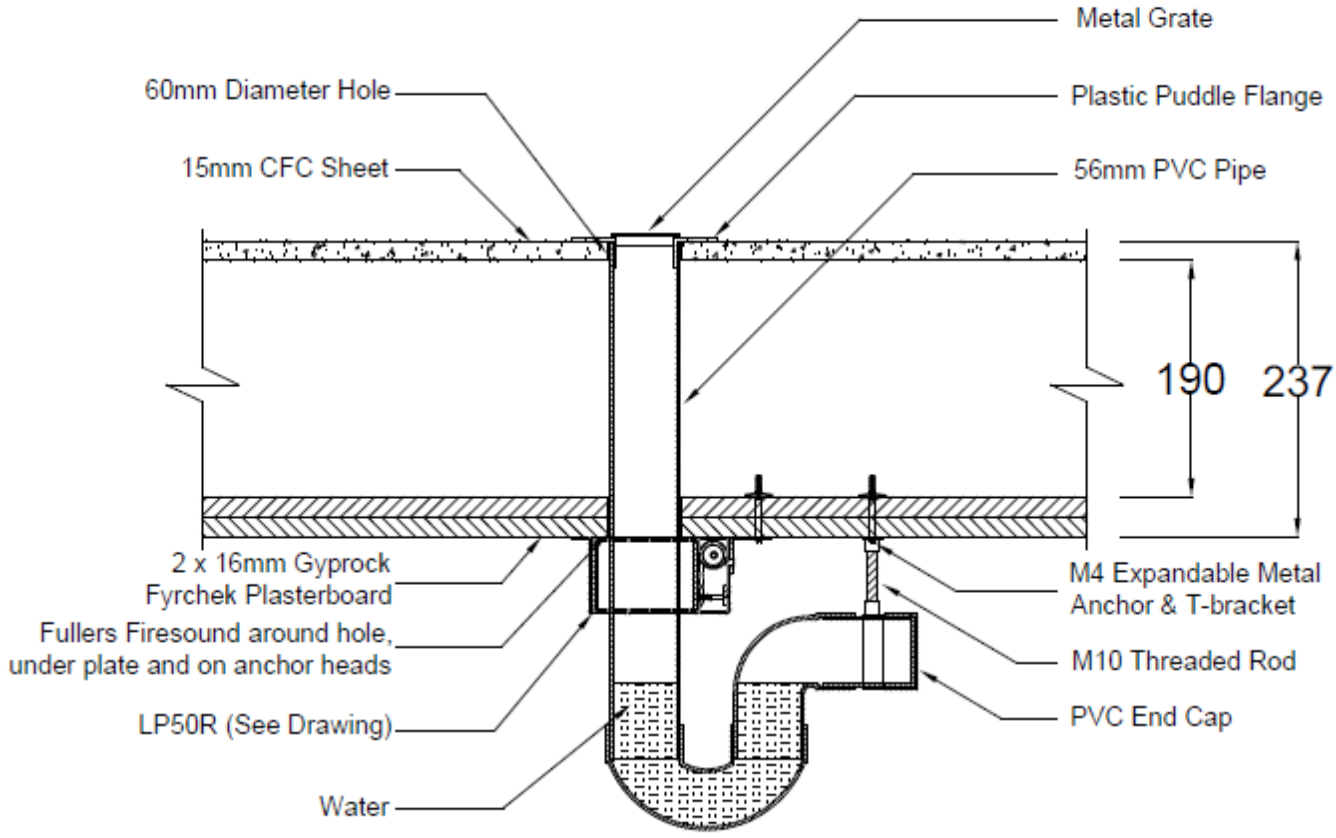
DRAWING TITLED "SPECIMEN #1 100 PVC-SC FLOORWASTE & LP100R-D", DATED 11 MARCH 2020, PROVIDED BY SNAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd
Specimen #2
100 PVC-SC Stack & LP100R-D
Date: 11 MAR 2020



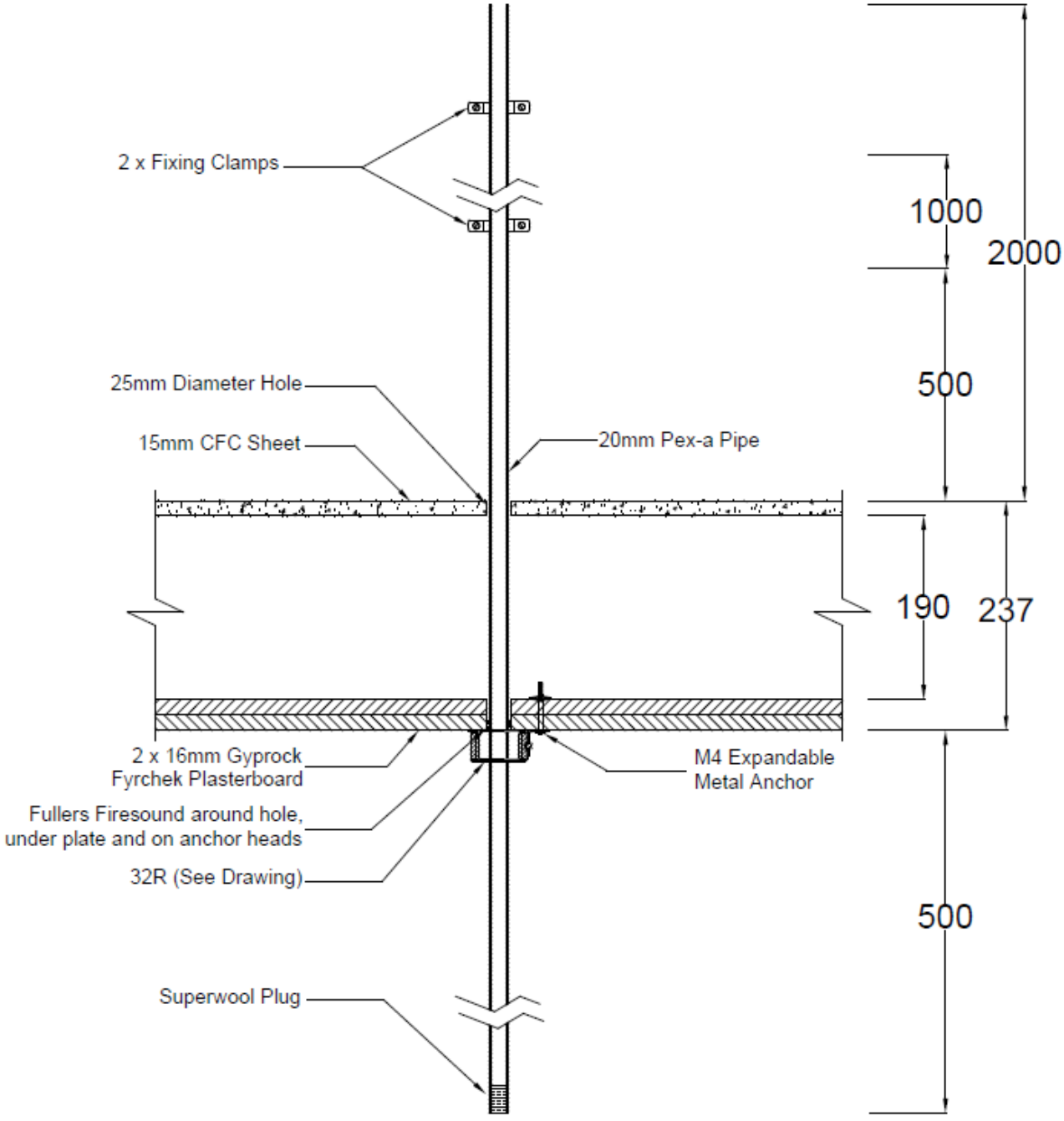
DRAWING TITLED "SPECIMEN #2 100 PVC-SC STACK & LP100R-D", DATED 11 MARCH 2020, PROVIDED BY SNAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd
Specimen #3
50 PVC Floorwaste & LP50R
Date: 25 FEB 2020



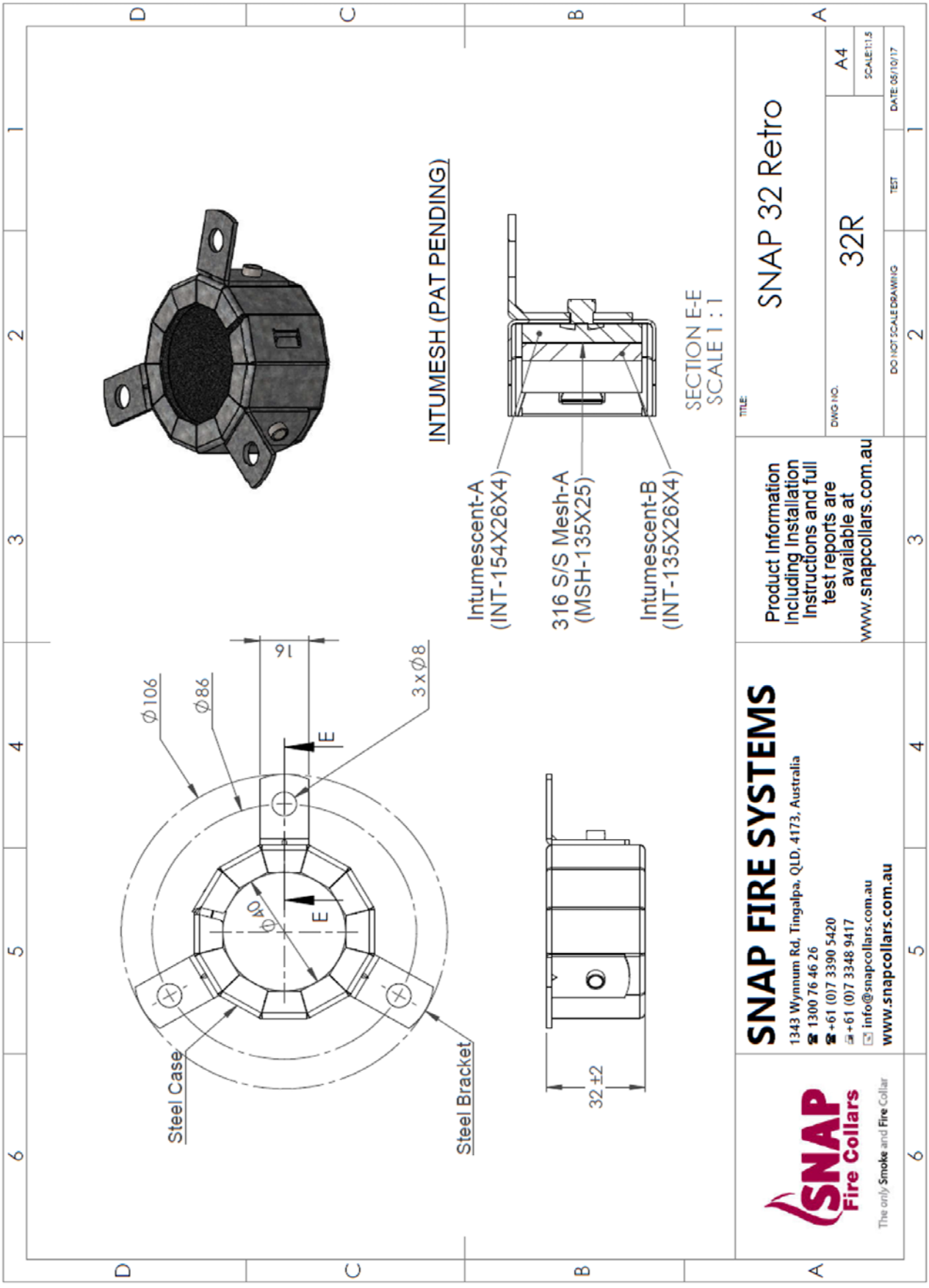
DRAWING TITLED "SPECIMEN #3 50 PVC FLOORWASTE & LP50R", DATED 25 FEBRUARY 2020, PROVIDED BY SNAP FIRE SYSTEMS PTY LTD.

Snap Fire Systems Pty Ltd
Specimen #4
20 Pex-a Stack & 32R
Date: 25 FEB 2020

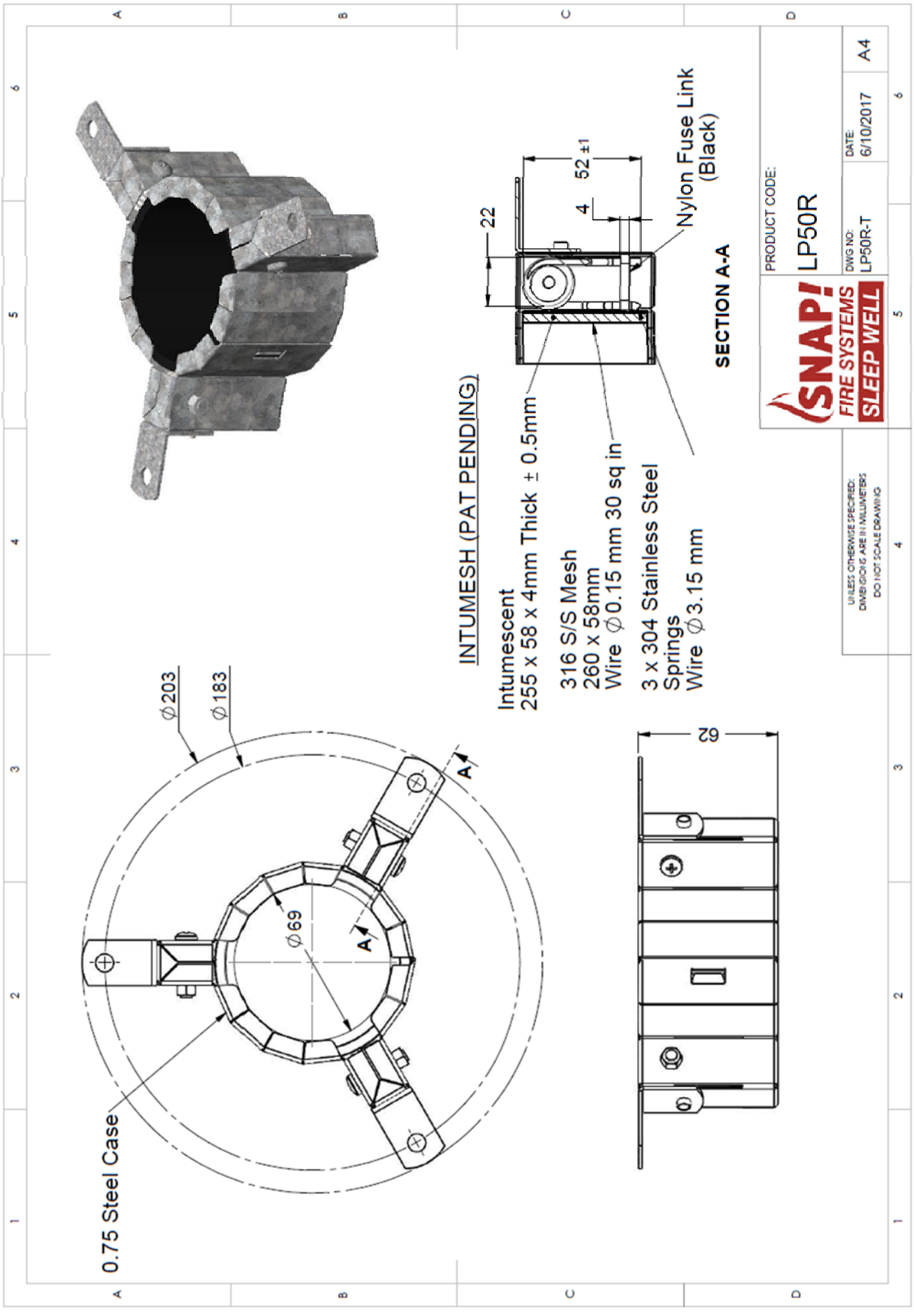


DRAWING TITLED "SPECIMEN #4 20 PEX-A STACK & 32R", DATED 25 FEBRUARY 2020, PROVIDED BY SNAP FIRE SYSTEMS PTY LTD

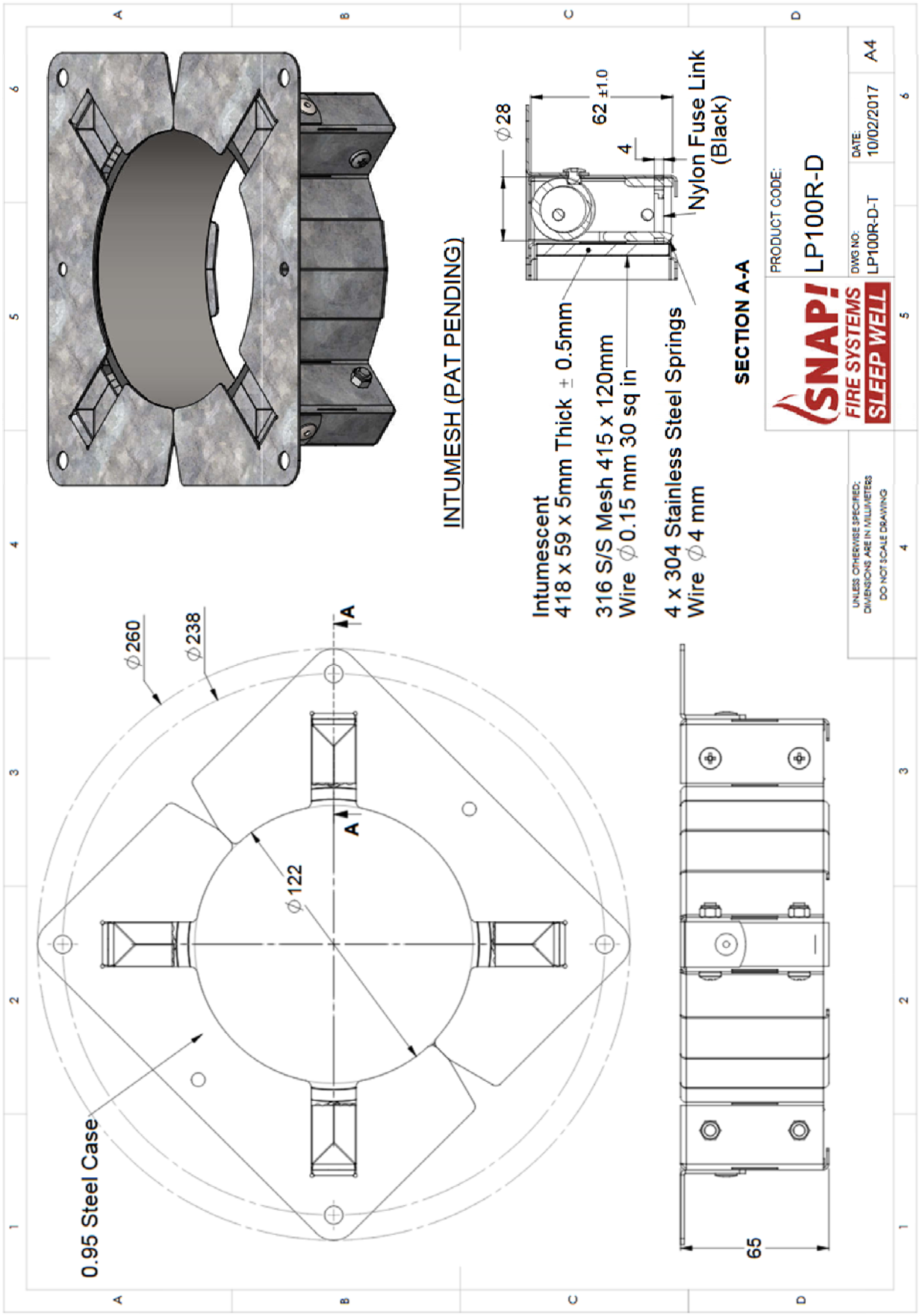
Appendix E – Specimen Drawings



DRAWING TITLE "SNAP 32 RETRO", DATED 5 OCTOBER 2017, BY SNAP FIRE SYSTEMS PTY LTD.



DRAWING NUMBERED LP50R-T, DATED 6 OCTOBER 2017, BY SNAP FIRE SYSTEMS PTY LTD.



DRAWING NUMBERED LP100R-D-T, DATED 10 FEBRUARY 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. 3396

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 QJd 4165

A full description of the test specimen and the complete test results are detailed in the Division's report numbered FSP 2097.

Product Name: SNAP LP100R-D Retrofit fire collar protecting a nominal 100-mm dia. Polyvinyl Chloride sandwich construction (PVC-SC) floor waste and PVC 4-way riser (Specimen 1)

Description: The specimen comprised an 1150-mm x 1150-mm x 237-mm thick plasterboard lined floor/ceiling system penetrated by a floor waste protected by retrofit Snap Fire Systems fire collars. The floor/ceiling system comprised, 35-mm x 190 mm Treated Pine floor joists supporting 2 layers of 16-mm thick CSR Fyrchek plasterboard on the exposed face and with one layer of 15-mm thick HardiePanel CFC floor sheeting (with a stated density of 27.25 kg/m2) on the top. The CSR 6134 floor/ceiling system as described in report by EWFA numbered 26162 has an established FRL of 90/90/90 and a Resistance to Incipient Spread of Fire (RISF) of 60 minutes. The SNAP Retrofit LP100R-D 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 with a mesh 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 collar was surface mounted around the pipe on the exposed face and fixed through 4 mounting brackets using 4 x M4 expandable metal anchors after applying a thin layer of Fullers Firesound mastic over the collar's flange plate and on the head of the fixings. The penetrating service comprised a 110.6-mm diameter Iplex PVC-SC pipe with a wall thickness of 3.41 mm fitted through the collar's sleeve. A 114-mm diameter opening was cut into the floor/ceiling linings and the collar fixed centrally over the hole. The annular gap around the pipe on the exposed side was sealed with a bead of Fullers Firesound mastic. The floor waste system was fitted with a chrome brass grate and PVC Puddle Flange. On the exposed side of the ceiling lining, a M10 threaded rod was connected to the penetrating pipe couplings, fixed to the plasterboard with two M4 expandable metal anchors and a T-bracket. On the exposed face, the 4-way riser was capped with PVC end cap. The floor waste was charged with water (600 mL) to the level shown in drawing titled "Specimen #1 100 PVC SC Floor waste & LP100R-D", dated 11 March 2020, 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 115 minutes
Insulation	-	no failure at 115 minutes
Incipient Spread of Fire	-	62 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/90/90.

The fire-resistance level (FRL) of the specimen is applicable when the system is exposed to fire from the same direction as tested. Incipient spread of fire is not considered in determination of FRL. The maximum FRL of any test specimen cannot exceed the FRL achieved by the system 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: 16 April 2020

Issued on the 11th day of May 2020 without alterations or additions.

Brett Roddy | Manager, Fire Testing and Assessments

This document is issued in accordance with NATA's accreditation requirements.
Accreditation No. 165 – Corporate Site No. 3625
Accredited for compliance with ISO/IEC 17025 - Testing

COPY OF CERTIFICATE OF TEST – NO. 3396

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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. 3397

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 2097.

Product Name: SNAP LP100R-D Retrofit fire collar protecting a nominal 100-mm diameter Polyvinyl Chloride sandwich construction (PVC-SC) pipe (Specimen 2)

Description: The specimen comprised an 1150-mm x 1150-mm x 237-mm thick plasterboard lined floor/ceiling system penetrated by a stack pipe protected by retrofit Snap Fire Systems fire collars. The floor/ceiling system comprised, 35-mm x 190 mm Treated Pine floor joists supporting 2 layers of 16-mm thick CSR Fyrchek plasterboard on the exposed face and with one layer of 15-mm thick HardiePanel CFC floor sheeting (with a stated density of 27.25 kg/m2) on the top. The CSR 6134 floor/ceiling system as described in report by EWFA numbered 26162 has an established FRL of 90/90/90 and a Resistance to Incipient Spread of Fire (RISF) of 60 minutes. The SNAP Retrofit LP100R-D 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 with a mesh 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 collar was surface mounted around the pipe on the exposed face and fixed through 4 mounting brackets using 4 x M4 expandable metal anchors after applying a thin layer of Fullers Firesound mastic over the collar's flange plate and on the head of the fixings. The penetrating service comprised a 110.6-mm outside diameter Iplex PVC-SC stack pipe with a wall thickness of 3.41-mm. The pipe penetrated the floor/ceiling system through a 114-mm diameter cut-out hole, projected vertically 2000-mm above the floor and 500-mm below into the furnace and was supported at 500 mm and 1500-mm above from the unexposed face of the floor. The annular gap around the pipe on the exposed side was sealed with a bead of Fullers Firesound mastic as shown in drawing titled "Specimen #2 100 PVC-SC Stack & LP100R-D", dated 11 March 2020, provided by Snap Fire Systems Pty Ltd. On the exposed face, the pipe was capped with PVC end cap.

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

Structural Adequacy	-	not applicable
Integrity	-	no failure at 115 minutes
Insulation	-	no failure at 115 minutes
Incipient Spread of Fire	-	82 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/90/90.

The fire-resistance level (FRL) of the specimen is applicable when the system is exposed to fire from the same direction as tested. Incipient spread of fire is not considered in determination of FRL. The maximum FRL of any test specimen cannot exceed the FRL achieved by the system 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: 16 April 2020

Issued on the 11th day of May 2020 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. 3398

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 2097.

Product Name: SNAP LP50R Retrofit fire collar protecting a nominal 50-mm diameter Polyvinyl Chloride (PVC) floor waste and P-trap (Specimen 3)

Description: The specimen comprised an 1150-mm x 1150-mm x 237-mm thick plasterboard lined floor/ceiling system penetrated by a floor waste and P-trap protected by retrofit Snap Fire Systems fire collars. The floor/ceiling system comprised, 35-mm x 190 mm Treated Pine floor joists supporting 2 layers of 16-mm thick CSR Fyrchek plasterboard on the exposed face and with one layer of 15-mm thick HardiePanel CFC floor sheeting (with a stated density of 27.25 kg/m2) on the top. The CSR 6134 floor/ceiling system as described in report by EWFA numbered 26162 has an established FRL of 90/90/90 and a Resistance to Incipient Spread of Fire (RISF) of 60 minutes. The SNAP Retrofit LP50R fire collar comprised a 0.75-mm steel casing with a 69-mm inner diameter and a 203-mm diameter base flange. The 62-mm high collar casing incorporated a closing mechanism which comprised a 255-mm x 58-mm x 4-mm thick Intumesh intumescent wrap lined within the internal circumference of the collar casing. The closing mechanism comprised three stainless steel springs, with black nylon fuse links and a 260-mm x 58-mm stainless steel mesh, as shown in drawing number "LP50R-T" dated 6 October 2017, by Snap Fire Systems Pty Ltd. The Snap collar was surface mounted around the pipe on the exposed face and fixed through 3 x M4 expandable metal anchors after applying a thin layer of Fullers Firesound mastic over the collar's flange plate and on the heads head of the fixings.The penetrating service comprised a 56.3-mm diameter Iplex PVC pipe with a wall thickness of 2.25 mm fitted through the collar's sleeve. A 60-mm diameter opening was cut into the floor/ceiling linings and the collar fixed centrally over the hole. The annular gap around the pipe on the exposed side was sealed with a bead of Fullers Firesound mastic. The floor waste system was fitted with a chrome brass grate and PVC Puddle Flange. On the exposed side of the ceiling lining, a M10 threaded rod was connected to the penetrating pipe couplings, fixed to the plasterboard with 4 x 8 Hollow wall anchors and a T-bracket. On the exposed face, the P-trap was capped with PVC end cap. The floor waste was charged with water to the level shown in drawing titled "Specimen #3 50 PVC Floor waste & LP50R", dated 25 February 2020, 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 115 minutes
Insulation	-	no failure at 115 minutes
Incipient Spread of Fire	-	69 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/90/90.

The fire-resistance level (FRL) of the specimen is applicable when the system is exposed to fire from the same direction as tested. Incipient spread of fire is not considered in determination of FRL. The maximum FRL of any test specimen cannot exceed the FRL achieved by the system 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: 16 April 2020

Issued on the 11th day of May 2020 without alterations or additions.

Brett Roddy | Manager, Fire Testing and Assessments

This document is issued in accordance with NATA's accreditation requirements.
Accreditation No. 165 – Corporate Site No. 3625
Accredited for compliance with ISO/IEC 17025 - Testing

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Certificate of Test

No. 3399

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 2097.

Product Name: SNAP 32R Retrofit fire collar protecting a nominal 20-mm diameter PE-Xa Rehau Rautitan pipe (Specimen 4)

Description: The specimen comprised an 1150-mm x 1150-mm x 237-mm thick plasterboard lined floor/ceiling system penetrated by a stack pipe protected by retrofit Snap Fire Systems fire collars. The floor/ceiling system comprised, 35-mm x 190 mm Treated Pine floor joists supporting 2 layers of 16-mm thick CSR Fyrchek plasterboard on the exposed face and with one layer of 15-mm thick HardiePanel CFC floor sheeting (with a stated density of 27.25 kg/m2) on the top. The CSR 6134 floor/ceiling system as described in report by EWFA numbered 26162 has an established FRL of 90/90/90 and a Resistance to Incipient Spread of Fire (RISF) of 60 minutes. The 32R Retrofit fire collar comprised a 0.75-mm steel casing with a 40-mm inner diameter and a 106-mm diameter base flange. The 32-mm high collar casing incorporated a closing mechanism that comprised two soft Intumesh intumescent strips lined within the internal circumference of the collar casing. The inner and outer strips were 4-mm thick x 26-mm wide x 135-mm long and 4-mm thick x 26-mm wide x 154-mm long respectively. Between the strips was a layer of 316 stainless steel mesh 135 mm long x 25-mm wide with wire mesh diameter of 0.15- mm, as shown in drawing titled "SNAP 32 Retro", dated 5 October 2017, by Snap Fire Systems Pty Ltd. The Snap collar was surface mounted around the pipe on the exposed face and fixed through 3 x M4 expandable metal anchors after applying a thin layer of Fullers Firesound mastic over the collar's flange plate and on the heads head of the fixings. The penetrating service comprised a 20-mm outside PE-Xa Rehau Rautitan stack pipe with a wall thickness of 3.17-mm. The pipe penetrated the floor/ceiling system through a 25-mm diameter cut-out hole, projected vertically 2000 mm above the floor and 500-mm below into the furnace and was supported at 500 mm and 1500-mm above from the unexposed face of the floor. The annular gap around the pipe on the exposed side was sealed with a bead of Fullers Firesound mastic as shown in drawing titled "Specimen #4 20 Pex-a Stack & 32R", dated 25 February 2020, provided by Snap Fire Systems Pty Ltd. On the exposed face, the pipe was plugged with ceramic fibre.

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

Structural Adequacy	-	not applicable
Integrity	-	no failure at 115 minutes
Insulation	-	no failure at 115 minutes
Incipient Spread of Fire	-	71 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/90/90.

The fire-resistance level (FRL) of the specimen is applicable when the system is exposed to fire from the same direction as tested. Incipient spread of fire is not considered in determination of FRL. The maximum FRL of any test specimen cannot exceed the FRL achieved by the system 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: 16 April 2020

Issued on the 11th day of May 2020 without alterations or additions.

B. Roddy

Brett Roddy | Manager, Fire Testing and Assessments

COPY OF CERTIFICATE OF TEST – NO. 3399

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 (Incorporating Amendment No.1) Reconfirmed 2016	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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