Fire-resistance test on retrofit fire collars protecting a plasterboard wall penetrated by services

Test Report

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Sponsored Investigation No. FSP 2216

1 Introduction

1.1 Identification of specimen

The sponsor identified the specimen as retrofit fire collars protecting a steel framed plasterboard wall penetrated by three (3) unplasticized polyvinyl chloride (uPVC) pipes, four (4) unplasticized polyvinyl chloride (uPVC) electrical conduits and a chlorinated polyvinyl chloride (C-PVC) pipe.

1.2 Sponsor

IG6 Pty Ltd as trustee for the IG6 IP Trust
1343 Wynnum Road
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1.3 Manufacturer

Snap Fire Systems Pty Ltd
1343 Wynnum Road
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Australia

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 5112/4604

1.7 Test date

The fire-resistance test was conducted on 15 July 2021.

2 Description of specimen

2.1 General

The plasterboard wall was constructed in accordance with Boral Firestop system SB60.1 with an established fire resistance level (FRL) of -/60/60 as detailed in the document titled "Plasterboard Fire and Acoustic Systems Australia", revision UB1231-SYS 12/18, by USG Boral Building Products Pty Ltd.

Construction comprised 64-mm x 0.55-mm steel studs installed at nominally 600-mm centres, lined on each side with a single layer of 13-mm thick Boral Firestop plasterboard sheets. The plasterboard sheeting was screw fixed to the steel studs using 6-gauge x 32-mm long plasterboard screws at nominally 200-mm centres. The wall cavity was filled with a single layer of 50-mm thick Acoustigard 11 insulation.

For the purpose of the test, the penetrations are referenced as Specimen 1, 2, 3, 4, 5, 6, 7, and 8. 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 1260 'PVC-U pipes and fittings for drain, waste and vent application'.
- AS/NZS 1477:2017: 'PVC pipes and fittings for pressure applications'.
- AS/NZS 2053.1:2001 'Conduits and fittings for electrical installations general requirements' and
- AS/NZS 4859.1:2002 'Materials for the thermal insulation of buildings'.

<u>Specimen 1 - SNAP 32R Retrofit fire collars protecting a nominal 25 (24.9-mm OD) uPVC electrical conduit penetrating a 29-mm diameter aperture.</u>

The SNAP 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 which comprised two soft Intumesh intumescent strips lined within the internal circumference of the collar. 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. One fire collar was fixed to each side of the plasterboard wall in a back-to-back configuration using three M4 expandable steel hollow wall anchors with stainless steel washers.

The penetrating service comprised a Keyplas uPVC conduit with an outside diameter of 24.9-mm and wall thickness of 1.9-mm, fitted through the collar's sleeve. The conduit penetrated the wall through a 29-mm diameter cut-out hole as shown in drawing titled 'Specimen #1, 25 PVC Conduit Stack & 32R', dated 24 February 2021, by Snap Fire Systems Pty Ltd.

The conduit projected horizontally, 2000-mm away from the unexposed face of the wall and approximately 500-mm into the furnace chamber. The conduit was supported at nominally 500-mm and 1500-mm from the unexposed face of the plasterboard wall. The conduit was open on the unexposed end and plugged with ceramic fibre (Superwool) on the exposed end.

Specimen 2 - SNAP MS70R Multi Service Retrofit fire collars protecting a nominal 32 (42.3-mm OD) PN12 uPVC pipe with 19-mm thick Armaflex fire-rated lagging penetrating a 70-mm diameter aperture.

The SNAP MS70R Multi Service Retrofit fire collar comprised a 0.75-mm thick steel casing with a 69-mm inner diameter and a 0.95-mm thick steel base flange with a 162-mm diameter. The 95-mm high collar casing incorporated a 4-mm thick x 90-mm wide x 250-mm long soft Intumesh intumescent wrap lined within the internal circumference of the collar casing. The closing mechanism comprised three stainless steel springs, a nylon fuse link and a 258-mm long x 88-mm wide 316 stainless steel mesh located around the intumescent strip, as shown in drawing titled 'SNAP 70 Multi Service Retro', dated 23 September 2019, by Snap Fire Systems Pty Ltd. One collar was fixed to each side of the plasterboard wall in a back-to-back configuration using three M4 expandable steel hollow wall anchors with stainless steel washers.

The penetrating service comprised a Iplex PN12 uPVC 43.2-mm outside diameter pipe, with a wall thickness of 2.2-mm, lagged with 19-mm thick Armaflex FRV nitrile rubber. The lagged pipe was fitted through the collar's sleeve and penetrated the wall through a 70-mm diameter cut-out hole as shown in drawing titled 'Specimen #2 32 PN12 PVC Pipe with 19mm F/R Lagging & MS70R ', dated 24 February 2021, by Snap Fire Systems Pty Ltd.

The lagged pipe projected horizontally, 2000-mm away from the unexposed face of the wall and approximately 500-mm into the furnace chamber. The lagged pipe was supported at nominally 500-mm and 1500-mm from the unexposed face of the plasterboard wall. The pipe was open on the unexposed end and plugged with ceramic fibre (Superwool) on the exposed end.

Specimen 3 - SNAP 32R Retrofit fire collars protecting a 25-mm uPVC electrical conduit incorporating a 2.5- mm^2 3C+E power cable protecting a 29-mm diameter aperture.

The SNAP 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 which comprised two soft Intumesh intumescent strips lined within the internal circumference of the collar. 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. One collar was fixed to each side of the plasterboard wall in a back-to-back configuration using three M4 expandable steel hollow wall anchors with stainless steel washers.

The penetrating service comprised a Keyplas PVC conduit with a 24.9-mm outside diameter and a wall thickness of 1.9-mm. The conduit incorporated Electra Cables 2.5 mm^2, ordinary duty 3C+E power cable located. The conduit and cable penetrated the wall through a 29-mm diameter cut-out hole as shown in drawing titled 'Specimen #3, 25 PVC Conduit with 2.5-mm^2 3C+E cable Stack & 32R', dated 23 February 2021, by Snap Fire Systems Pty Ltd.

The conduit and cable projected horizontally, 2000-mm away from the unexposed face of the wall and approximately 500-mm into the furnace chamber. The conduit was supported at nominally 500-mm and 1500-mm from the unexposed face of the plasterboard wall. The conduit was open on the unexposed end and plugged with ceramic fibre (Superwool) on the exposed end.

Specimen 4 - SNAP 50R Retrofit fire collars protecting a nominal 40 (43.2-mm OD) uPVC pipe incorporating a coupling inside the collar penetrating a 44-mm diameter aperture.

The SNAP Retrofit 50R fire collar comprised a 0.75-mm steel casing with a 62-mm inner diameter and a 147-mm diameter base flange. The 47-mm high collar casing incorporated a closing mechanism which comprised two soft Intumesh intumescent wraps lined within the internal circumference of the collar. Intumescent A was 4-mm thick x 43-mm wide x 220-mm long, and Intumescent B was 4-mm thick x 43-mm wide x 200-mm long. Between the strips was a layer of 316 grade stainless steel mesh 210-mm long x 42-mm wide with a wire mesh diameter of 0.15-mm, as shown in drawing titled "SNAP 50 Retro", dated 18 January 2019, by Snap Fire Systems Pty Ltd. One collar was fixed to each side of the plasterboard wall in a back-to-back configuration using three M4 expandable steel hollow wall anchors with stainless steel washers.

The penetrating service comprised a Iplex DWV uPVC 43.24-mm outside diameter pipe, with a wall thickness of 2.22-mm and a PVC coupling* fitted through the collar's sleeve on the exposed face. The pipe penetrated the wall through a 44-mm diameter cut-out hole as shown in drawing titled 'Specimen #4, 40 PVC Stack + Fitting & 50R', dated 24 February 2021, by Snap Fire Systems Pty Ltd.

The pipe projected horizontally, 2000-mm away from the unexposed face of the wall and approximately 500-mm into the furnace chamber. The pipe was supported at nominally 500-mm and 1500-mm from the unexposed face of the plasterboard wall. The pipe was open on the unexposed end and capped with a DWV uPVC endcap on the exposed end.

* The specimen was asymmetric in construction and has been tested with the coupling inside the collar on the exposed face, which is the more onerous orientation, or "weaker direction" as required in clause 2.9.7 of AS 1530.4-2014.

Specimen 5 - SNAP 50R Retrofit fire collars protecting a nominal 50 (60.4-mm OD) PN12 uPVC pipe penetrating a 64-mm diameter aperture.

The SNAP Retrofit 50R fire collar comprised a 0.75-mm steel casing with a 62-mm inner diameter and a 147-mm diameter base flange. The 47-mm high collar casing incorporated a closing mechanism which comprised two soft Intumesh intumescent wraps lined within the internal circumference of the collar. Intumescent A was 4-mm thick x 43-mm wide x 220-mm long, and Intumescent B was 4-mm thick x 43-mm wide x 200-mm long. Between the strips was a layer of 316 grade stainless steel mesh 210-mm long x 42-mm wide with a wire mesh diameter of 0.15-mm, as shown in drawing titled "SNAP 50 Retro", dated 18 January 2019, by Snap Fire Systems Pty Ltd. One collar was fixed to each side of the plasterboard wall in a back-to-back configuration using three M4 expandable steel hollow wall anchors with stainless steel washers.

The penetrating service comprised a Iplex PN12 uPVC 60.4-mm outside diameter pipe, with a wall thickness of 3.28-mm fitted through the collar's sleeve and penetrated the wall through a 64-mm diameter cut-out hole as shown in drawing titled 'Specimen #5, 50 PN12 PVC Stack & 50R', dated 24 February 2021, by Snap Fire Systems Pty Ltd.

The pipe projected horizontally, 2000-mm away from the unexposed face of the wall and approximately 500-mm into the furnace chamber. The pipe was supported at nominally 500-mm and 1500-mm from the unexposed face of the plasterboard wall. The pipe was open on the unexposed end and plugged with ceramic fibre (Superwool) on the exposed end.

Specimen 6 - SNAP 32R Retrofit fire collars protecting a 25-mm uPVC conduit incorporating optical fibre cables penetrating a 29-mm diameter aperture.

The SNAP 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 which comprised two soft Intumesh intumescent strips lined within the internal circumference of the collar. 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. One collar was fixed to each side of the plasterboard wall in a back-to-back configuration using three M4 expandable steel hollow wall anchors with stainless steel washers.

The penetrating service comprised a Keyplas uPVC 24.9-mm outside diameter conduit with a wall thickness of 1.9-mm incorporating three Garland optical fibre cables 1x 12F and 2 x 6F optical fibre cables located inside the conduit. The conduit and cables penetrated the wall through a 29-mm diameter cut-out hole as shown in drawing titled 'Specimen #6, 25 PVC Conduit with Fibre Optic Cables Stack & 32R', dated 23 February 2021, by Snap Fire Systems Pty Ltd. Both the conduit and cables projected horizontally, 2000-mm away from the unexposed face of the wall and approximately 500 mm into the furnace chamber.

The conduit was supported at nominally 500-mm and 1500-mm from the unexposed face of the plasterboard wall. The conduit was open on the unexposed end and plugged with ceramic fibre (Superwool) on the exposed end.

Specimen 7 - SNAP 32R Retrofit fire collars protecting a 25-mm uPVC conduit incorporating Category 7 network cables penetrating a 29-mm diameter aperture.

The SNAP 32R Retrofit 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 which comprised two soft Intumesh intumescent strips lined within the internal circumference of the collar. 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. One collar was fixed to each side of the plasterboard wall in a back-to-back configuration using three M4 expandable steel hollow wall anchors with stainless steel washers.

The penetrating service comprised a Keyplas uPVC 24.9-mm outside diameter conduit with a wall thickness of 1.9-mm incorporating three Belden Category 7 network cables located inside the conduit. The conduit and cables penetrated the wall through a 29-mm diameter cut-out hole as shown in drawing titled 'Specimen #7, 25 PVC Conduit with Category 7 Cables Stack & 32R', dated 23 February 2021, by Snap Fire Systems Pty Ltd. The both the conduit and cables projected horizontally, 2000-mm away from the unexposed face of the wall and approximately 500 mm into the furnace chamber.

The conduit was supported at nominally 500-mm and 1500-mm from the unexposed face of the plasterboard wall. The conduit was open on the unexposed end and plugged with ceramic fibre (Superwool) on the exposed end.

Specimen 8 - SNAP 50R Retrofit fire collars protecting a nominal 2-inch (60.5-mm OD) C-PVC pipe penetrating a 64-mm diameter aperture.

The SNAP Retrofit 50R fire collar comprised a 0.75-mm steel casing with a 62-mm inner diameter and a 147-mm diameter base flange. The 47-mm high collar casing incorporated a closing mechanism which comprised two soft Intumesh intumescent wraps lined within the internal circumference of the collar. Intumescent A was 4-mm thick x 43-mm wide x 220-mm long, and Intumescent B was 4-mm thick x 43-mm wide x 200-mm long. Between the strips was a layer of 316 grade stainless steel mesh 210-mm long x 42-mm wide with a wire mesh diameter of 0.15-mm, as shown in drawing titled "SNAP 50 Retro", dated 18 January 2019, by Snap Fire Systems Pty Ltd. One collar was fixed to each side of the plasterboard wall in a back-to-back configuration using three M4 expandable steel hollow wall anchors with stainless steel washers.

The penetrating service comprised a Fesco 2-inch C-PVC 60.5-mm outside diameter pipe, with a wall thickness of 4.98-mm fitted through the collar's sleeve and penetrated the wall through a 64-mm diameter cut-out hole as shown in drawing titled 'Specimen #8, 2in C-PVC Stack & 50R', dated 1 March 2021, by Snap Fire Systems Pty Ltd. The pipe projected horizontally, 2000-mm away from the unexposed face of the wall and approximately 500-mm into the furnace chamber.

The pipe was supported at nominally 500-mm and 1500-mm from the unexposed face of the plasterboard wall. The pipe was open on the unexposed end and plugged with ceramic fibre (Superwool) on the exposed end.

2.2 Dimensions

The plasterboard wall was nominally 1150-mm wide x 1150-mm high x 90-mm thick.

2.3 Orientation

The plasterboard wall was placed vertically against the furnace chamber and subjected to fire exposure from one side only.

2.4 Conditioning

The specimen was delivered on 25 May 2021 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 wall construction and specimen installation was organised by the sponsor. CSIRO was not involved in the selection of the materials.

3 Documentation

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

Documents titled 'Plasterboard Fire and Acoustic Systems Australia', revision UB1231-SYS 12/18, by USG Boral Building Products Pty Ltd.

Drawing titled 'Test Wall W-21-G Layout', dated 12 February 2021, by Snap Fire Systems Pty Ltd.

Drawing titled 'Specimen #1, 25 PVC Conduit Stack & 32R', dated 24 February 2021, by Snap Fire Systems Pty Ltd.

Drawing titled 'Specimen #2 32 PN12 PVC Pipe with 19mm F/R Lagging & MS70R', dated 24 February 2021, by Snap Fire Systems Pty Ltd.

Drawing titled 'Specimen #3, 25 PVC Conduit with 2.5-mm^2 3C+E cable Stack & 32R', dated 23 February 2021, by Snap Fire Systems Pty Ltd.

Drawing titled 'Specimen #4, 40 PVC Stack + Fitting & 50R', dated 24 February 2021, by Snap Fire Systems Pty Ltd.

Drawing titled 'Specimen #5, 50 PN12 PVC Stack & 50R', dated 24 February 2021, by Snap Fire Systems Pty Ltd.

Drawing titled 'Specimen #6, 25 PVC Conduit with Fibre Optic Cables Stack & 32R', dated 23 February 2021, by Snap Fire Systems Pty Ltd.

Drawing titled 'Specimen #7, 25 PVC Conduit with Category 7 Cables Stack & 32R', dated 23 February 2021, by Snap Fire Systems Pty Ltd.

Drawing titled 'Specimen #8, 2in C-PVC Stack & 50R', dated 1 March 2021, by Snap Fire Systems Pty Ltd.
Drawing title 'SNAP 32 Retro', dated 5 October 2017, by Snap Fire Systems Pty Ltd.

Drawing titled 'SNAP 70 Multi Service Retro', dated 23 September 2019, by Snap Fire Systems Pty Ltd.

Drawing title 'SNAP 50 Retro', dated 18 January 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 17°C at the commencement of the test.

6 Departure from standard

There were no departures from the requirements of AS 1530.4-2014.

7 Termination of test

The test was terminated at 91 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 minutes -	Smoke is being emitted between the collar and the pipe of Specimens 1 and 3. Smoke has started to flue from the end of the pipe of Specimens 1 & 4.
2 minutes -	Smoke has ceased fluing from the pipe of Specimen 1.
3 minutes -	Smoke has started to flue from the end of the pipe of Specimens 2, 5 and 8.
4 minutes -	Smoke is being emitted between the collar and the pipe of Specimens 6 and 7. Smoke has ceased fluing from the collar of Specimen 3.
5 minutes -	Smoke has ceased fluing from the end of the pipe of Specimens 2, 4 and 5.
6 minutes -	Smoke has ceased fluing from the collar of Specimens 6 and 7.
7 minutes -	Smoke has ceased fluing from the pipe of Specimen 8.
18 minutes -	Smoke has resumed fluing between the collar and pipe of specimens 1, 3, 6 and 7.
29 minutes -	Light smoke is being emitted from the pipes of Specimens 5, 7 and 8.
40 minutes -	Smoke is being emitted between the collar and the pipe of Specimens 2 and 8.
42 minutes -	Smoke staining has formed on the plasterboard at the base of Specimens 5 and 8.
44 minutes -	Light smoke has resumed fluing at the end of the pipe of Specimens 1 and 3.
47 minutes -	The Armaflex lagging adjacent to the collar of Specimen 2 has started to swell.
55 minutes -	The level of smoke emitting from the collars of Specimen 2 has intensified.
58 minutes -	Light smoke has resumed fluing at the end of the pipe of Specimen 4.
59 minutes -	A loud click was emitted from Specimen 2, indicating the release of the lower left fusible link of the MS70 collar.
63 minutes -	The level of smoke emitting from the collar of Specimen 2 has reduced substantially.
71 minutes -	Insulation failure of Specimen 2 – maximum temperature rise of 180K is exceeded on the plasterboard wall 25-mm above the collar of Specimen 2. The plasterboard wall to has started to discolour.
72 minutes -	The plasterboard wall around the base of Specimen 2 has started to discolour and char.
74 minutes -	Insulation failure of Specimen 7 – maximum temperature rise of 180K is exceeded on the plasterboard wall 25-mm above the collar of Specimen 7.
77 minutes -	The charring on the plasterboard wall around Specimen 2 has intensified.
78 minutes -	Insulation failure of Specimen 1 – maximum temperature rise of 180K is exceeded on the plasterboard wall 25-mm below the collar of Specimen 1.
79 minutes -	Smoke fluing from end of the pipe of Specimens 1, 3, 4, 5, 6, 7 and 8 has intensified.

80 minutes - Insulation failure of Specimen 8 – maximum temperature rise of 180K is exceeded on the plasterboard wall 25-mm above the collar of Specimen 8.

83 minutes - Insulation failure of Specimen 6 – maximum temperature rise of 180K is exceeded on the plasterboard wall 25-mm above the collar of Specimen 6.

84 minutes - The pipes inside the collars of Specimens 1, 3, 4, 5, 6 and 7 have distorted.

85 minutes - Insulation failure of Specimens 3 and 4 – maximum temperature rise of 180K is exceeded on the plasterboard wall, 25-mm from their respective collars.

89 minutes - Insulation failure of Specimen 5 – maximum temperature rise of 180K is exceeded on the plasterboard wall 25-mm above the collar of Specimen 5.

91 minutes - Test terminated.

8.2 Furnace temperature

Figure 1 shows the standard curves of temperature versus time for heating the furnace chamber and the actual curves of average and maximum temperature versus time recorded during the heating period.

8.3 Furnace severity

Figure 2 shows the curve of furnace severity versus time during the heating period.

8.4 Specimen temperature

Figure 3 shows the curve of temperature versus time associated with Specimen 1.

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

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

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

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

Figure 8 shows the curve of temperature versus time associated with Specimen 6.

Figure 9 shows the curve of temperature versus time associated with Specimen 7.

Figure 10 shows the curve of temperature versus time associated with Specimen 8.

8.5 Performance

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

Specimen 1 - SNAP 32R Retrofit fire collars protecting a nominal 25 (24.9-mm OD) uPVC electrical conduit penetrating a 29-mm diameter aperture.

Structural adequacy	-	not applicable
Integrity	-	no failure at 91 minutes
Insulation	-	78 minutes

Specimen 2 - SNAP MS70R Multi Service Retrofit fire collars protecting a nominal 32 (42.2-mm OD) PN12 uPVC pipe with 19-mm thick Armaflex fire-rated lagging penetrating a 70-mm diameter aperture

Structural adequacy	-	not applicable
Integrity	-	no failure at 91 minutes
Insulation	-	71 minutes

Specimen 3 - SNAP 32R Retrofit fire collars protecting a 25-mm uPVC electrical conduit incorporating a 2.5 mm^2 3C+E power cable protecting a 29-mm diameter aperture

Structural adequacy	-	not applicable
Integrity	-	no failure at 91 minutes
Insulation	-	85 minutes

Specimen 4 - SNAP 50R Retrofit fire collars protecting a nominal 40 (43.2-mm OD) uPVC pipe incorporating a coupling inside the collar penetrating a 44-mm diameter aperture

Structural adequacy	-	not applicable
Integrity	-	no failure at 91 minutes
Insulation	-	85 minutes

Specimen 5 - SNAP 50R Retrofit fire collars protecting a nominal 50 (60.4-mm OD) PN12 uPVC pipe penetrating a 64-mm diameter aperture

Structural adequacy	-	not applicable
Integrity	-	no failure at 91 minutes
Insulation	-	89 minutes

Specimen 6 - SNAP 32R Retrofit fire collars protecting a 25-mm uPVC conduit incorporating optical fibre cables penetrating a 29-mm diameter aperture

Structural adequacy	-	not applicable
Integrity	-	no failure at 91 minutes
Insulation	-	83 minutes

Specimen 7 - SNAP 32R Retrofit fire collars protecting a 25-mm uPVC conduit incorporating Category 7 network cables penetrating a 29-mm diameter aperture

Structural adequacy	-	not applicable
Integrity	-	no failure at 91 minutes
Insulation	-	74 minutes

Specimen 8 - SNAP 50R Retrofit fire collars protecting a nominal 2-inch (60.5-mm OD) C-PVC pipe penetrating a 64-mm diameter aperture

Structural adequacy	-	not applicable
Integrity	-	no failure at 91 minutes
Insulation	-	80 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, 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	-/60/60
Specimen 2	-/60/60
Specimen 3	-/60/60
Specimen 4	-/60/60
Specimen 5	-/60/60
Specimen 6	-/60/60
Specimen 7	-/60/60
Specimen 8	-/60/60

The fire-resistance level is applicable when the system is exposed to fire from either direction.

The test was conducted on a wall system with an established FRL of -/60/60. The maximum FRL of any test specimen cannot exceed the FRL achieved by the wall 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.

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

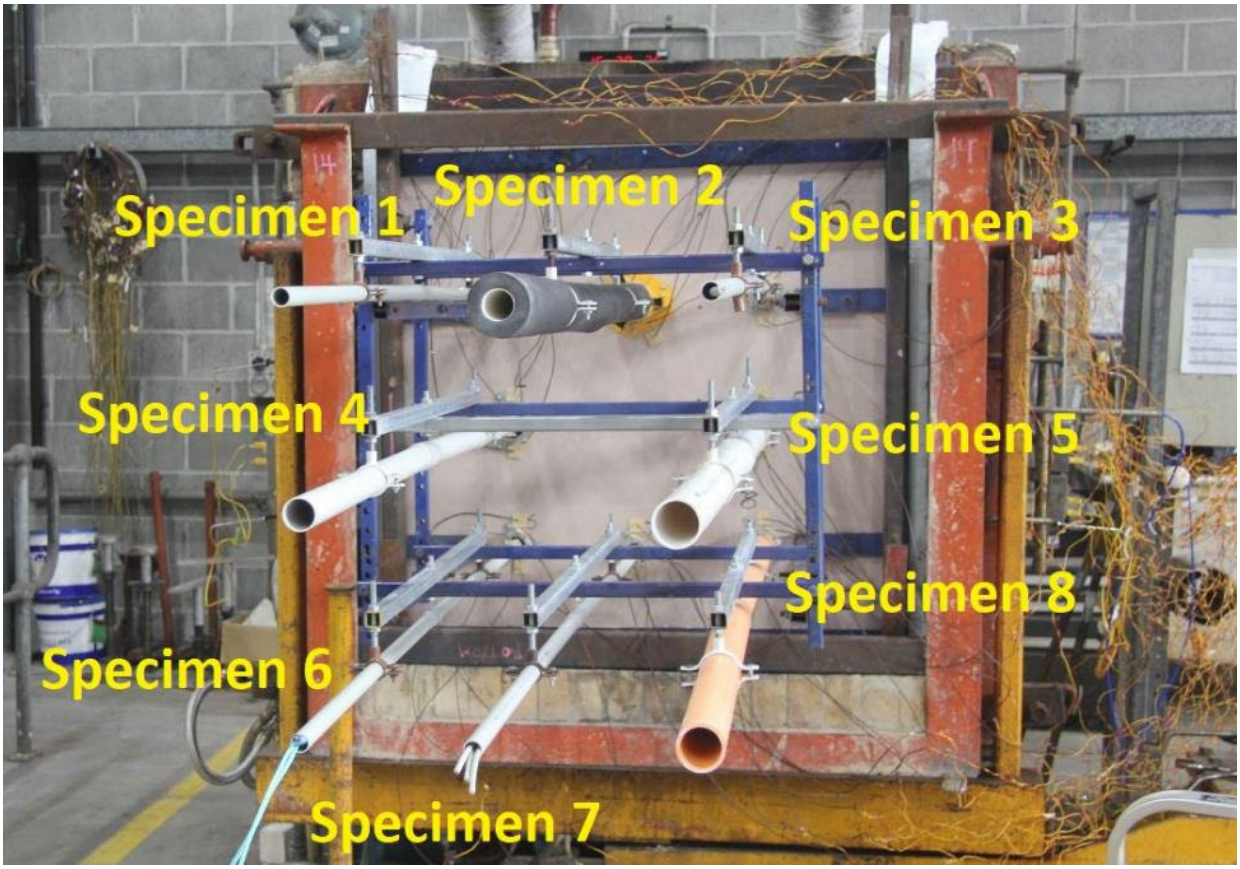
Appendix A – Measurement location

SPECIMEN	THERMCOUPLE POSITION	DESIGNATION
Specimen 1 - SNAP 32R Retrofit fire collars protecting a 25-mm PVC electrical conduit penetrating a 29-mm diameter aperture.	On P/B wall, 25-mm above collar	S1
	On P/B wall, 25-mm below collar	S2
	On collar top left side	S3
	On collar bottom right side	S4
	On top of pipe, 25-mm from collar	S5
	On bottom side of pipe, 25-mm from collar	S6
Specimen 2 SNAP MS70R Multi Service Retrofit fire collars protecting a nominal 32 (42.3-mm OD) PN12 PVC pipe with 19-mm thick Armaflex fire-rated lagging penetrating a 70mm diameter aperture.	On P/B wall, 25-mm above collar –top right	S7
	On P/B wall, 25-mm below collar	S8
	On collar right side	S9
	On collar bottom side	S10
	On top of pipe, 25-mm from collar	S11
	On bottom of pipe, 25-mm from collar	S12
Specimen 3 - SNAP 32R Retrofit fire collars protecting a 25-mm PVC electrical conduit incorporating a 2.5-mm^2 3C+E power cable penetrating a 29-mm diameter aperture.	On P/B wall, 25-mm above collar	S13
	On P/B wall, 25-mm below collar	S14
	On collar top side	S15
	On collar left side	S16
	On top of pipe, 25-mm from collar	S17
	On bottom side of pipe, 25-mm from collar	S18
Specimen 4 - SNAP 50R Retrofit fire collars protecting a nominal 40 (43.2-mm OD) PVC pipe penetrating a 44-mm diameter aperture.	On P/B wall, 25-mm above collar	S19
	On P/B wall, 25-mm below collar	S20
	On collar top side	S21
	On collar bottom side	S22
	On top of pipe, 25-mm from collar	S23
	On bottom of pipe, 25-mm from collar	S24
Specimen 5 - SNAP 50R Retrofit fire collars protecting a nominal 50 (60.4-mm OD) PN12 PVC pipe penetrating a 64-mm diameter aperture.	On P/B wall, 25-mm above collar	S25
	On P/B wall, 25-mm below collar	S26
	On collar top side	S27
	On collar bottom side	S28
	On top of pipe, 25-mm from collar	S29
	On bottom of pipe, 25-mm from collar	S30

SPECIMEN	THERMCOUPLE POSITION	DESIGNATION
Specimen 6 - SNAP 32R Retrofit fire collars protecting a 25-mm PVC electrical conduit with Fibre Optic cables penetrating a 29-mm diameter aperture.	On P/B wall, 25-mm above collar	S31
	On P/B wall, 25-mm below collar	S32
	On collar top side	S33
	On collar left side	S34
	On top of pipe, 25-mm from collar	S35
	On bottom of pipe, 25-mm from collar	S36
Specimen 7 - SNAP 32R Retrofit fire collars protecting a 25-mm PVC electrical conduit with Cat 7 Network cables penetrating a 29-mm diameter aperture.	On P/B wall, 25-mm above collar	S37
	On P/B wall, 25-mm below collar	S38
	On collar top side	S39
	On collar left side	S40
	On top of pipe, 25-mm from collar	S41
	On bottom side of pipe, 25-mm from collar	S42
Specimen 8 - SNAP 50R Retrofit fire collars protecting a nominal 2-inch CPVC pipe penetrating a 64-mm diameter aperture.	On P/B wall, 25-mm above collar	S43
	On P/B wall, 25-mm below collar	S44
	On collar top side	S45
	On collar left side	S46
	On right side of pipe, 25-mm from collar	S47
	On left side of pipe, 25-mm from collar	S48
Rover		S49
Ambient		S50

Appendix B – Photographs

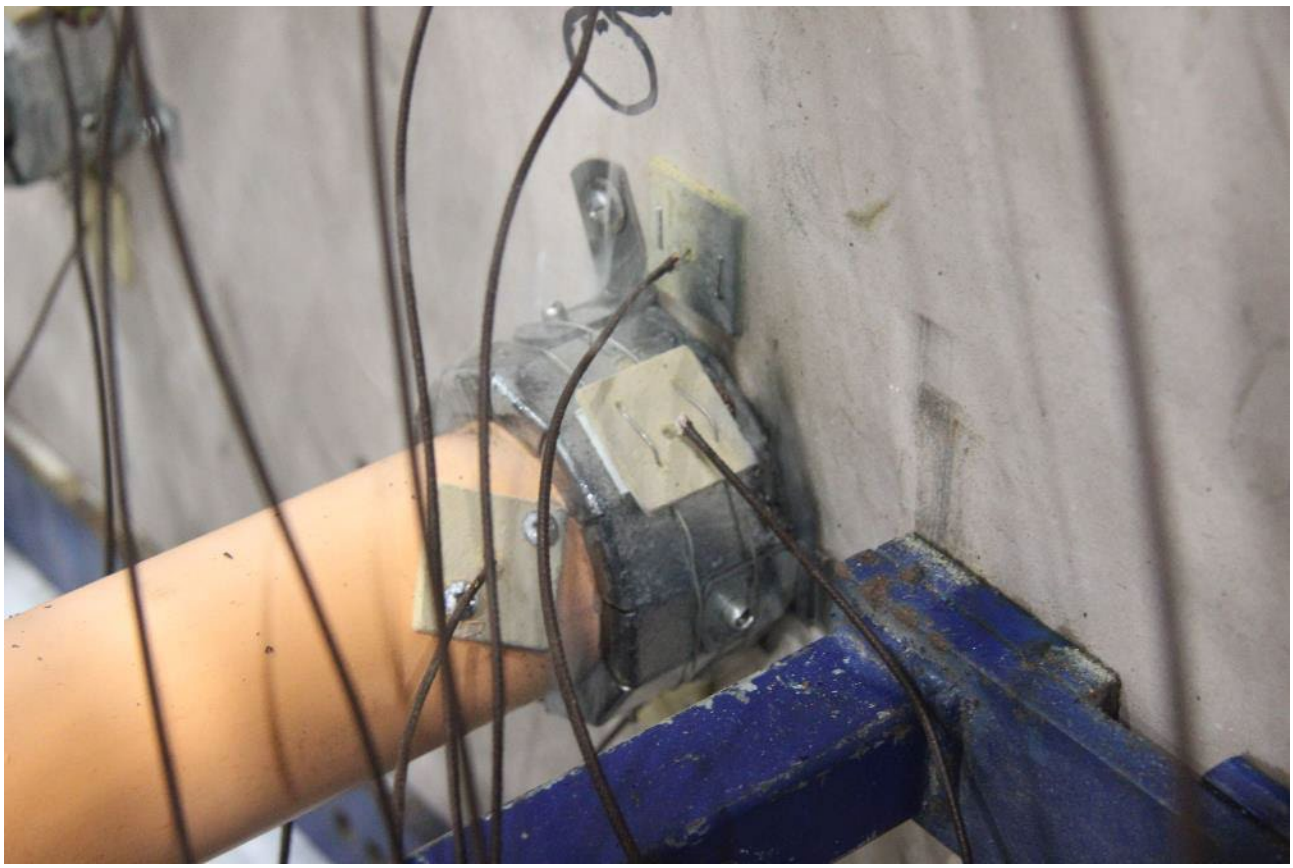
PHOTOGRAPH 1 – EXPOSED FACE OF SPECIMENS PRIOR TO TESTING



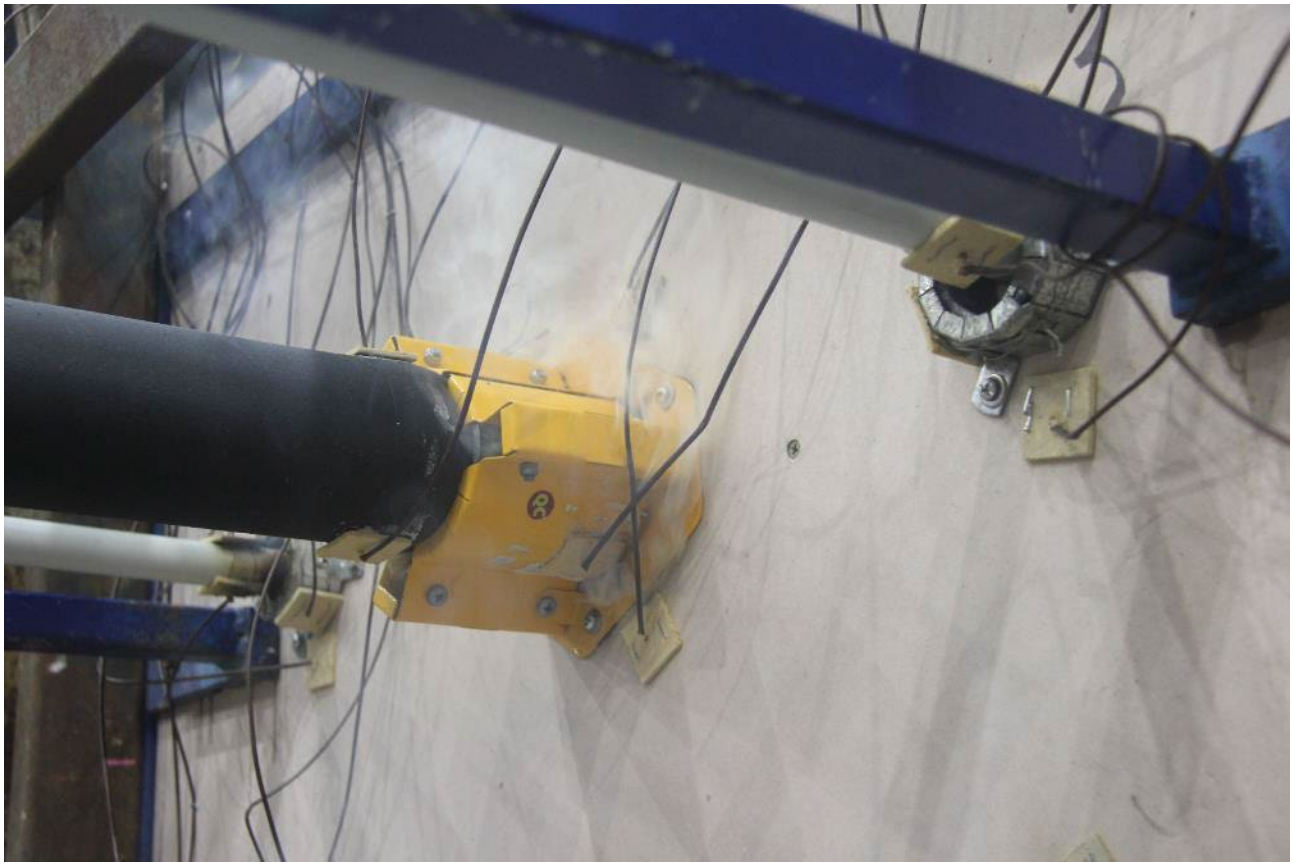
PHOTOGRAPH 2 – UNEXPOSED FACE OF SPECIMENS PRIOR TO TESTING

PHOTOGRAPH 3 – SPECIMENS AFTER 7 MINUTES OF TESTING

PHOTOGRAPH 4 – SPECIMENS AFTER 30 MINUTES OF TESTING



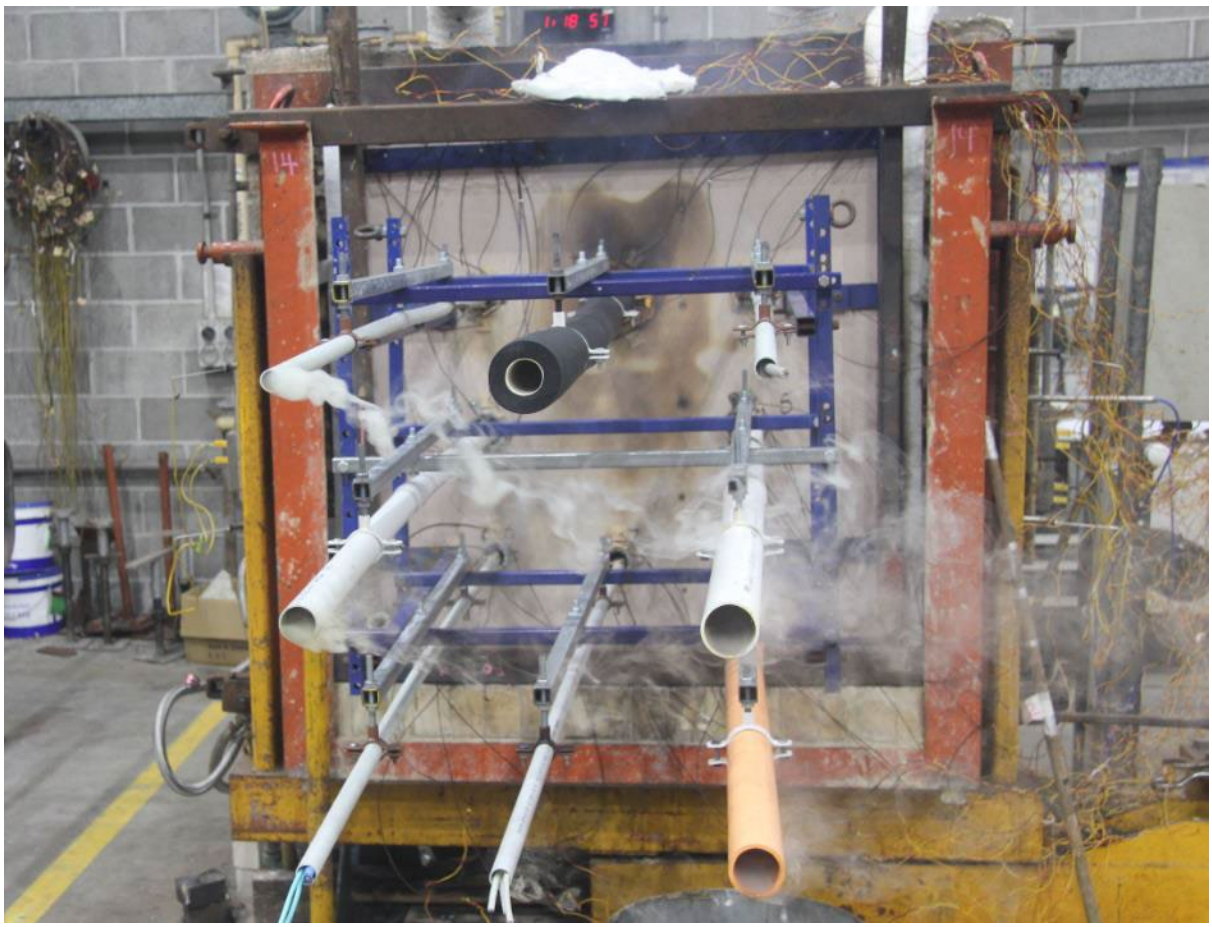
PHOTOGRAPH 5 – SPECIMEN 8 AFTER 40 MINUTES OF TESTING



PHOTOGRAPH 6 – SPECIMEN 2 AFTER 55 MINUTES OF TESTING

PHOTOGRAPH 7 – SPECIMENS AFTER 60 MINUTES OF TESTING

PHOTOGRAPH 8 – SPECIMEN 2 AFTER 62 MINUTES OF TESTING



PHOTOGRAPH 9 – SPECIMENS AFTER 79 MINUTES OF TESTING

PHOTOGRAPH 10 – SPECIMENS AFTER 90 MINUTES OF TESTING

PHOTOGRAPH 11 – SPECIMENS AT CONCLUSION OF TESTING

PHOTOGRAPH 12 – EXPOSED FACE OF SPECIMENS AT CONCLUSION OF TESTING

Appendix C – Test data charts

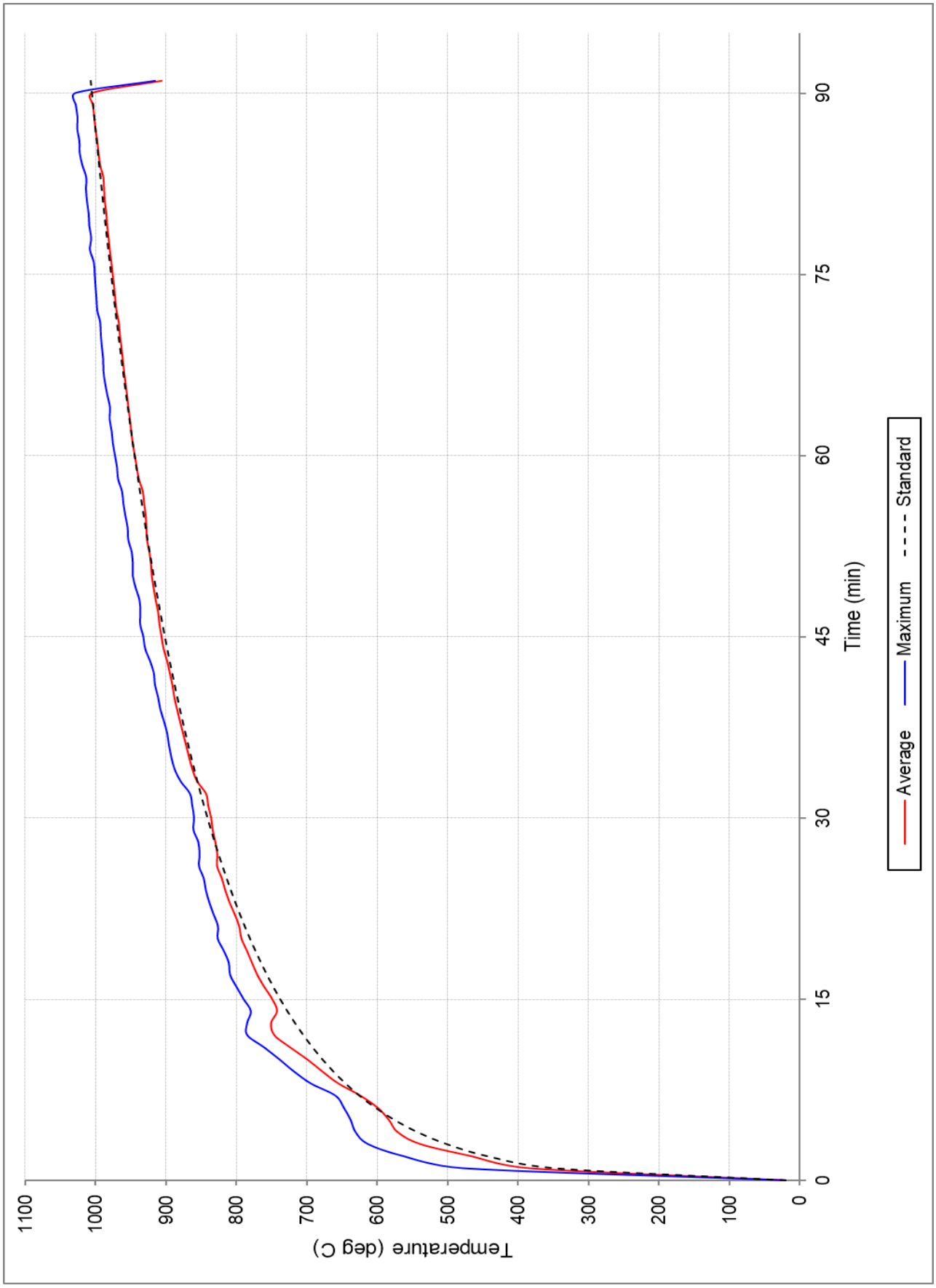


FIGURE 1 – FURNACE TEMPERATURE

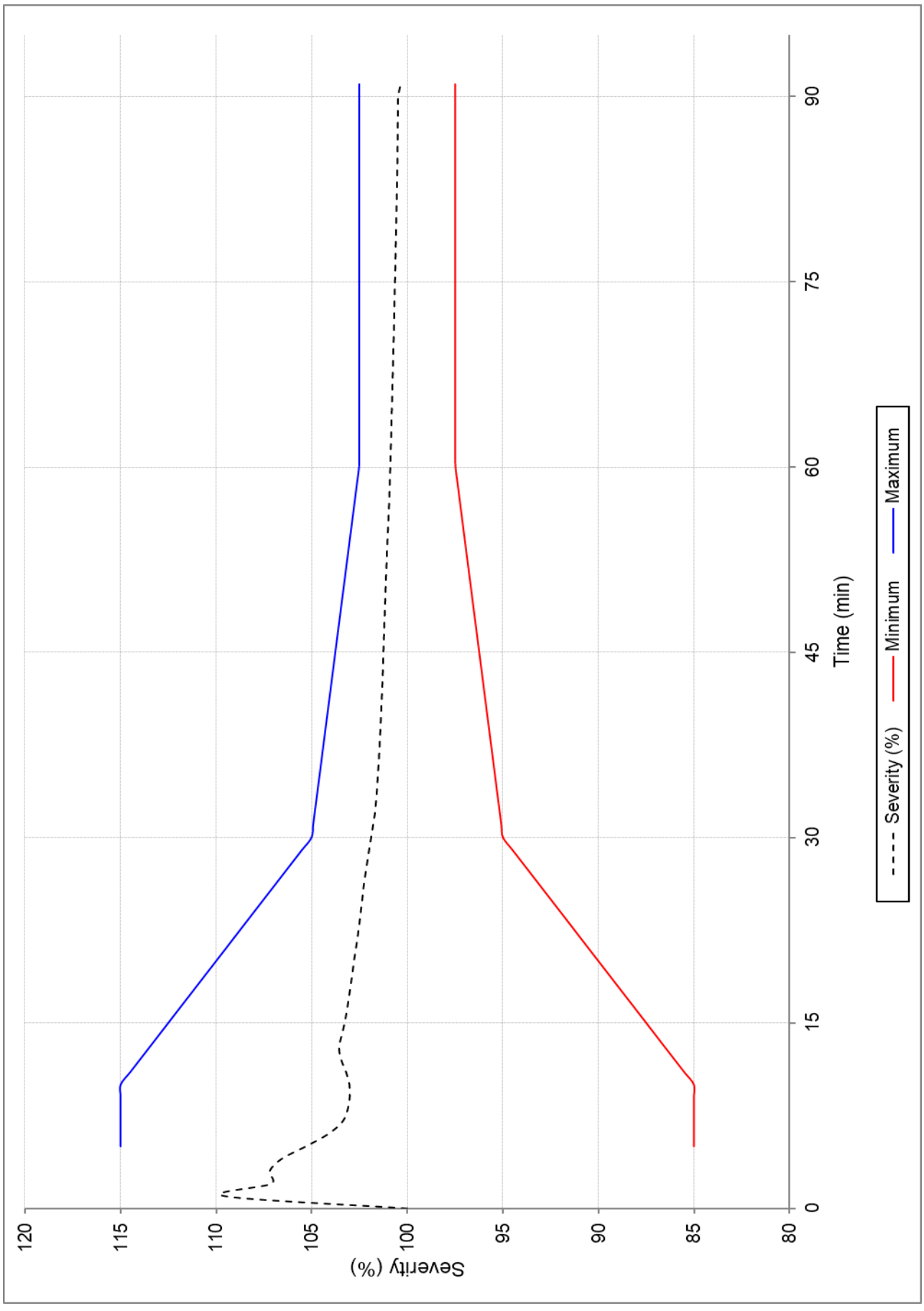


FIGURE 2 – FURNACE SEVERITY

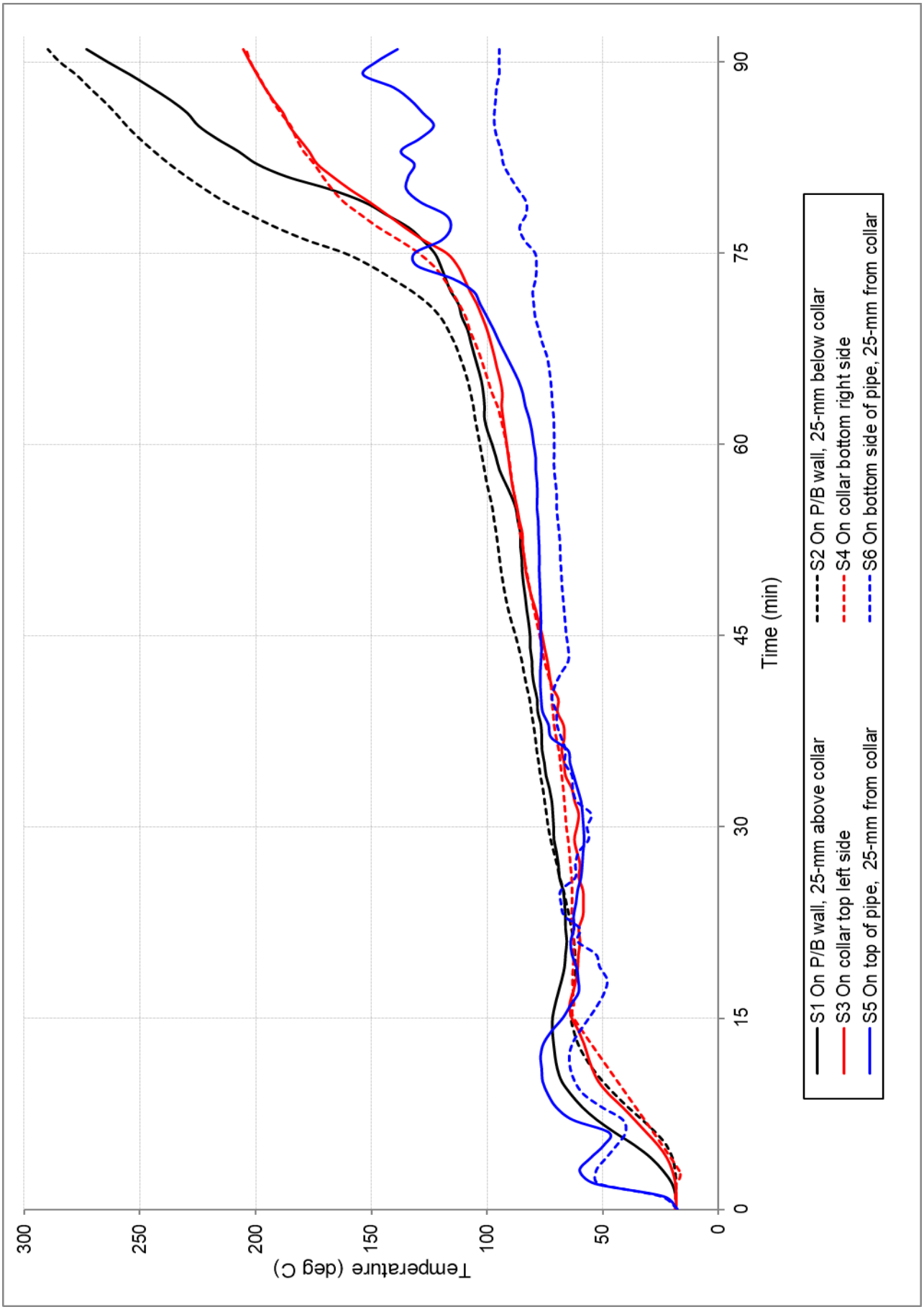


FIGURE 3 - TEMPERATURE VERSUS TIME ASSOCIATED WITH SPECIMEN #1

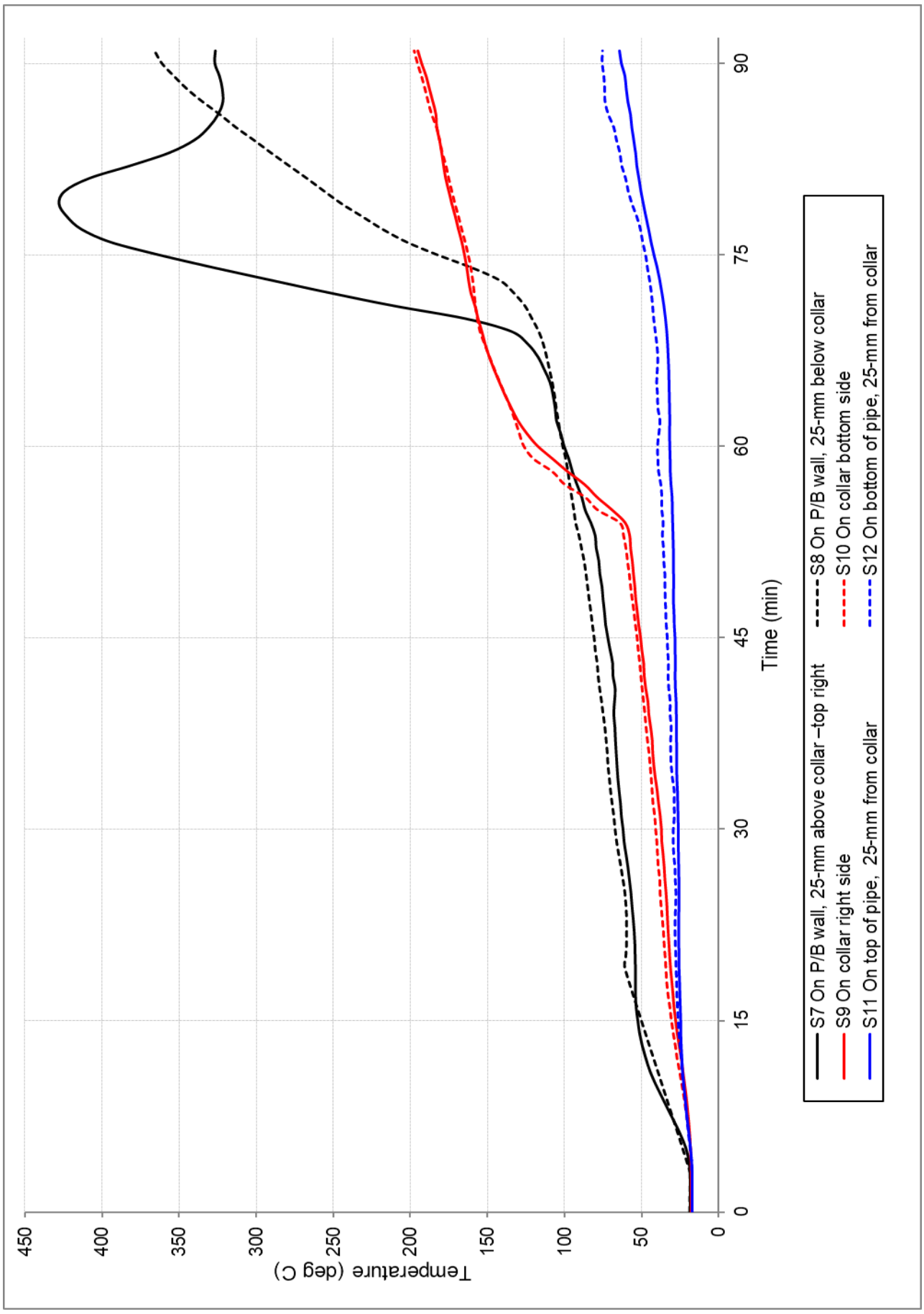


FIGURE 4 - TEMPERATURE VERSUS TIME ASSOCIATED WITH SPECIMEN #2

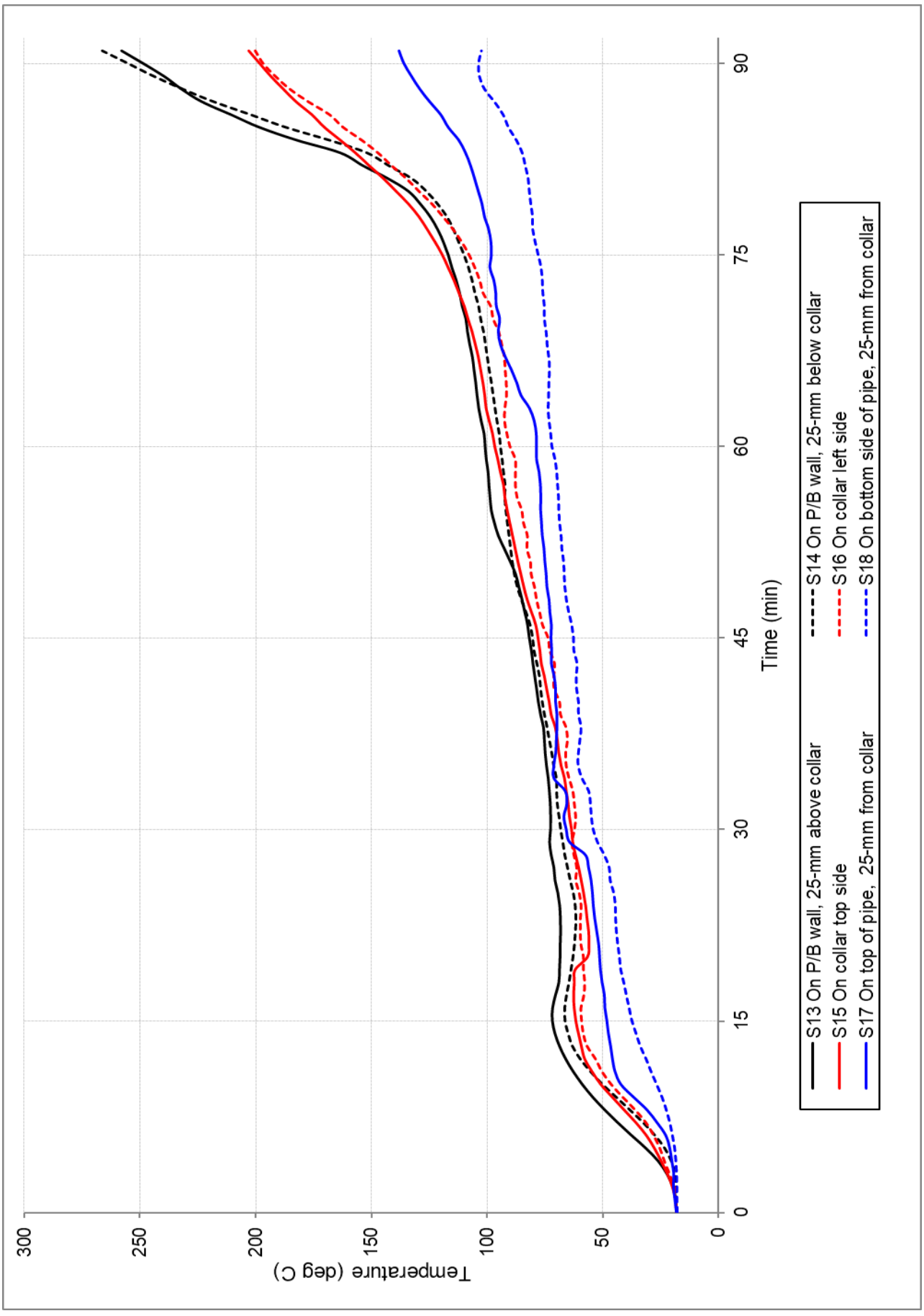


FIGURE 5 - TEMPERATURE VERSUS TIME ASSOCIATED WITH SPECIMEN #3

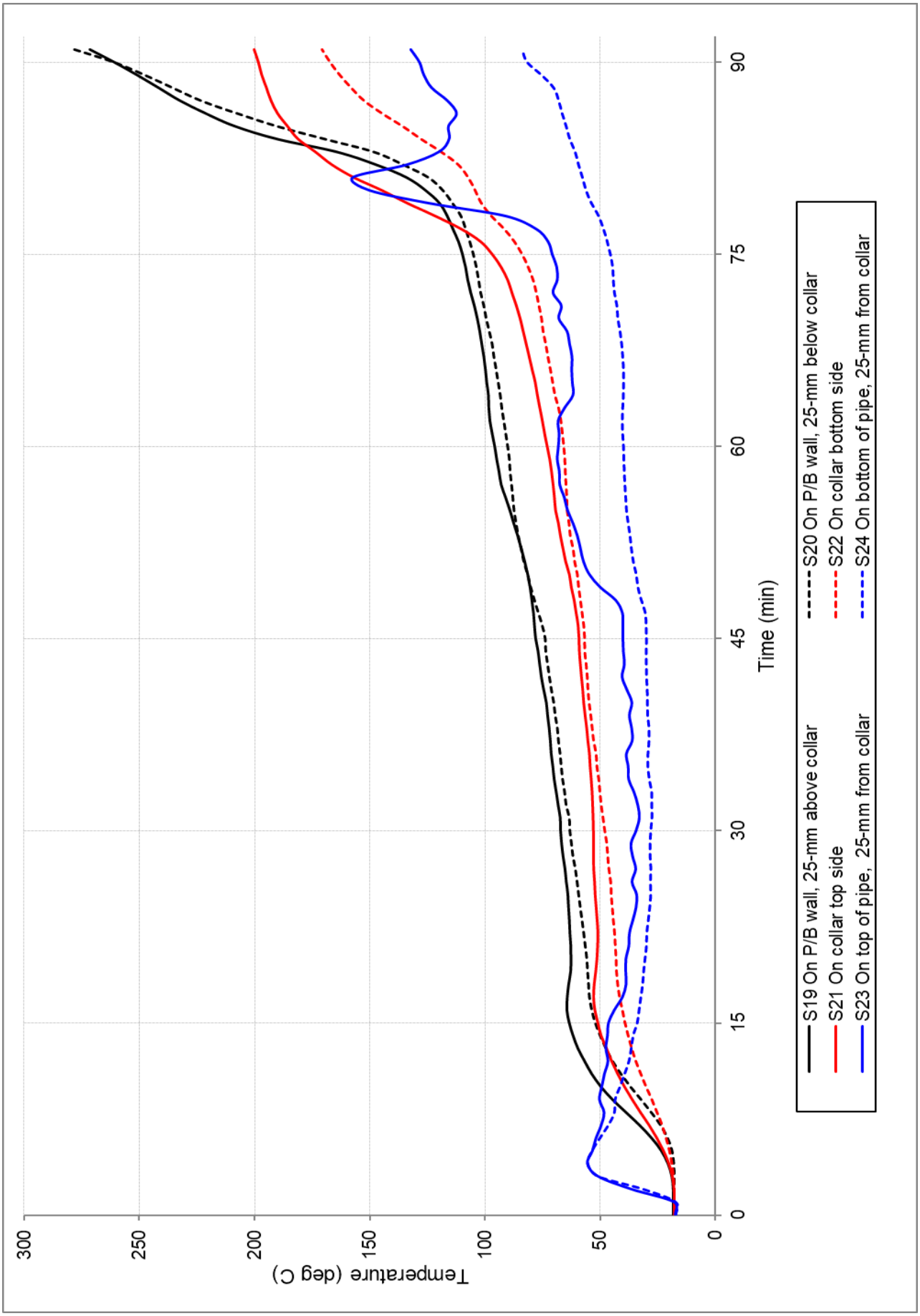


FIGURE 6 - TEMPERATURE VERSUS TIME ASSOCIATED WITH SPECIMEN #4

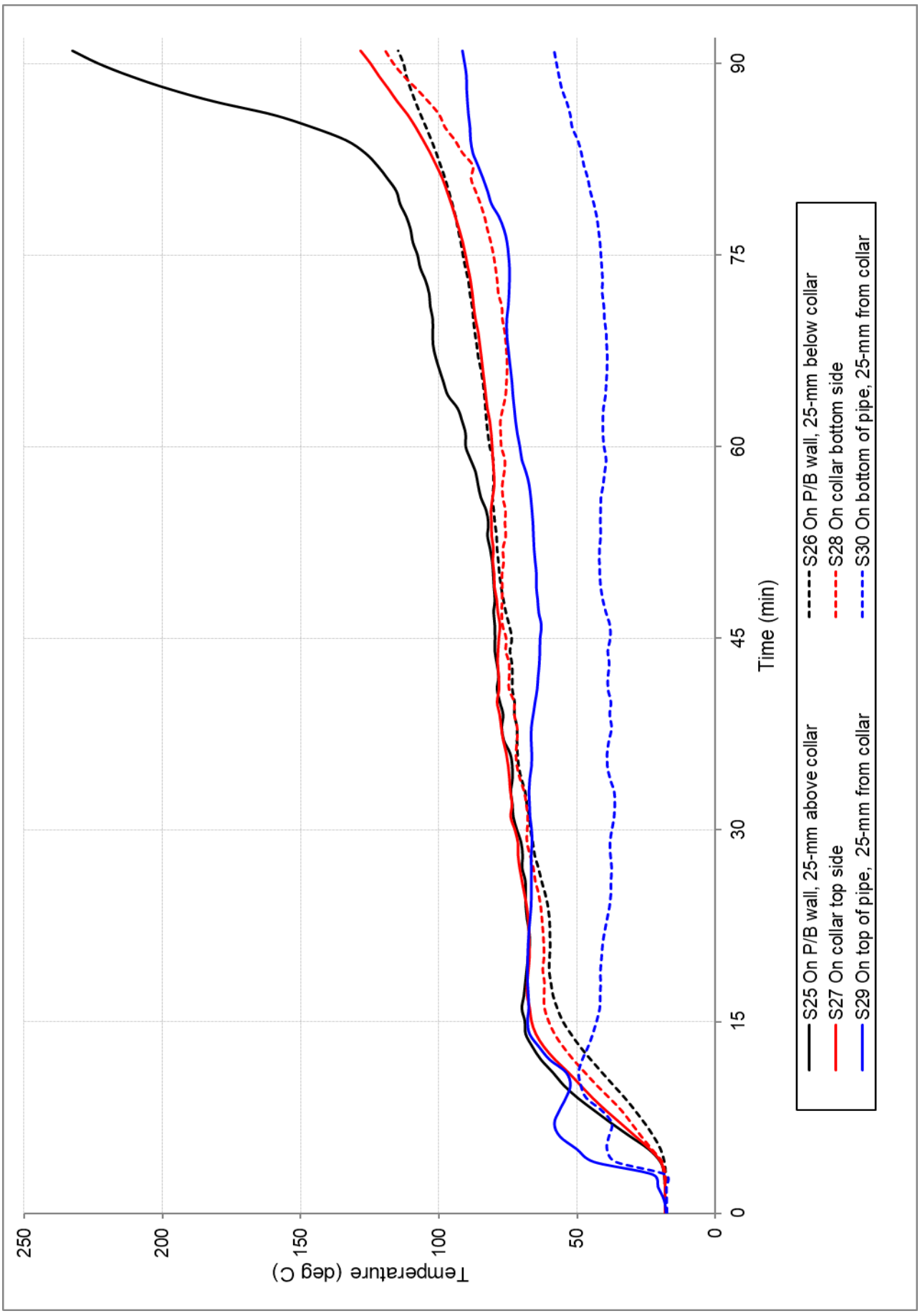


FIGURE 7 - TEMPERATURE VERSUS TIME ASSOCIATED WITH SPECIMEN #5

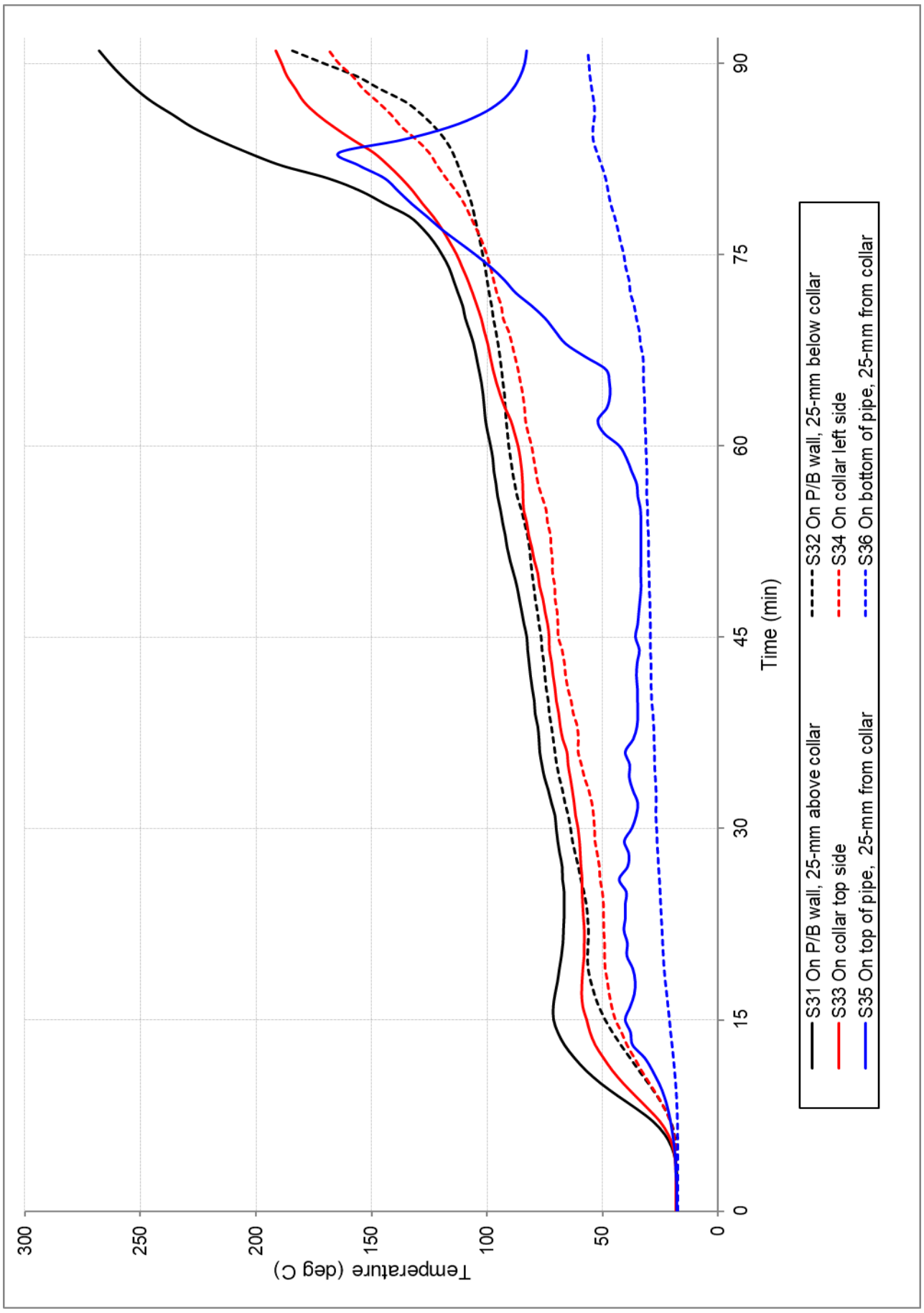


FIGURE 8 - TEMPERATURE VERSUS TIME ASSOCIATED WITH SPECIMEN #6

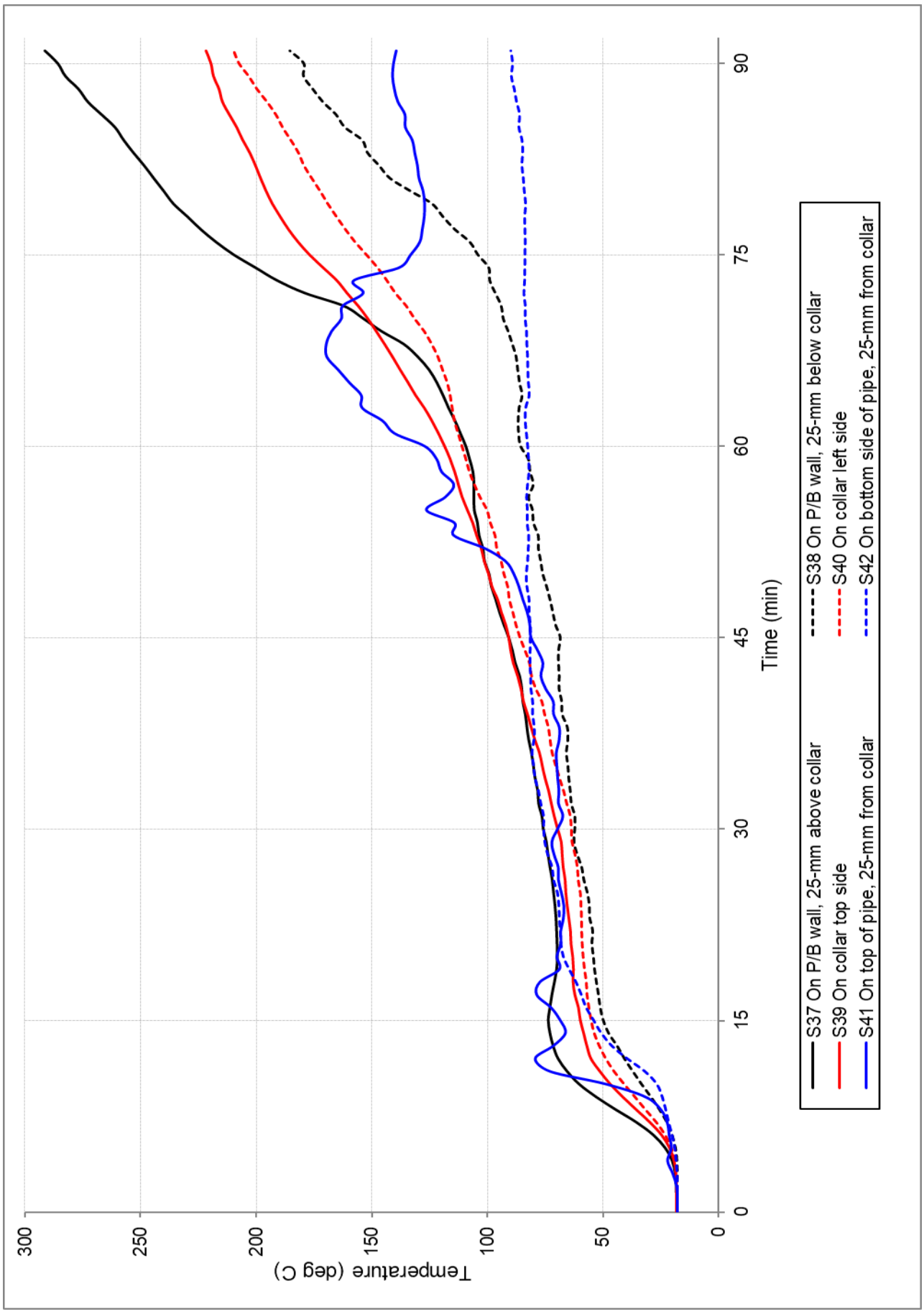


FIGURE 9 - TEMPERATURE VERSUS TIME ASSOCIATED WITH SPECIMEN #7

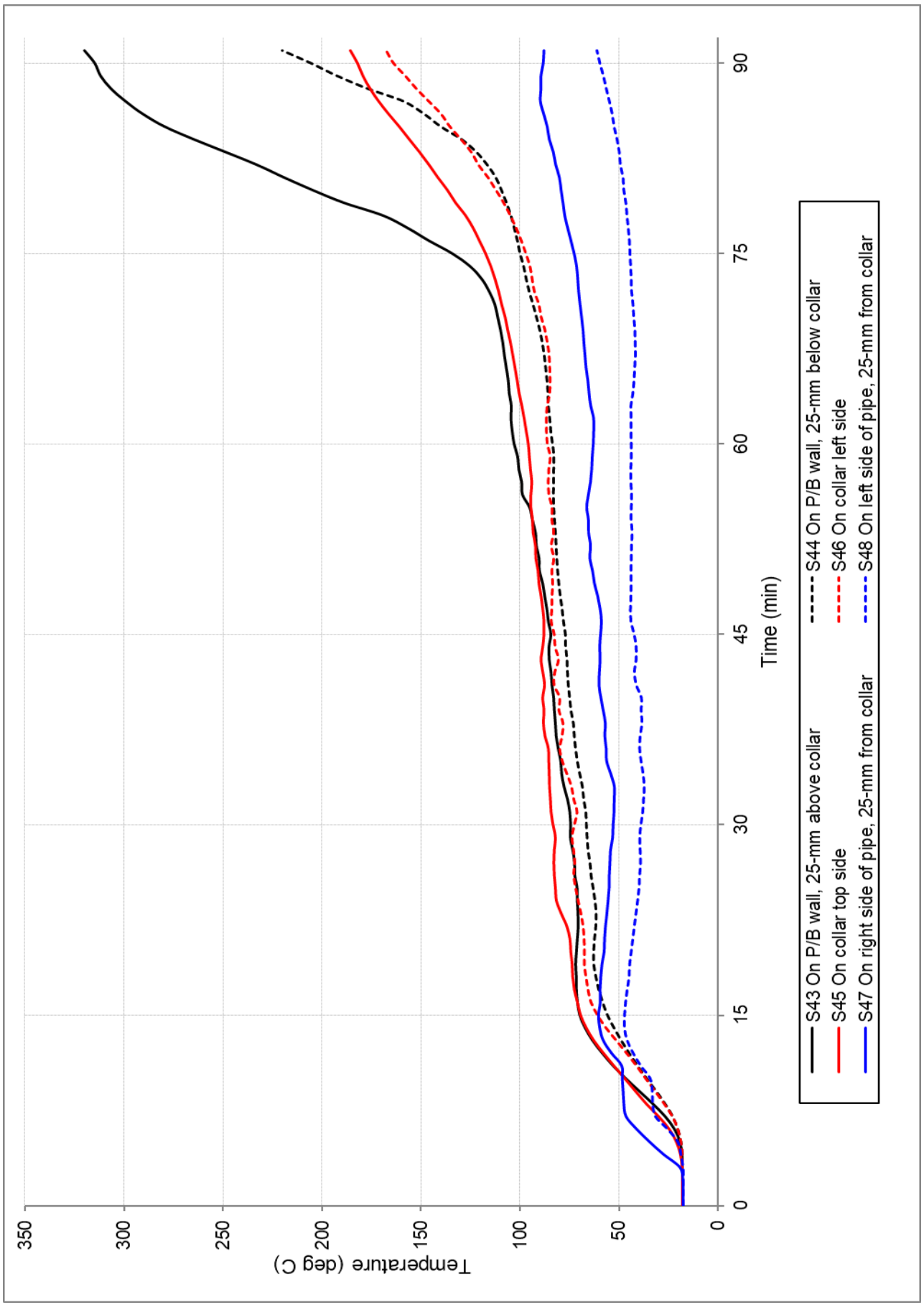


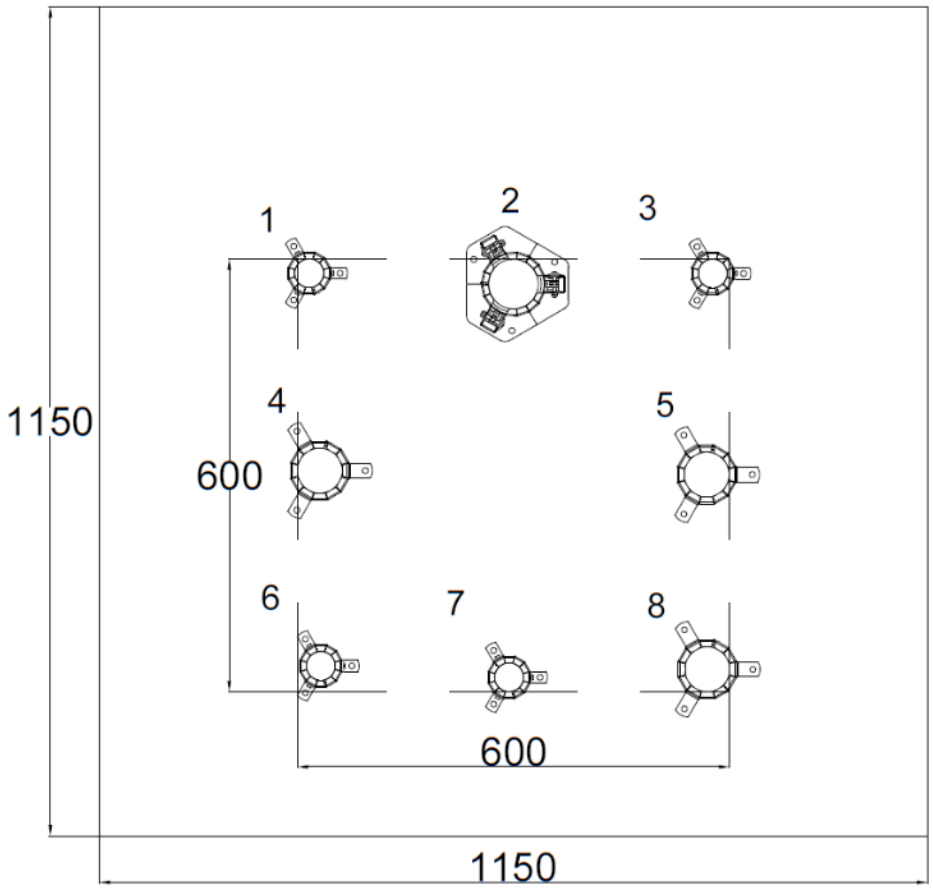
FIGURE 10 - TEMPERATURE VERSUS TIME ASSOCIATED WITH SPECIMEN #8

Appendix D – Layout and installation drawings

Snap Fire Systems Pty Ltd

Test Wall W-21-G Layout

Date: 12 FEB 2021



Penetration	Collar Code	Pipe Type	Pipe Diameter
1	32R	PVC	25
2	MS70R	PVC PN12 + Armaflex Lagging	32 (19mm lagging)
3	32R	PVC+Power Cable	25 & 2.5mm² 3C+E
4	50R	PVC+Fitting	40
5	50R	PVC PN12	50
6	32R	PVC+Optic Fibre	25
7	32R	PVC+Cat7	25
8	50R	C-PVC	2 in

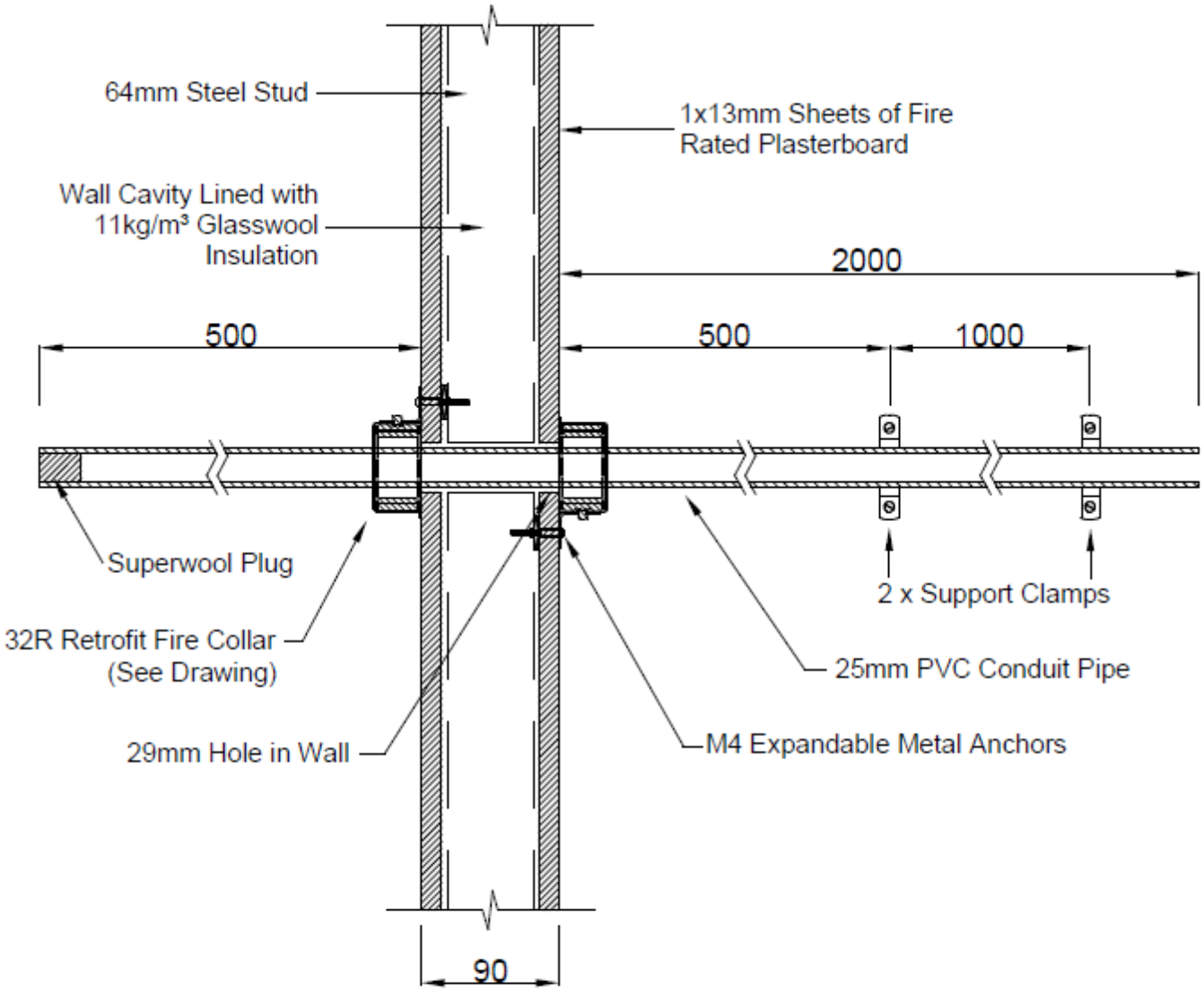
DRAWING TITLED 'TEST WALL W-21-G LAYOUT, DATED 12 FEBRUARY 2021, BY SNAP FIRE SYSTEMS PTY LTD.

Snap Fire Systems Pty Ltd

Specimen #1

25 PVC Conduit Stack & 32R

Date: 24 FEB 2021



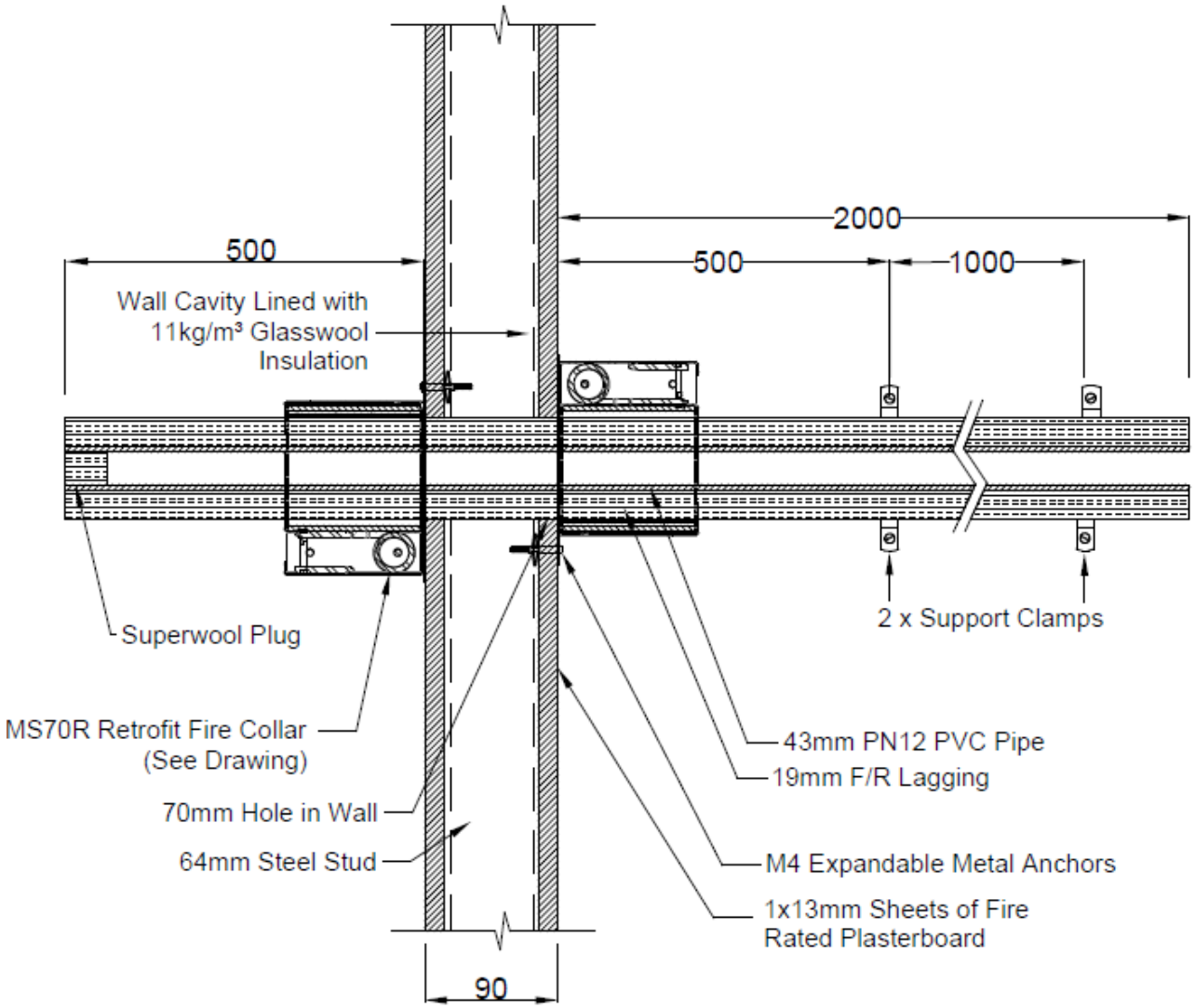
DRAWING TITLED 'SPECIMEN #1 25 PVC CONDUIT STACK & 32R', DATED 24 FEBRUARY 2021, BY SNAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd

Specimen #2

32 PN12 PVC Pipe with 19mm F/R Lagging & MS70R

Date: 24 FEB 2021



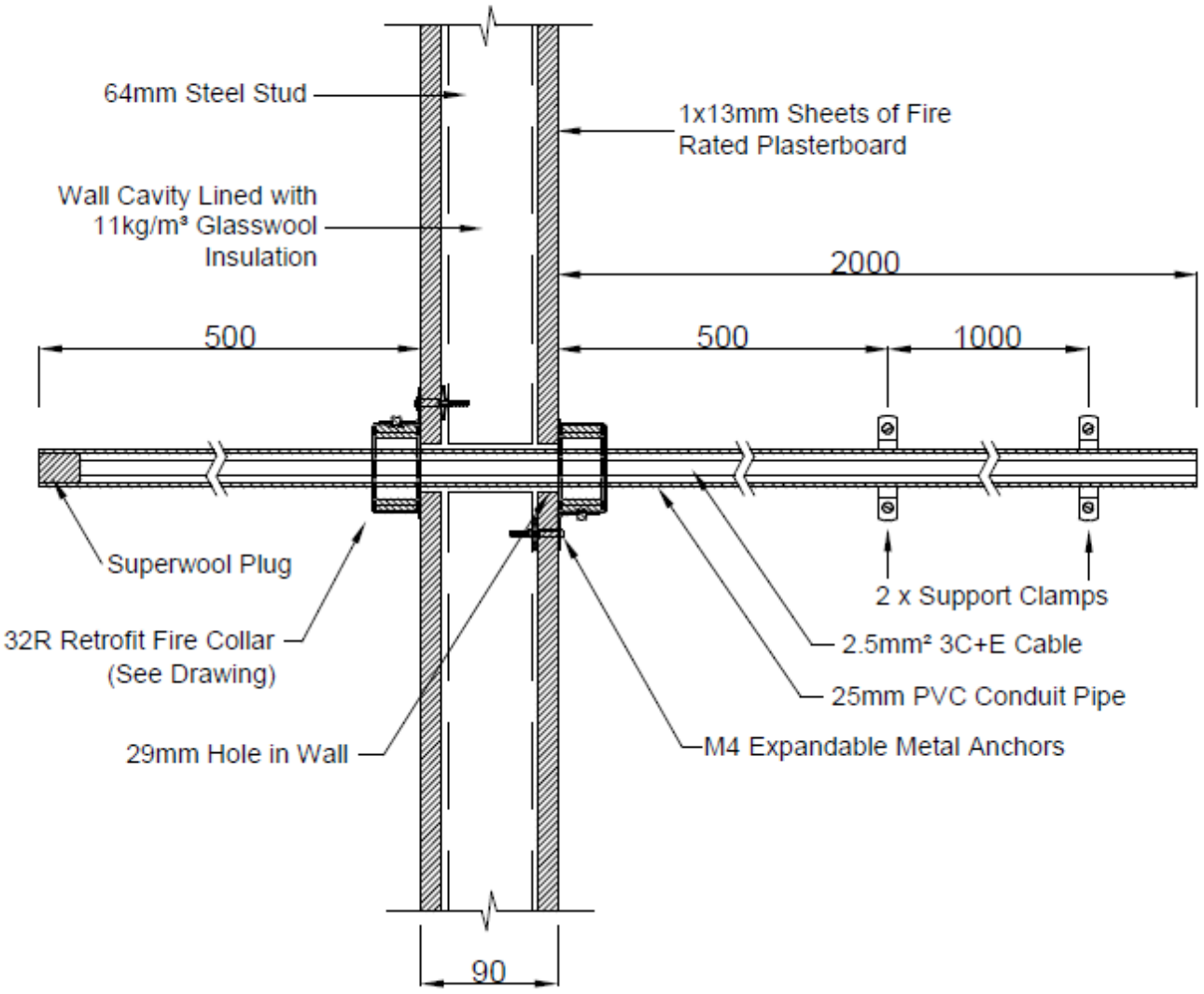
DRAWING TITLED 'SPECIMEN #2 32 PN12 PVC PIPE WITH 19MM F/R LAGGING & MS70R', DATED 24 FEBRUARY 2021, BY SNAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd

Specimen #3

25 PVC Conduit with 2.5mm² 3C+E Cable Stack & 32R

Date: 23 FEB 2021



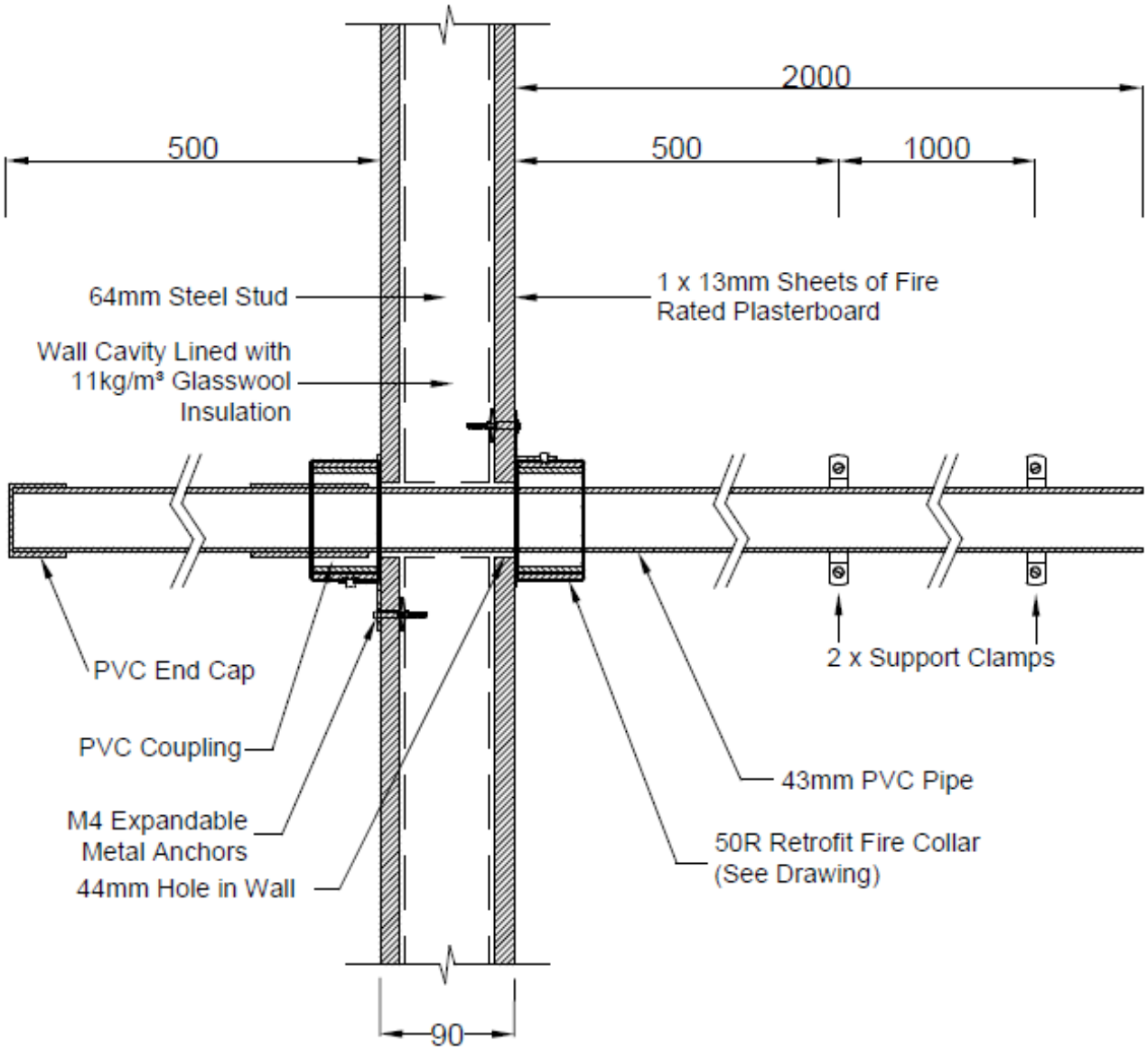
DRAWING TITLED 'SPECIMEN #3, 25 PVC CONDUIT WITH 2.5-MM^2 3C+E CABLE STACK & 32R', DATED 23 FEBRUARY 2021, BY SNAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd

Specimen #4

40 PVC Stack + Fitting & 50R

Date: 24 FEB 2021



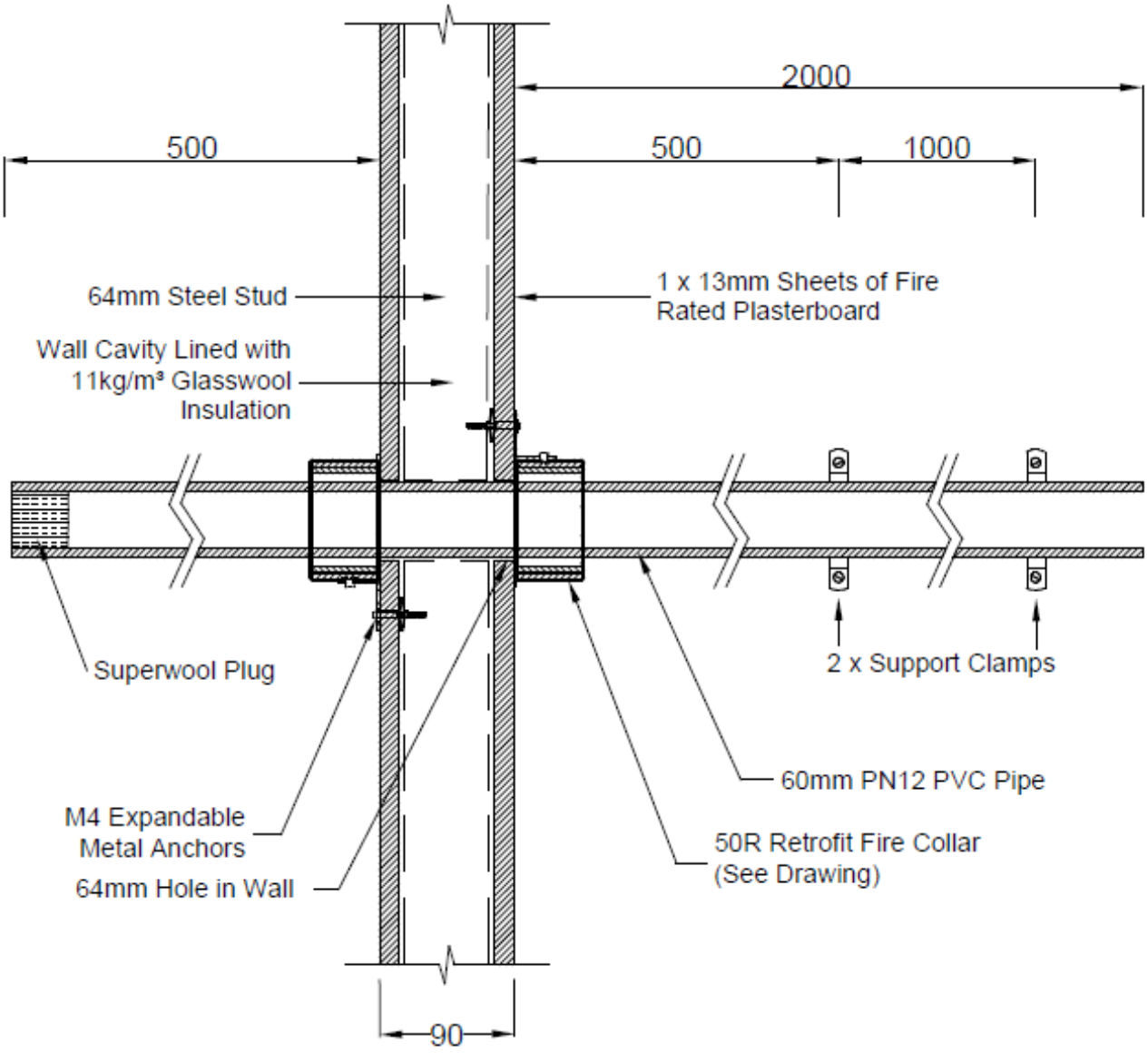
DRAWING TITLED 'SPECIMEN #4, 40 PVC STACK + FITTING & 50R', DATED 24 FEBRUARY 2021, BY SNAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd

Specimen #5

50 PN12 PVC Stack & 50R

Date: 24 FEB 2021



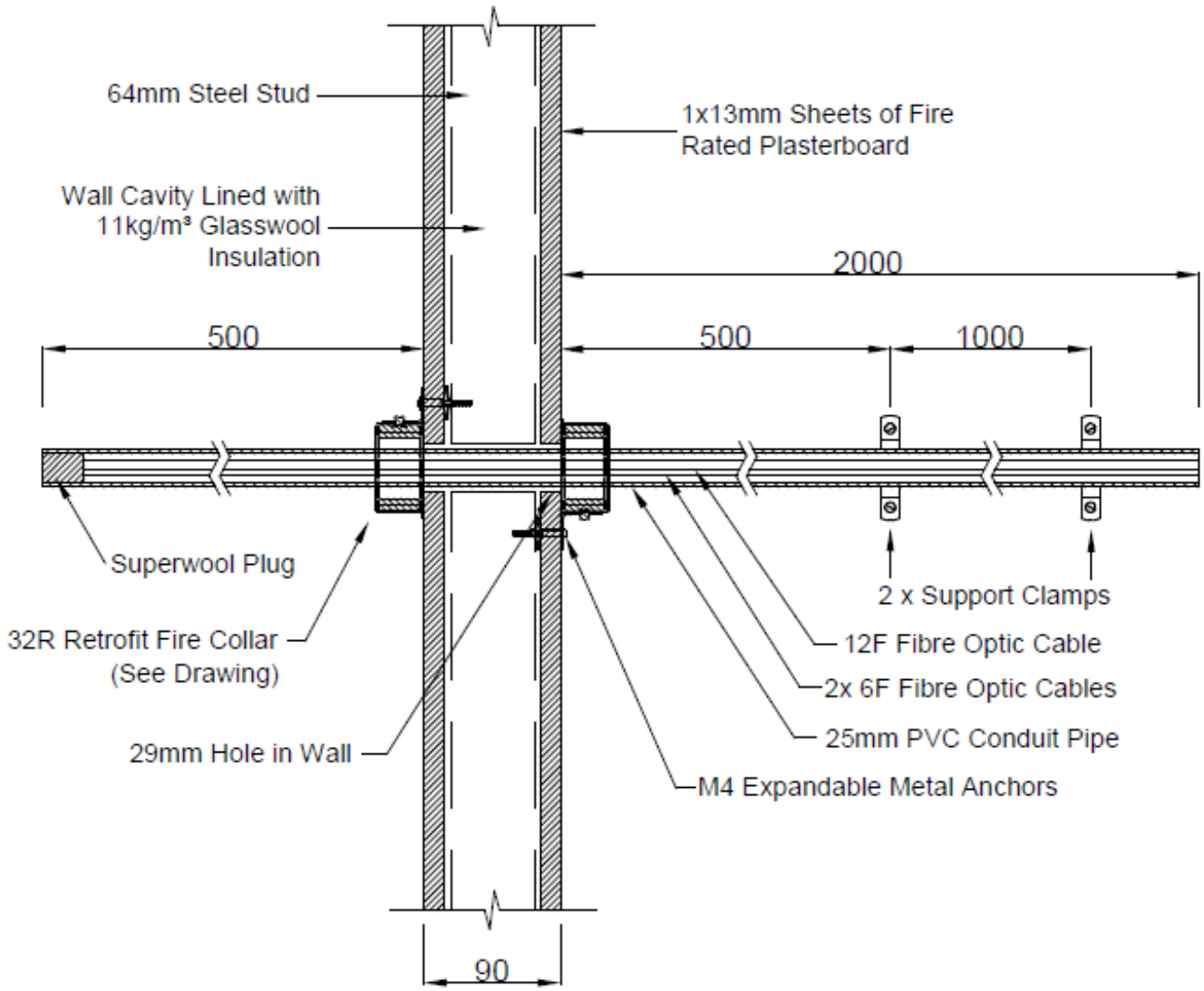
DRAWING TITLED 'SPECIMEN #5, 50 PN12 PVC STACK & 50R', DATED 24 FEB 2021, BY SNAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd

Specimen #6

25 PVC Conduit with Fibre Optic Cables Stack & 32R

Date: 23 FEB 2021



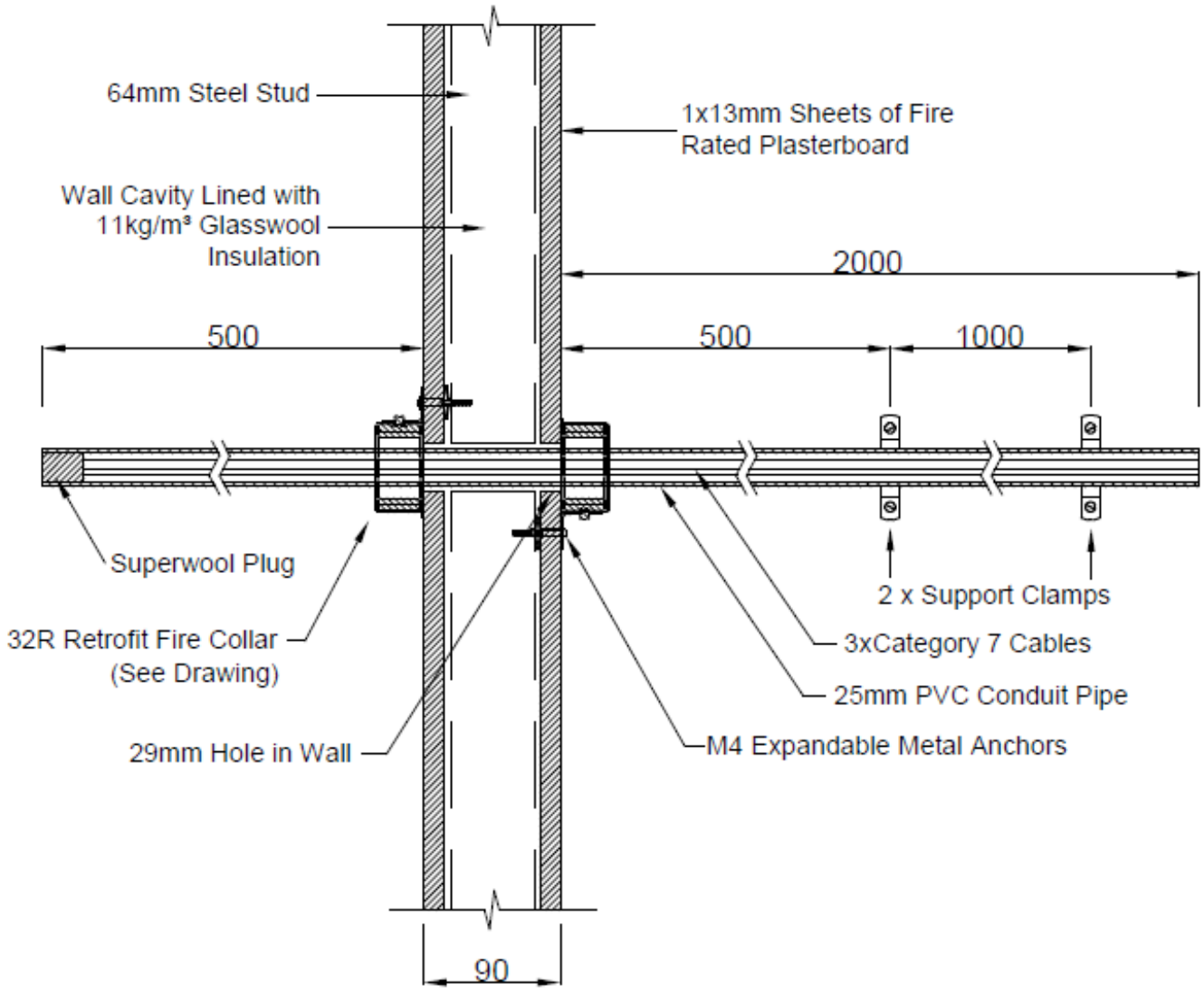
DRAWING TITLED 'SPECIMEN #6 25 PVC CONDUIT WITH FIBRE OPTIC CABLES STACK & 32R', DATED 23 FEB 2021, BY SNAP FIRE SNAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd

Specimen #7

25 PVC Conduit with Category 7 Cables Stack & 32R

Date: 23 FEB 2021



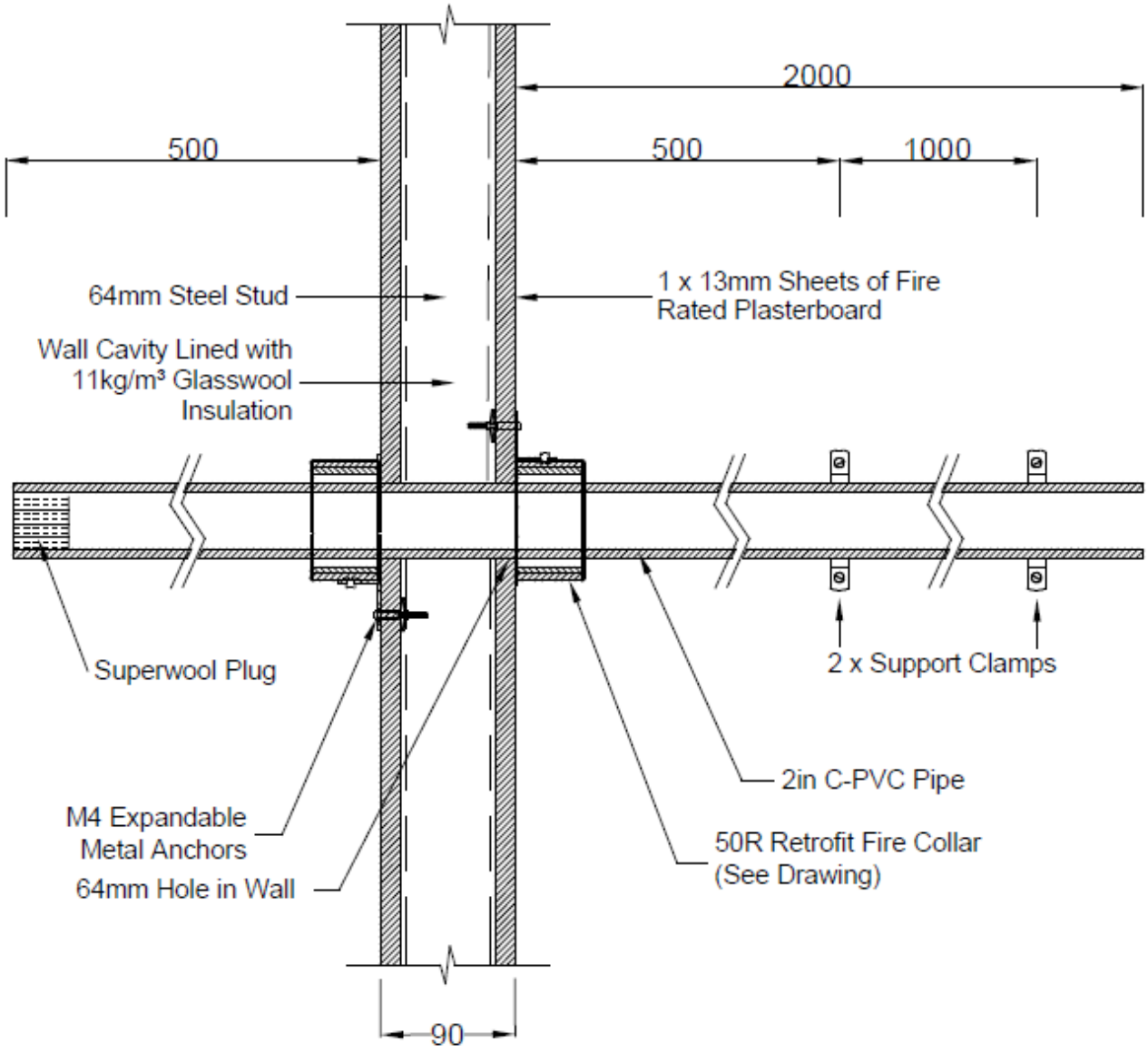
DRAWING TITLED 'SPECIMEN #7, 25 PVC CONDUIT WITH CATEGORY 7 CABLES STACK & 32R', DATED 23 FEB 2021, BY SNAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd

Specimen #8

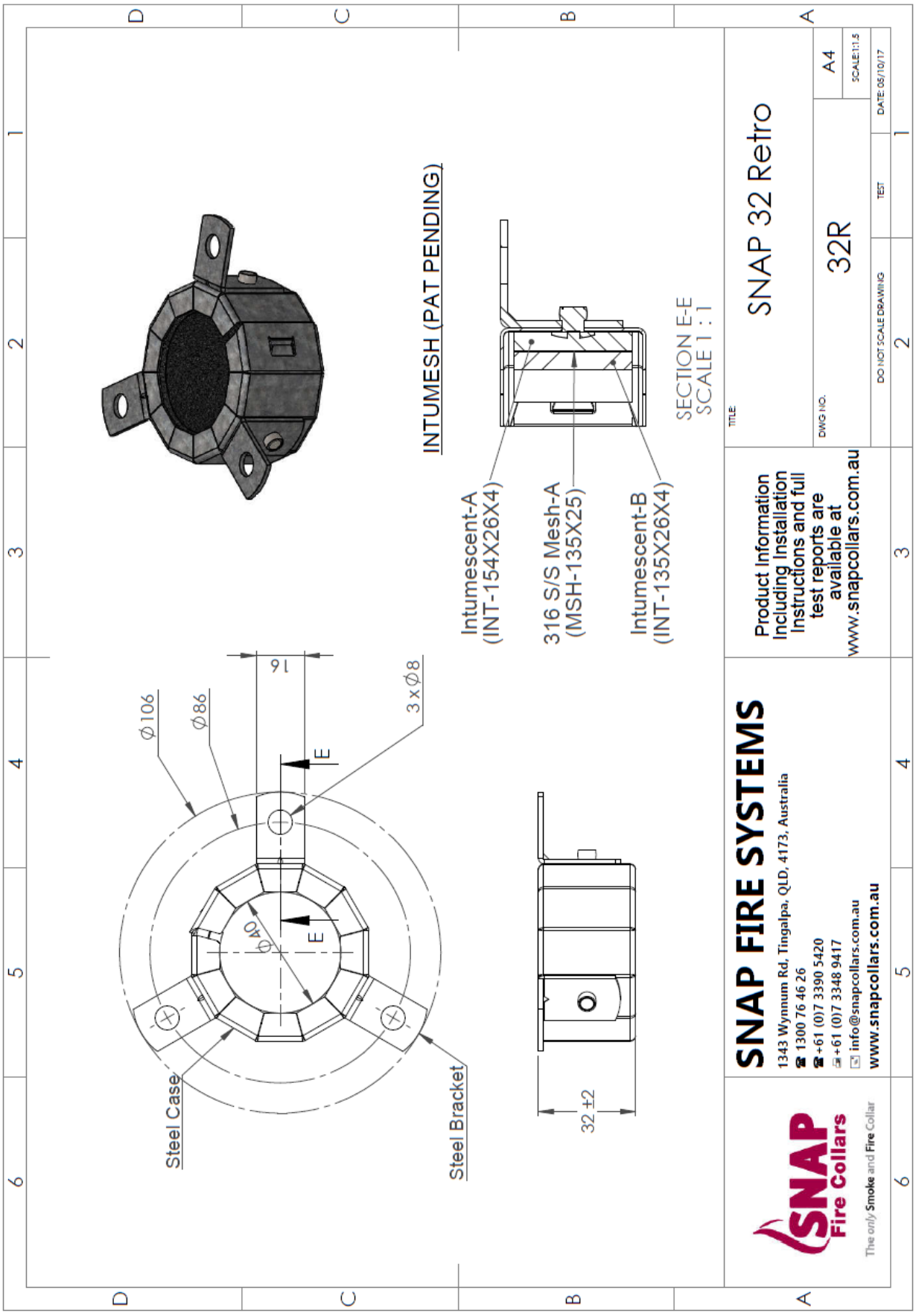
2in C-PVC Stack & 50R

Date: 01 MAR 2021

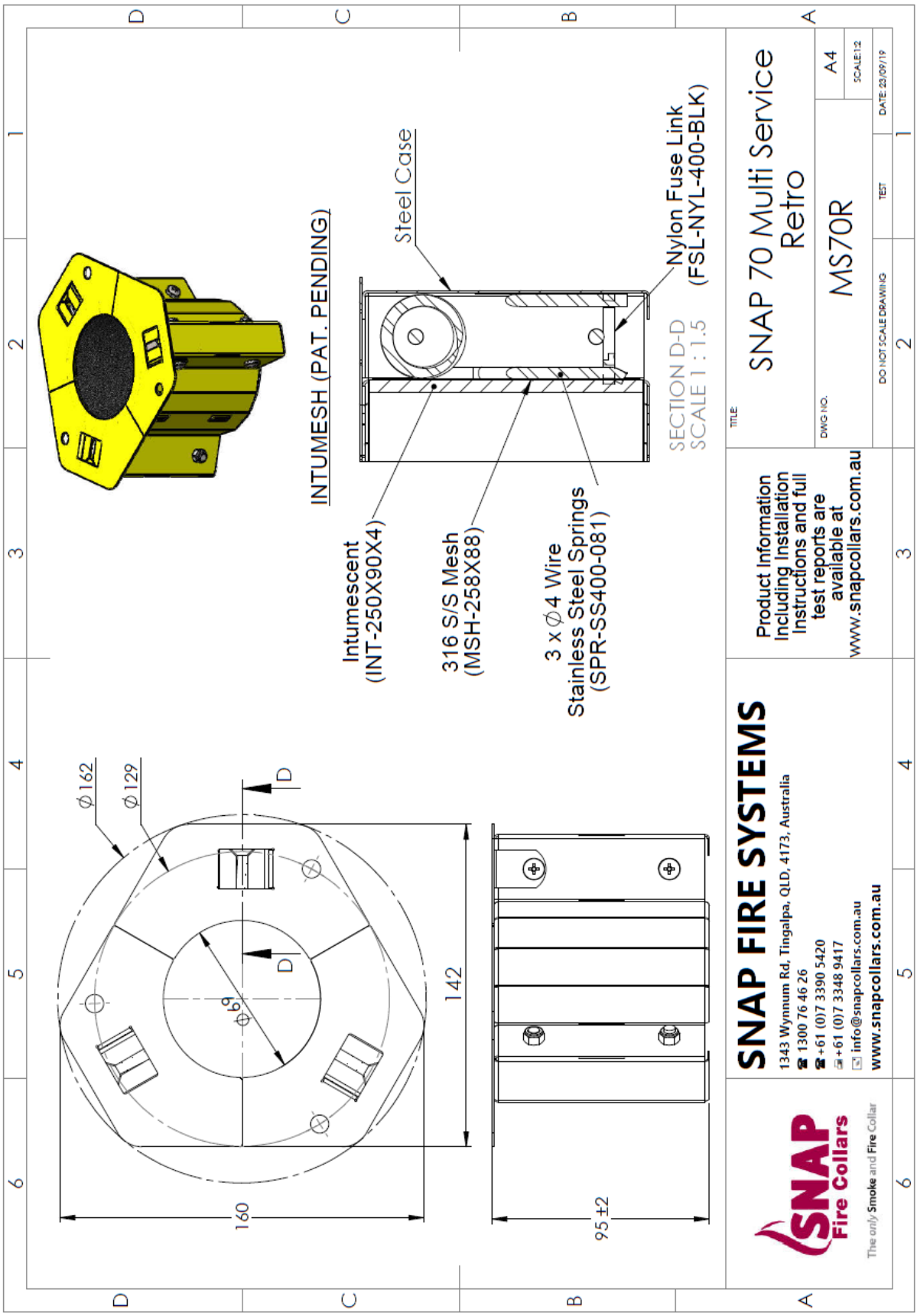


DRAWING TITLED 'SPECIMEN #8 2IN C-PVC STACK & 50R', DATED 1 MARCH 2021, BY SNAP FIRE SNAP FIRE SYSTEMS PTY LTD

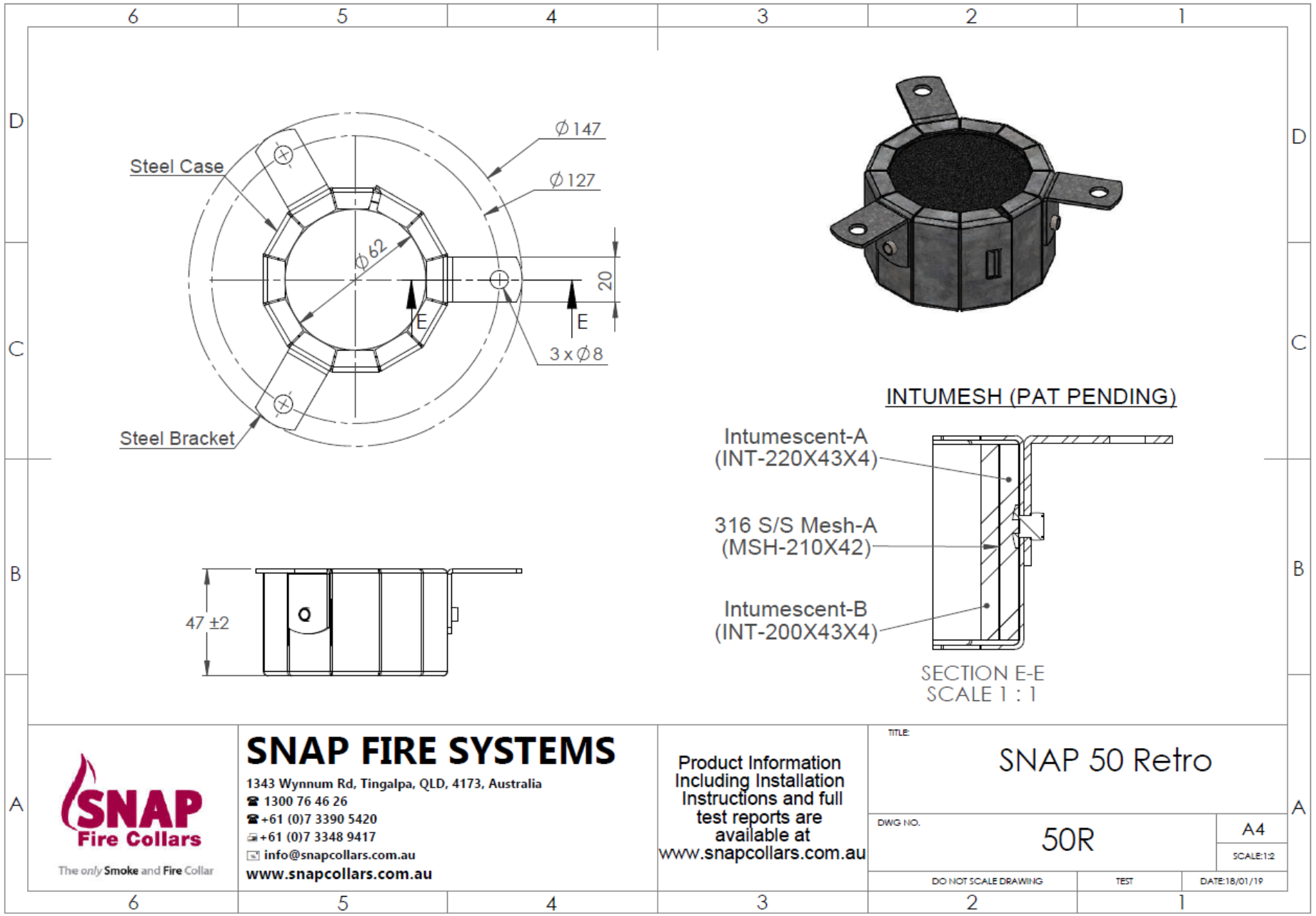
Appendix E – Specimen Drawings



DRAWING TITLED 'SNAP 32 RETRO', DATED 5 OCTOBER 2017, BY SNAP FIRE SYSTEMS.



DRAWING TITLED 'SNAP 70 MULTI SERVICE RETRO', DATED 23 SEPTEMBER 2019, BY SNAP FIRE SYSTEMS.



DRAWING TITLED 'SNAP 50 RETRO', DATED 18 JANUARY 2019, BY SNAP FIRE SYSTEMS.

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. 3601

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
1343 Wynnum Road
Tingalpa QLD

A full description of the test specimen and the complete test results are detailed in the Division's report FSP 2216.

Product Name: SNAP 32R Retrofit fire collars protecting a nominal 25 (24.9 mm OD) uPVC electrical conduit penetrating a 29 mm diameter aperture (Specimen 1)

Description: The sponsor identified the specimen as retrofit fire collars protecting a steel framed plasterboard wall penetrated by an unplasticized polyvinyl chloride (uPVC) pipe. The plasterboard wall was constructed in accordance with Boral Firestop system SB60.1 with an established fire resistance level (FRL) of -/60/60 as detailed in the document titled "Plasterboard Fire and Acoustic Systems Australia", revision UB1231-SYS 12/18, by USG Boral Building Products Pty Ltd. Construction comprised 64-mm x 0.55-mm steel studs installed at nominally 600-mm centres, lined on each side with a single layer of 13-mm thick Boral Firestop plasterboard sheets. The plasterboard sheeting was screw fixed to the steel studs using 6-gauge x 32-mm long plasterboard screws at nominally 200-mm centres. The wall cavity was filled with a single layer of 50 mm thick Acoustigard 11 insulation. The SNAP 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 which comprised two soft Intumesh intumescent strips lined within the internal circumference of the collar. 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. One fire collar was fixed to each side of the plasterboard wall in a back-to-back configuration using three M4 expandable steel hollow wall anchors with stainless steel washers. The penetrating service comprised a Keyplas uPVC conduit with an outside diameter of 24.9-mm and wall thickness of 1.9-mm, fitted through the collar's sleeve. The conduit penetrated the wall through a 29 mm diameter cut-out hole as shown in drawing titled 'Specimen #1, 25 PVC Conduit Stack & 32R', dated 24 February 2021, by Snap Fire Systems Pty Ltd. The conduit projected horizontally, 2000-mm away from the unexposed face of the wall and approximately 500 mm into the furnace chamber. The conduit was supported at nominally 500 mm and 1500-mm from the unexposed face of the plasterboard wall. The conduit was open on the unexposed end and plugged with ceramic fibre (Superwool) on the exposed end.

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

Structural Adequacy	-	not applicable
Integrity	-	no failure at 91 minutes
Insulation	-	78 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/60/60.

The fire-resistance level is applicable when the system is exposed to fire from either direction. The test was conducted on a wall system with an established FRL of -/60/60. The maximum FRL of any test specimen cannot exceed the FRL achieved by the wall 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: 15 July 2021

Issued on the 27th day of September 2021 without alterations or additions.

Brett Roddy | Manager, Fire Testing and Assessments

COPY OF CERTIFICATE OF TEST – NO. 3601

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. 3602

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
1343 Wynnum Road
Tingalpa QLD

A full description of the test specimen and the complete test results are detailed in the Division's report FSP 2216.

Product Name: SNAP MS70R Multi Service Retrofit fire collars protecting a nominal 32 (42.3-mm OD) PN12 uPVC pipe with 19-mm thick Armaflex fire-rated lagging penetrating a 70-mm diameter aperture (Specimen 2)

Description: The sponsor identified the specimen as retrofit fire collars protecting a steel framed plasterboard wall penetrated by an unplasticized polyvinyl chloride (uPVC) pipe. The plasterboard wall was constructed in accordance with Boral Firestop system SB60.1 with an established fire resistance level (FRL) of -/60/60 as detailed in the document titled "Plasterboard Fire and Acoustic Systems Australia", revision UB1231-SYS 12/18, by USG Boral Building Products Pty Ltd. Construction comprised 64-mm x 0.55-mm steel studs installed at nominally 600-mm centres, lined on each side with a single layer of 13-mm thick Boral Firestop plasterboard sheets. The plasterboard sheeting was screw fixed to the steel studs using 6-gauge x 32-mm long plasterboard screws at nominally 200-mm centres. The wall cavity was filled with a single layer of 50 mm thick Acoustigard 11 insulation. The SNAP MS70R Multi Service Retrofit fire collar comprised a 0.75-mm thick steel casing with a 69-mm inner dia. and a 0.95-mm thick steel base flange with a 162-mm diameter. The 95 mm high collar casing incorporated a 4-mm thick x 90-mm wide x 250-mm long soft Intumesh intumescent wrap lined within the internal circumference of the collar casing. The closing mechanism comprised three stainless steel springs, a nylon fuse link and a 258-mm long x 88-mm wide 316 stainless steel mesh located around the intumescent strip, as shown in drawing 'SNAP 70 Multi Service Retro', dated 23 September 2019, by Snap Fire Systems Pty Ltd. One collar was fixed to each side of plasterboard wall in a back-to-back configuration using three M4 expandable steel hollow wall anchors with stainless steel washers. The penetrating service comprised a Iplex PN12 uPVC 43.2-mm outside dia. pipe, with a wall thickness of 2.2-mm, lagged with 19-mm thick Armaflex FRV nitrile rubber. The lagged pipe was fitted through the collar's sleeve and penetrated wall through a 70-mm dia. cut-out hole as shown in drawing 'Specimen #2 32mm PN12 PVC Pipe with 19mm F/R Lagging & MS70R Collar', dated 24 February 2021, by Snap Fire Systems Pty Ltd. The lagged pipe projected horizontally, 2000-mm away from the unexposed face of the wall and approximately 500 mm into the furnace chamber. The lagged pipe was supported at nominally 500 mm and 1500-mm from the unexposed face of plasterboard wall. The pipe was open on unexposed end and plugged with ceramic fibre (Superwool) on exposed end.

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

Structural Adequacy	-	not applicable
Integrity	-	no failure at 91 minutes
Insulation	-	71 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/60/60.

The fire-resistance level is applicable when the system is exposed to fire from either direction. The test was conducted on a wall system with an established FRL of -/60/60. The maximum FRL of any test specimen cannot exceed the FRL achieved by the wall 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: 15 July 2021

Issued on the 27th day of September 2021 without alterations or additions.

Brett Roddy | Manager, Fire Testing and Assessments

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Certificate of Test

No. 3603

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
1343 Wynnum Road
Tingalpa QLD

A full description of the test specimen and the complete test results are detailed in the Division's report FSP 2216.

Product Name: SNAP 32R Retrofit fire collars protecting a 25-mm uPVC electrical conduit incorporating a 2.5 mm2 3C+E power cable protecting a 29-mm diameter aperture (Specimen 3)

Description: The sponsor identified the specimen as retrofit fire collars protecting a steel framed plasterboard wall penetrated by an unplasticized polyvinyl chloride (uPVC) electrical conduit. The plasterboard wall was constructed in accordance with Boral Firestop system SB60.1 with an established fire resistance level (FRL) of -/60/60 as detailed in the document titled "Plasterboard Fire and Acoustic Systems Australia", revision UB1231-SYS 12/18, by USG Boral Building Products Pty Ltd. Construction comprised 64-mm x 0.55-mm steel studs installed at nominally 600-mm centres, lined on each side with a single layer of 13-mm thick Boral Firestop plasterboard sheets. The plasterboard sheeting was screw fixed to the steel studs using 6-gauge x 32-mm long plasterboard screws at nominally 200-mm centres. The wall cavity was filled with a single layer of 50 mm thick Acoustigard 11 insulation. The SNAP 32R Retrofit fire collar comprised a 0.75-mm steel casing with a 40 mm inner dia. and a 106-mm dia. base flange. The 32-mm high collar casing incorporated a closing mechanism which comprised two soft Intumesh intumescent strips lined within the internal circumference of collar. 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 dia. of 0.15-mm, as shown in drawing "SNAP 32 Retro", dated 5 October 2017, by Snap Fire Systems Pty Ltd. One collar was fixed to each side of wall in a back-to-back configuration using three M4 expandable steel hollow wall anchors with stainless steel washers. Penetrating service comprised a Keyplas PVC conduit with a 24.9-mm outside dia. and a wall thickness of 1.9-mm. The conduit incorporated Electra Cables 2.5 mm2, ordinary duty 3C+E power cable located. The conduit and cable penetrated the wall through a 29-mm dia. cut out hole as shown in drawing 'Specimen #3, 25 PVC Conduit with 2.5-mm^2 3C+E cable Stack & 32R', dated 23 February 2021, by Snap Fire Systems Pty Ltd. The conduit and cable projected horizontally, 2000-mm away from unexposed face of wall and approximately 500 mm into furnace chamber. The conduit was supported at nominally 500-mm and 1500-mm from the unexposed face of the plasterboard wall. The conduit was open on unexposed end and plugged with ceramic fibre (Superwool) on exposed end.

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

Structural Adequacy	-	not applicable
Integrity	-	no failure at 91 minutes
Insulation	-	85 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/60/60.

The fire-resistance level is applicable when the system is exposed to fire from either direction. The test was conducted on a wall system with an established FRL of -/60/60. The maximum FRL of any test specimen cannot exceed the FRL achieved by the wall 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: 15 July 2021

Issued on the 27th day of September 2021 without alterations or additions.

Brett Roddy | Manager, Fire Testing and Assessments

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Certificate of Test

No. 3604

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
1343 Wynnum Road
Tingalpa QLD

A full description of the test specimen and the complete test results are detailed in the Division's report FSP 2216.

Product Name: SNAP 50R Retrofit fire collars protecting a nominal 40 (43.2-mm OD) uPVC pipe incorporating a coupling inside the collar penetrating a 44-mm diameter aperture (Specimen 4)

Description: The sponsor identified the specimen as retrofit fire collars protecting a steel framed plasterboard wall penetrated by an unplasticized polyvinyl chloride (uPVC) pipe. The plasterboard wall was constructed in accordance with Boral Firestop system SB60.1 with an established fire resistance level (FRL) of -/60/60 as detailed in the document titled "Plasterboard Fire and Acoustic Systems Australia", revision UB1231-SYS 12/18, by USG Boral Building Products Pty Ltd. Construction comprised 64-mm x 0.55-mm steel studs installed at nominally 600-mm centres, lined on each side with a single layer of 13-mm thick Boral Firestop plasterboard sheets. The plasterboard sheeting was screw fixed to the steel studs using 6-gauge x 32-mm long plasterboard screws at nominally 200-mm centres. The wall cavity was filled with a single layer of 50 mm thick Acoustigard 11 insulation. The SNAP Retrofit 50R fire collar comprised a 0.75-mm steel casing with a 62 mm inner diameter and a 147-mm diameter base flange. The 47-mm high collar casing incorporated a closing mechanism which comprised two soft Intumesh intumescent wraps lined within the internal circumference of the collar. Intumescent A was 4-mm thick x 43-mm wide x 220-mm long, and Intumescent B was 4 mm thick x 43-mm wide x 200-mm long. Between strips was a layer of 316 grade stainless steel mesh 210-mm long x 42-mm wide with a wire mesh diameter of 0.15 mm, as shown in drawing "SNAP 50 Retro", dated 18 January 2019, by Snap Fire Systems Pty Ltd. One collar was fixed to each side of plasterboard wall in a back-to-back configuration using three M4 expandable steel hollow wall anchors with stainless steel washers. The penetrating service comprised a Iplex DWV uPVC 43.24-mm outside diameter pipe, with a wall thickness of 2.22-mm and a PVC coupling* fitted through the collar's sleeve on exposed face. The pipe penetrated wall through a 44-mm dia. cut-out hole as shown in drawing 'Specimen #4, 40 PVC Stack + Fitting & 50R', dated 24 February 2021, by Snap Fire Systems Pty Ltd. The pipe projected horizontally, 2000-mm away from unexposed face of the wall and approximately 500 mm into furnace chamber. The pipe was supported at nominally 500-mm and 1500-mm from unexposed face of plasterboard wall. The pipe was open on unexposed end and capped with a DWV uPVC endcap on exposed end. * The specimen was asymmetric in construction and has been tested with coupling inside the collar on the exposed face, which is the more onerous orientation, or "weaker direction" as required in Clause 2.9.7 of AS 1530.4 2014.

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

Structural Adequacy	-	not applicable
Integrity	-	no failure at 91 minutes
Insulation	-	85 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/60/60.

The fire-resistance level is applicable when the system is exposed to fire from either direction. The test was conducted on a wall system with an established FRL of -/60/60. The maximum FRL of any test specimen cannot exceed the FRL achieved by the wall 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: 15 July 2021

Issued on the 27th day of September 2021 without alterations or additions.

B. Roddy

Brett Roddy | Manager, Fire Testing and Assessments

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Certificate of Test

No. 3605

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
1343 Wynnum Road
Tingalpa QLD

A full description of the test specimen and the complete test results are detailed in the Division's report FSP 2216.

Product Name: SNAP 50R Retrofit fire collars protecting a nominal 50 (60.4-mm OD) PN12 uPVC pipe penetrating a 64-mm diameter aperture (Specimen 5)

Description: The sponsor identified the specimen as retrofit fire collars protecting a steel framed plasterboard wall penetrated by an unplasticized polyvinyl chloride (uPVC) pipe. The plasterboard wall was constructed in accordance with Boral Firestop system SB60.1 with an established fire resistance level (FRL) of -/60/60 as detailed in the document titled "Plasterboard Fire and Acoustic Systems Australia", revision UB1231-SYS 12/18, by USG Boral Building Products Pty Ltd. Construction comprised 64-mm x 0.55-mm steel studs installed at nominally 600-mm centres, lined on each side with a single layer of 13-mm thick Boral Firestop plasterboard sheets. The plasterboard sheeting was screw fixed to the steel studs using 6-gauge x 32-mm long plasterboard screws at nominally 200-mm centres. The wall cavity was filled with a single layer of 50 mm thick Acoustigard 11 insulation. The SNAP Retrofit 50R fire collar comprised a 0.75-mm steel casing with a 62 mm inner diameter and a 147-mm diameter base flange. The 47-mm high collar casing incorporated a closing mechanism which comprised two soft Intumesh intumescent wraps lined within the internal circumference of the collar. Intumescent A was 4-mm thick x 43-mm wide x 220-mm long, and Intumescent B was 4 mm thick x 43-mm wide x 200-mm long. Between the strips was a layer of 316 grade stainless steel mesh 210-mm long x 42-mm wide with a wire mesh diameter of 0.15 mm, as shown in drawing titled "SNAP 50 Retro", dated 18 January 2019, by Snap Fire Systems Pty Ltd. One collar was fixed to each side of the plasterboard wall in a back-to-back configuration using three M4 expandable steel hollow wall anchors with stainless steel washers. The penetrating service comprised a Iplex PN12 uPVC 60.4-mm outside diameter pipe, with a wall thickness of 3.28-mm fitted through the collar's sleeve and penetrated the wall through a 64 mm diameter cut-out hole as shown in drawing titled 'Specimen #5, 50 PN12 PVC Stack & 50R', dated 24 February 2021, by Snap Fire Systems Pty Ltd. The pipe projected horizontally, 2000-mm away from the unexposed face of the wall and approximately 500 mm into the furnace chamber. The pipe was supported at nominally 500-mm and 1500-mm from the unexposed face of the plasterboard wall. The pipe was open on the unexposed end and plugged with ceramic fibre (Superwool) on the exposed end.

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

Structural Adequacy	-	not applicable
Integrity	-	no failure at 91 minutes
Insulation	-	89 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/60/60.

The fire-resistance level is applicable when the system is exposed to fire from either direction. The test was conducted on a wall system with an established FRL of -/60/60. The maximum FRL of any test specimen cannot exceed the FRL achieved by the wall 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: 15 July 2021

Issued on the 27th day of September 2021 without alterations or additions.

B. Roddy

Brett Roddy | Manager, Fire Testing and Assessments

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Certificate of Test

No. 3606

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
1343 Wynnum Road
Tingalpa QLD

A full description of the test specimen and the complete test results are detailed in the Division's report FSP 2216.

Product Name: SNAP 32R Retrofit fire collars protecting a 25-mm uPVC conduit incorporating optical fibre cables penetrating a 29-mm diameter aperture (Specimen 6)

Description: The sponsor identified the specimen as retrofit fire collars protecting a steel framed plasterboard wall penetrated by an unplasticized polyvinyl chloride (uPVC) electrical conduit. The plasterboard wall was constructed in accordance with Boral Firestop system SB60.1 with an established fire resistance level (FRL) of -/60/60 as detailed in the document titled "Plasterboard Fire and Acoustic Systems Australia", revision UB1231-SYS 12/18, by USG Boral Building Products Pty Ltd. Construction comprised 64-mm x 0.55-mm steel studs installed at nominally 600-mm centres, lined on each side with a single layer of 13-mm thick Boral Firestop plasterboard sheets. The plasterboard sheeting was screw fixed to the steel studs using 6-gauge x 32-mm long plasterboard screws at nominally 200-mm centres. The wall cavity was filled with a single layer of 50 mm thick Acoustigard 11 insulation. The SNAP 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 which comprised two soft Intumesh intumescent strips lined within the internal circumference of the collar. 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. One collar was fixed to each side of the plasterboard wall in a back-to-back configuration using three M4 expandable steel hollow wall anchors with stainless steel washers. The penetrating service comprised a Keyplas uPVC 24.9-mm outside diameter conduit with a wall thickness of 1.9-mm incorporating three Garland optical fibre cables 1x 12F and 2 x 6F optical fibre cables located inside the conduit. The conduit and cables penetrated the wall through a 29 mm diameter cut out hole as shown in drawing titled 'Specimen #6, 25 PVC Conduit with Fibre Optic Cables Stack & 32R', dated 23 February 2021, by Snap Fire Systems Pty Ltd. Both the conduit and cables projected horizontally, 2000-mm away from the unexposed face of the wall and approximately 500 mm into the furnace chamber. The conduit was supported at nominally 500 mm and 1500-mm from the unexposed face of the plasterboard wall. The conduit was open on the unexposed end and plugged with ceramic fibre (Superwool) on the exposed end.

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

Structural Adequacy	-	not applicable
Integrity	-	no failure at 91 minutes
Insulation	-	83 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/60/60.

The fire-resistance level is applicable when the system is exposed to fire from either direction. The test was conducted on a wall system with an established FRL of -/60/60. The maximum FRL of any test specimen cannot exceed the FRL achieved by the wall 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: 15 July 2021

Issued on the 27th day of September 2021 without alterations or additions.

Brett Roddy | Manager, Fire Testing and Assessments

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Certificate of Test

No. 3607

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
1343 Wynnum Road
Tingalpa QLD

A full description of the test specimen and the complete test results are detailed in the Division's report FSP 2216.

Product Name: SNAP 32R Retrofit fire collars protecting a 25-mm uPVC conduit incorporating Category 7 network cables penetrating a 29-mm diameter aperture (Specimen 7)

Description: The sponsor identified the specimen as retrofit fire collars protecting a steel framed plasterboard wall penetrated by an unplasticized polyvinyl chloride (uPVC) electrical conduit. The plasterboard wall was constructed in accordance with Boral Firestop system SB60.1 with an established fire resistance level (FRL) of -/60/60 as detailed in the document titled "Plasterboard Fire and Acoustic Systems Australia", revision UB1231-SYS 12/18, by USG Boral Building Products Pty Ltd. Construction comprised 64-mm x 0.55-mm steel studs installed at nominally 600-mm centres, lined on each side with a single layer of 13-mm thick Boral Firestop plasterboard sheets. The plasterboard sheeting was screw fixed to the steel studs using 6-gauge x 32-mm long plasterboard screws at nominally 200-mm centres. The wall cavity was filled with a single layer of 50 mm thick Acoustigard 11 insulation. The SNAP 32R Retrofit 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 which comprised two soft Intumesh intumescent strips lined within the internal circumference of the collar. 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. One collar was fixed to each side of the plasterboard wall in a back-to-back configuration using three M4 expandable steel hollow wall anchors with stainless steel washers. The penetrating service comprised a Keyplas uPVC 24.9-mm outside diameter conduit with a wall thickness of 1.9-mm incorporating three Belden Category 7 network cables located inside the conduit. The conduit and cables penetrated the wall through a 29 mm diameter cut out hole as shown in drawing titled 'Specimen #7, 25 PVC Conduit with Category 7 Cables Stack & 32R', dated 23 February 2021, by Snap Fire Systems Pty Ltd. The both the conduit and cables projected horizontally, 2000-mm away from the unexposed face of the wall and approximately 500 mm into the furnace chamber. The conduit was supported at nominally 500-mm and 1500-mm from the unexposed face of the plasterboard wall. The conduit was open on the unexposed end and plugged with ceramic fibre (Superwool) on the exposed end.

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

Structural Adequacy	-	not applicable
Integrity	-	no failure at 91 minutes
Insulation	-	74 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/60/60.

The fire-resistance level is applicable when the system is exposed to fire from either direction. The test was conducted on a wall system with an established FRL of -/60/60. The maximum FRL of any test specimen cannot exceed the FRL achieved by the wall 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: 15 July 2021

Issued on the 27th day of September 2021 without alterations or additions.

Brett Roddy | Manager, Fire Testing and Assessments

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Certificate of Test

No. 3608

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
1343 Wynnum Road
Tingalpa QLD

A full description of the test specimen and the complete test results are detailed in the Division's report FSP 2216.

Product Name: SNAP 50R Retrofit fire collars protecting a nominal 2-inch (60.5-mm OD) C-PVC pipe penetrating a 64-mm diameter aperture (Specimen 8)

Description: The sponsor identified the specimen as retrofit fire collars protecting a steel framed plasterboard wall penetrated by a chlorinated polyvinyl chloride (C-PVC) pipe. The plasterboard wall was constructed in accordance with Boral Firestop system SB60.1 with an established fire resistance level (FRL) of -/60/60 as detailed in the document titled "Plasterboard Fire and Acoustic Systems Australia", revision UB1231-SYS 12/18, by USG Boral Building Products Pty Ltd. Construction comprised 64-mm x 0.55-mm steel studs installed at nominally 600-mm centres, lined on each side with a single layer of 13-mm thick Boral Firestop plasterboard sheets. The plasterboard sheeting was screw fixed to the steel studs using 6-gauge x 32-mm long plasterboard screws at nominally 200-mm centres. The wall cavity was filled with a single layer of 50 mm thick Acoustigard 11 insulation. The SNAP Retrofit 50R fire collar comprised a 0.75-mm steel casing with a 62 mm inner diameter and a 147-mm diameter base flange. The 47-mm high collar casing incorporated a closing mechanism which comprised two soft Intumesh intumescent wraps lined within the internal circumference of the collar. Intumescent A was 4-mm thick x 43-mm wide x 220-mm long, and Intumescent B was 4 mm thick x 43-mm wide x 200-mm long. Between the strips was a layer of 316 grade stainless steel mesh 210-mm long x 42-mm wide with a wire mesh diameter of 0.15 mm, as shown in drawing titled "SNAP 50 Retro", dated 18 January 2019, by Snap Fire Systems Pty Ltd. One collar was fixed to each side of the plasterboard wall in a back-to-back configuration using three M4 expandable steel hollow wall anchors with stainless steel washers. The penetrating service comprised a Fesco 2-inch C-PVC 60.5-mm outside diameter pipe, with a wall thickness of 4.98-mm fitted through the collar's sleeve and penetrated the wall through a 64 mm diameter cut-out hole as shown in drawing titled 'Specimen #8, 2in C-PVC Stack & 50R', dated 1 March 2021, by Snap Fire Systems Pty Ltd. The pipe projected horizontally, 2000-mm away from the unexposed face of the wall and approximately 500 mm into the furnace chamber. The pipe was supported at nominally 500-mm and 1500-mm from the unexposed face of the plasterboard wall. The pipe was open on the unexposed end and plugged with ceramic fibre (Superwool) on the exposed end.

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

Structural Adequacy	-	not applicable
Integrity	-	no failure at 91 minutes
Insulation	-	80 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/60/60.

The fire-resistance level is applicable when the system is exposed to fire from either direction. The test was conducted on a wall system with an established FRL of -/60/60. The maximum FRL of any test specimen cannot exceed the FRL achieved by the wall 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: 15 July 2021

Issued on the 27th day of September 2021 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 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.

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