Fire-resistance test on fire collars protecting a Hebel PowerPanel wall penetrated by services

Test Report

Author: Peter Gordon
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Client: IG6 Pty Ltd as trustee for the IG6 IP Trust

Inquiries should be addressed to:

Fire Testing and Assessments	Author	The Client
NATA Registered Laboratory 14 Julius Avenue North Ryde, NSW 2113 Telephone +61 2 9490 5444	Infrastructure Technologies 14 Julius Avenue North Ryde, NSW 2113 Telephone +61 2 9490 5500	IG6 Pty Ltd as trustee for the IG6 IP Trust 3 Skirmish Court Victoria Point Qld 4165 Telephone +61 7 3390 5420

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AUTHOR	REVIEWED BY	AUTHORISED BY
Peter Gordon	Glenn Williams	Brett Roddy
		
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Fire-resistance test on fire collars protecting a Hebel PowerPanel wall penetrated by services

Sponsored Investigation No. FSP 2058

1 Introduction

1.1 Identification of specimen

The sponsor identified the specimen as Snap Retrofit fire collars protecting a 75-mm thick Hebel PowerPanel wall penetrated by five services.

1.2 Sponsor

IG6 Pty Ltd as trustee for the IG6 IP Trust
3 Skirmish Court
Victoria Point Qld 4165

1.3 Manufacturer

Snap Fire Systems Pty Ltd
Building A, 1343 Wynnum Road
Tingalpa QLD 4173

1.4 Test standard

Australian Standard 1530, Methods for fire tests on building materials, components and structures, Part 4-2014, Fire-resistance tests of elements of construction.

Section 10: Service penetrations and control joints

1.5 Reference standard

Australian Standard 4072, Components for the protection of openings in fire-resistant separating elements, Part 1 - 2005, Service penetrations and control joints.

1.6 Test number

CSIRO Reference test number: FS 4931/4462

1.7 Test date

The fire-resistance test was conducted on 7 November 2019.

2 Description of specimen

2.1 General

The specimen comprised an 1150-mm x 1150-mm x 75-mm thick Hebel PowerPanel wall penetrated by five (5) services protected by retro-fitted Snap Fire Systems fire collars.

The wall comprised a 75-mm thick Hebel PowerPanel autoclaved aerated concrete (AAC) wall system with an established fire resistance level (FRL) of -/90/90 as detailed in CSIRO test report FSV 0979.

For the purpose of the test, the specimens were referenced as Specimen 1, 2, 3, 4 and 5. 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 4176.1-2010: Multilayer pipes for pressure applications - Multilayer piping systems for hot and cold water plumbing applications – General;
- AS/NZS 1571 Copper—Seamless tubes for air-conditioning and refrigeration;
- AS/NZS 1477:2017 PVC pipes and fittings for pressure applications and
- AS/NZS 7671:2010 Plastic piping systems for soil and waste discharge (low and high temperature) inside buildings— Polypropylene (PP)

Specimen 1 – SNAP 32R Retrofit fire collar protecting a nominal 16-mm CXL Pex-Al-Pex 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 a 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 collars were surface mounted around the pipe on both the exposed and unexposed face of the wall and fixed through 3 mounting brackets using 14-10 65-mm hex head screws.

The penetrating service comprised a 16-mm CXL Pex-Al-Pex pipe, with a wall thickness of 2.3-mm, penetrating the wall through a 20-mm diameter cut-out hole as shown in drawing titled “Specimen #1, 16mm CXL Pex-Al-Pex Stack & 32R” dated 2 October 2019, provided by Snap Fire Systems Pty Ltd. The pipes 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 Hebel wall. The pipe was open on the unexposed end and capped with a Superwool plug on the exposed end.

Specimen 2 – SNAP 32R Retrofit fire collar protecting a nominal 20-mm Gaspex Pex-Al-Pex 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 collars were surface mounted around the pipe on both the exposed and unexposed face of the wall and fixed through 3 mounting brackets using 14-10 65-mm hex head screws.

The penetrating service comprised a 20-mm GasPex Pex-Al-Pex pipe, with a wall thickness of 2.3-mm, penetrating the wall through a 25-mm diameter cut-out hole as shown in drawing titled "Specimen #2, 20mm CXL Pex-Al-Pex Stack & 32R" dated 2 October 2019, provided by Snap Fire Systems Pty Ltd. The pipes projected horizontally, 2000-mm away from the unexposed face of the wall and approximately 500 mm into the furnace chamber. The pipes were supported at nominally 500-mm and 1500-mm from the unexposed face of the Hebel wall. The pipe was open on the unexposed end and capped with a Superwool plug on the exposed end.

Specimen 3 - SNAP MS70R Multi Services Retrofit fire collar protecting a ¾-in and a ⅜-in Pair Coil pipes, a nominal 25-mm pressure PVC pipe and a 10-mm Electrical cable.

The SNAP Multi Service Retrofit MS70R fire collar comprised a 0.75 mm thick steel casing with a 69-mm inner diameter and a 0.95-mm steel base flange with a 162-mm diameter. The 95-mm high collar casing incorporated a closing mechanism which comprised a soft Intumesh intumescent wraps, 4-mm thick x 90-mm wide x 250-mm long lined within the internal circumference of the collar casing. The closing mechanism comprised three stainless steel springs, with 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 50 Multi Services Retro", dated 23 September, by Snap Fire Systems Pty Ltd. The Snap collars were surface mounted around the pipe on both the exposed and unexposed face of the wall and fixed through 3 mounting brackets using 14-10 65-mm hex head screws.

The penetrating service comprised a cluster of pair coil pipes ¾-in and a ⅜-in copper having a wall thickness of 1-mm and 1.5-mm respectively and both covered with a 10-mm thick crosslinked non fire rated PE foam lagging. Additional services included a 10-mm grey electrical cable (3 core plus Earth) and a 25-mm PVC pressure pipe with a wall thickness of 2.2 mm; which all penetrated the wall through a 64-mm diameter cut-out hole as shown in drawing titled "Specimen #3 ¾-in and a ⅜-in Insulated Copper Pair Coil, 25-mm Pressure PVC, 3 Core Cable + E & MS70R", dated 2 October 2019", provided by Snap Fire Systems Pty Ltd.

The 25-mm pressure PVC conduct projected horizontally 2000-mm away from the unexposed face of the wall and approximately 500 mm into the furnace chamber, and was supported at nominally 500-mm, and 1500-mm from the unexposed face of the wall. The ¾-in and ⅜-in copper lagged pair coil pipes and the electrical cable projected horizontally 500-mm away from the unexposed face of the wall and approximately 500 mm into the furnace chamber and were supported at nominally 500-mm from the wall. The 25-mm pressure PVC pipe was open on the unexposed end and capped with a Superwool plug on the exposed end. The ¾-in and a ⅜-in copper pipes were left open on the unexposed face and crimped closed on the exposed end.

Specimen 4 - SNAP LP50R Retrofit fire collar protecting a nominal 50-mm polypropylene (Triplus) pipe.

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 dated 6 October 2017, by Snap Fire Systems Pty Ltd. The collars were surface mounted around the pipe on both the exposed and unexposed face of the wall and fixed through 3 mounting brackets using 14-10 65-mm hex head screws.

The penetrating service comprised a 50-mm outside diameter polypropylene pipe, with a wall thickness of 2.7-mm which penetrated the wall through a 56-mm diameter cut-out hole as shown in drawing titled "Specimen #4 50mm Valsir Triplus Stack & LP50R", dated 2 October 2019, provided 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 wall. The pipe was open on the unexposed end and capped with a Superwool plug on the exposed end.

Specimen 5 – SNAP LP100R-D Retrofit fire collar protecting a nominal 110-mm polypropylene (Triplus) pipe.

The SNAP Retrofit LP100R-D fire collar comprised a 0.95-mm steel casing with a 118-mm inner diameter and a 260-mm diameter base flange. The 65-mm high collar casing incorporated a closing mechanism that was comprised of a soft Intumesh intumescent strip and wire mesh lined within the internal circumference of the collar casing. The intumescent strip was 5-mm thick x 59-mm wide x 418-mm long with a folded over a layer of 316 stainless steel mesh, 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 collars were surface mounted around the pipe on both the exposed and unexposed face of the wall and fixed through 4 mounting brackets using 14-10 65-mm hex head screws.

The penetrating service comprised a 110-mm outside diameter polypropylene pipe, with a wall thickness of 3.7-mm fitted through the collar's sleeve. The pipe penetrated the wall through a 114-mm diameter opening and 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, as shown in drawing titled "Specimen #5, 110mm Valsir Triplus Stack & LP100R-D", dated 2 October 2019, provided by Snap Fire Systems Pty Ltd. The pipe was open on the unexposed end and plugged on the exposed end with Superwool.

2.2 Dimensions

The wall specimen was 1150-mm wide x 1150-mm high x 75-mm thick. All dimensions are nominal.

2.3 Orientation

The Hebel 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 17 October 2019 and left 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:

- Drawing titled “Test Wall W-19-G Layout”, dated 2 October 2019, by Snap Fire Systems Pty Ltd.
- Drawing titled “Specimen #1, 16mm CXL Pex-Al-Pex Stack & 32R” dated 2 October 2019, by Snap Fire Systems Pty Ltd.
- Drawing titled “Specimen #2, 20mm GasPex Pex-Al-Pex Stack & 32R” dated 2 October 2019, provided by Snap Fire Systems Pty Ltd.
- Drawing titled “Specimen #3 ¾-in and a ⅜-in Insulated Copper Pair Coil, 25 Pressure PVC, 3 Core Cable + E & MS70R”, dated 2 October 2019”, provided by Snap Fire Systems Pty Ltd.
- Drawing titled “Specimen #4, 110 Triplus Stack & 110R”, dated 2 October 2019, provided by Snap Fire Systems Pty Ltd.
- Drawing titled “Specimen #4 50mm Valsir Triplus Stack & LP50R”, dated 2 October 2019, provided by Snap Fire Systems Pty Ltd.
- Drawing titled “Specimen #5, 110mm Valsir Triplus Stack & LP100R-D”, dated 2 October 2019, provided by Snap Fire Systems Pty Ltd.
- Drawing titled “SNAP 32 Retro”, dated 5 October 2017”, by Snap Fire Systems Pty Ltd.
- Drawing titled “SNAP 50 Multi Service Retro”, dated 23 September 2019, 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 2 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 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 29°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 121 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 -	A small quantity of smoke is fluing from the insulation at the end of the ¾-inch copper pair coil pipe of Specimen 3.
2 minutes -	Smoke is fluing from the end of the PVC pipe of Specimen 3.
3 minutes -	Smoke is being emitted between the collar and pipe of Specimen 5.
4 minutes -	Smoke has begun fluing from the end of the pipe of Specimen 2.
5 minutes -	Smoke has ceased fluing from the end of the PVC pipe of Specimen 3.
6 minutes -	The pipe of Specimens 5 has been pushed approximately 40-mm away from the Hebel wall. Photograph 3

7 minutes - Smoke has ceased fluing from the end of the pipe of Specimen 2.

8 minutes - Smoke has ceased being emitted from between the collar and the pipe of Specimen 5.

10 minutes - Light smoke has begun fluing from the end of the pipe of Specimen 5.

12 minutes - The pipe of Specimen 3 has been pushed approximately 25-mm away from the Hebel wall.

21 minutes - Smoke resumes fluing from the insulation at the end of the ¾-inch copper pair coil pipes of Specimen 3.

22 minutes - The insulation at the base of the ¾-inch and ⅜-inch insulated copper pair coil pipes of Specimen 3 has begun to melt and shrink. Thermocouples S19 and S20 measuring the temperature of the ¾-inch and ⅜-inch insulated copper pair coil pipes have detached from the pipe lagging.

38 minutes - Smoke is being emitted between the collar and pipe of Specimen 1.

58 minutes - Thermocouple #20 was pressed against the insulation of the ¾-inch insulated copper pair coil. A maximum temperature reading of 163°C was recorded.

69 minutes - Thermocouple #20 was pressed against the insulation of the ¾-inch insulated copper pair coil. A maximum temperature of reading of 171° C was recorded.

89 minutes - Thermocouple #20 was pressed against the insulation of the ¾-inch insulated copper pair coil. A maximum temperature reading of 205° C was recorded.

99 minutes - Insulation Failure of Specimen 3 – maximum temperature rise of 180K is exceeded on the ¾-inch insulated copper pair coil pipes, 25-mm from the collar of Specimen 3.

121 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.

8.5 Performance

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

Specimen 1 – SNAP 32R Retrofit fire collar protecting a nominal 16-mm CXL Pex-Al-Pex pipe.

Structural adequacy	-	not applicable
Integrity	-	no failure at 121 minutes
Insulation	-	no failure at 121 minutes

Specimen 2 – SNAP 32R Retrofit fire collar protecting a nominal 20-mm Gaspex Pex-Al-Pex pipe.

Structural adequacy	-	not applicable
Integrity	-	no failure at 121 minutes
Insulation	-	no failure at 121 minutes

Specimen 3 - SNAP MS70R Multi Services Retrofit fire collar protecting ¾-in and a ⅜-in Pair Coil lagged copper pipes, a nominal 25-mm pressure PVC pipe and a 10-mm electrical cable.

Structural adequacy	-	not applicable
Integrity	-	no failure at 121 minutes
Insulation	-	99 minutes

Specimen 4 - SNAP LP50R Retrofit fire collar protecting a nominal 50-mm polypropylene (Triplus) pipe.

Structural adequacy	-	not applicable
Integrity	-	no failure at 121 minutes
Insulation	-	no failure at 121 minutes

Specimen 5 – SNAP LP100R-D Retrofit fire collar protecting a nominal 110-mm polypropylene (Triplus) pipe.

Structural adequacy	-	not applicable
Integrity	-	no failure at 121 minutes
Insulation	-	no failure at 121 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

Specimen 5 - -/90/90

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 -/90/90. 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 10.11 of AS 1530.4-2014, have been made provided no individual component is removed or reduced.

11 Tested by

Peter Gordon
Testing Officer

Appendices

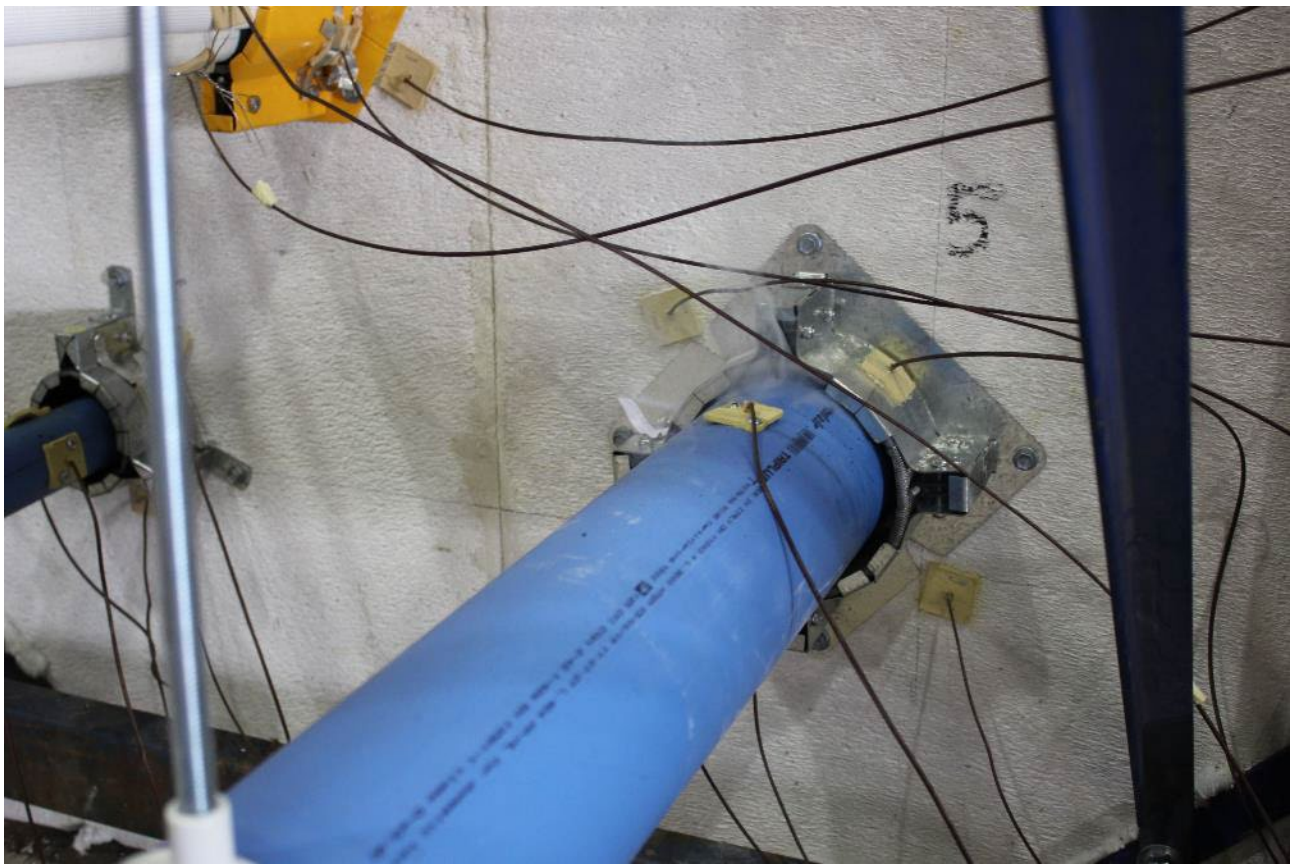
Appendix A – Measurement location

SPECIMEN	THERMOCOUPLE POSITION	DESIGNATION
Specimen 1 – 16-mm OD CXL Pex-Al-Pex pipe with a wall thickness of 2.3-mm protected with Snap 32R Fire collars retro-fitted to both sides of the wall through a 20-mm opening.	On Hebel wall, 25-mm above collar	S1
	On Hebel wall, 25-mm below collar	S2
	On collar left side	S3
	On collar right side	S4
	On top of pipe, 25-mm from collar	S5
	On bottom of pipe, 25-mm from collar	S6
Specimen 2 – 20-mm OD Gaspex Pex-Al-Pex pipe with a wall thickness of 2.3-mm protected with Snap 32R Fire collars retro-fitted to both sides of the wall through a 25-mm opening.	On Hebel wall, 25-mm above collar	S7
	On Hebel wall, 25-mm below collar	S8
	On collar left side	S9
	On collar right side	S10
	On top of pipe, 25-mm from collar	S11
	On bottom of pipe, 25-mm from collar	S12
Specimen 3 – A cluster two lagged copper pair coil pipes ¾-in and a ⅜-in copper pipes, a 10-mm grey electrical cable (3 core +E) and a 25-mm PVC pressure pipe protected with Snap MS70R Fire collars retro-fitted to both sides of the wall through a 65-mm opening.	On Hebel wall, 25-mm above collar	S13
	On Hebel wall, 25-mm right of collar	S14
	On collar top	S15
	On collar right side	S16
	On PVC pipe, 25-mm from collar	S17
	On 3 Core Cable + E, 25-mm from collar	S18
	On ⅜-in Insulated Copper Pair Coil 25-mm from collar	S19
	On ¾-in Insulated Copper Pair Coil 25-mm from collar	S20
Specimen 4 – 50-mm OD Triplus pipe (polypropylene) having a wall thickness of 2.7-mm protected with Snap LP50R Fire collars retro-fitted to both sides of the wall through a 56-mm opening.	On Hebel wall, 25-mm above collar	S21
	On Hebel wall, 25-mm below collar	S22
	On collar left side	S23
	On collar right side	S24
	On top of pipe, 25-mm from collar	S25
	On pipe, right side 25-mm from collar	S26
Specimen 5 – 110-mm OD Triplus pipe (polypropylene) having a wall thickness of 3.7-mm protected with Snap LP100R-D fire collars retro-fitted to both sides of the wall through a 114-mm opening.	On Hebel wall, 25-mm above collar	S27
	On Hebel wall, 25-mm below collar	S28
	On collar top side	S29
	On collar bottom side	S30
	On top of pipe, 25-mm from collar	S31
	On pipe left side, 25-mm from collar	S32
Rover and Ambient	Rover S33, Ambient S34	S33 & 34

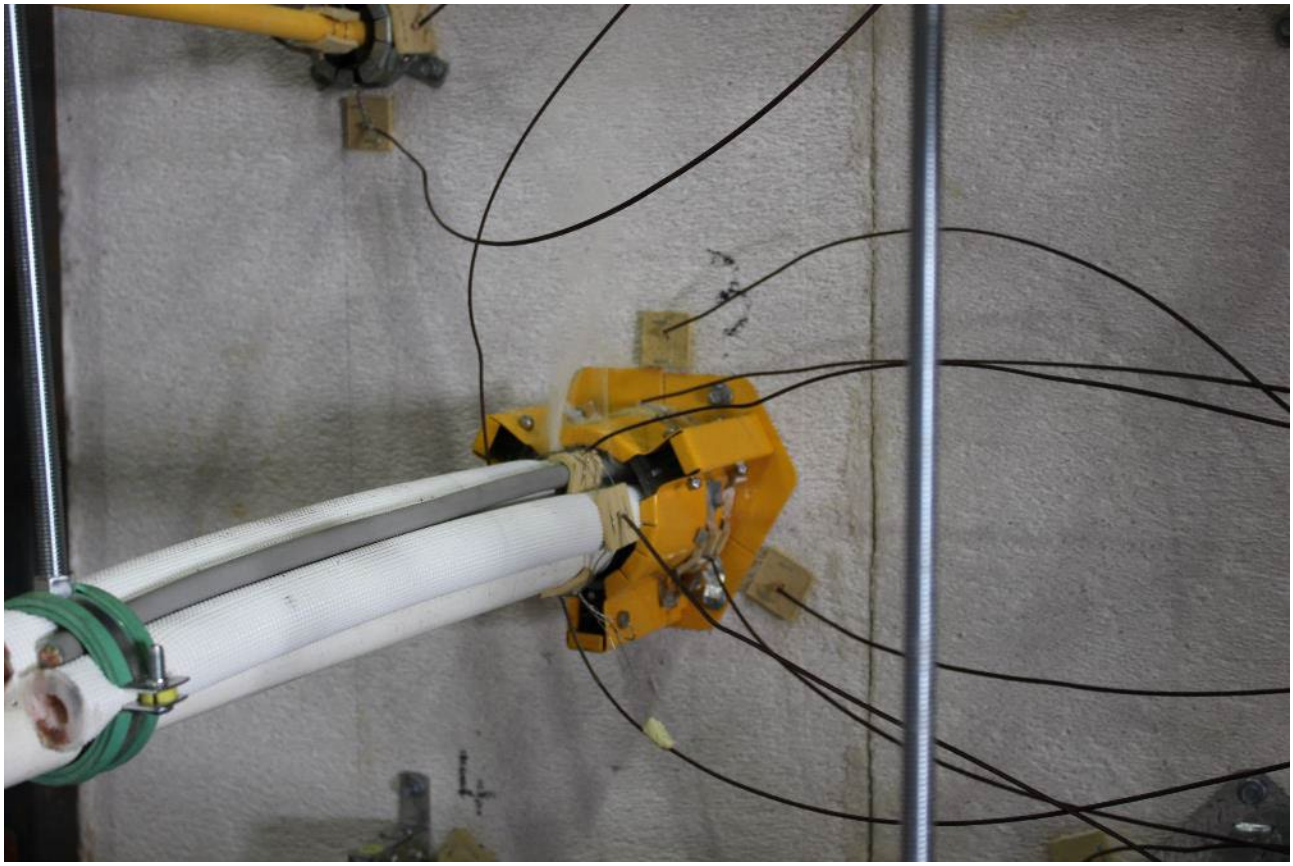
Appendix B – Photographs

PHOTOGRAPH 1 – EXPOSED FACE OF SPECIMENS PRIOR TO TESTING

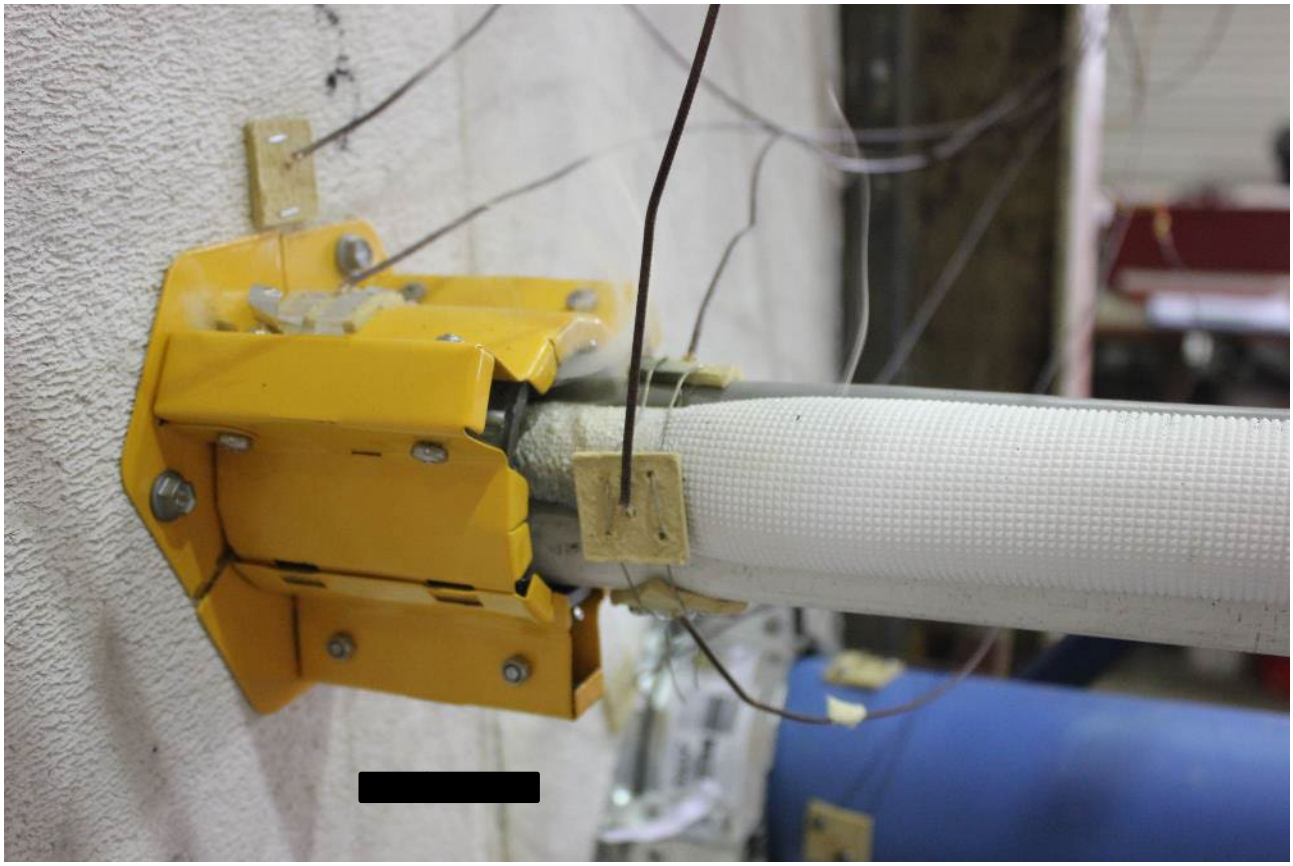
PHOTOGRAPH 2 – UNEXPOSED FACE OF SPECIMENS PRIOR TO TESTING



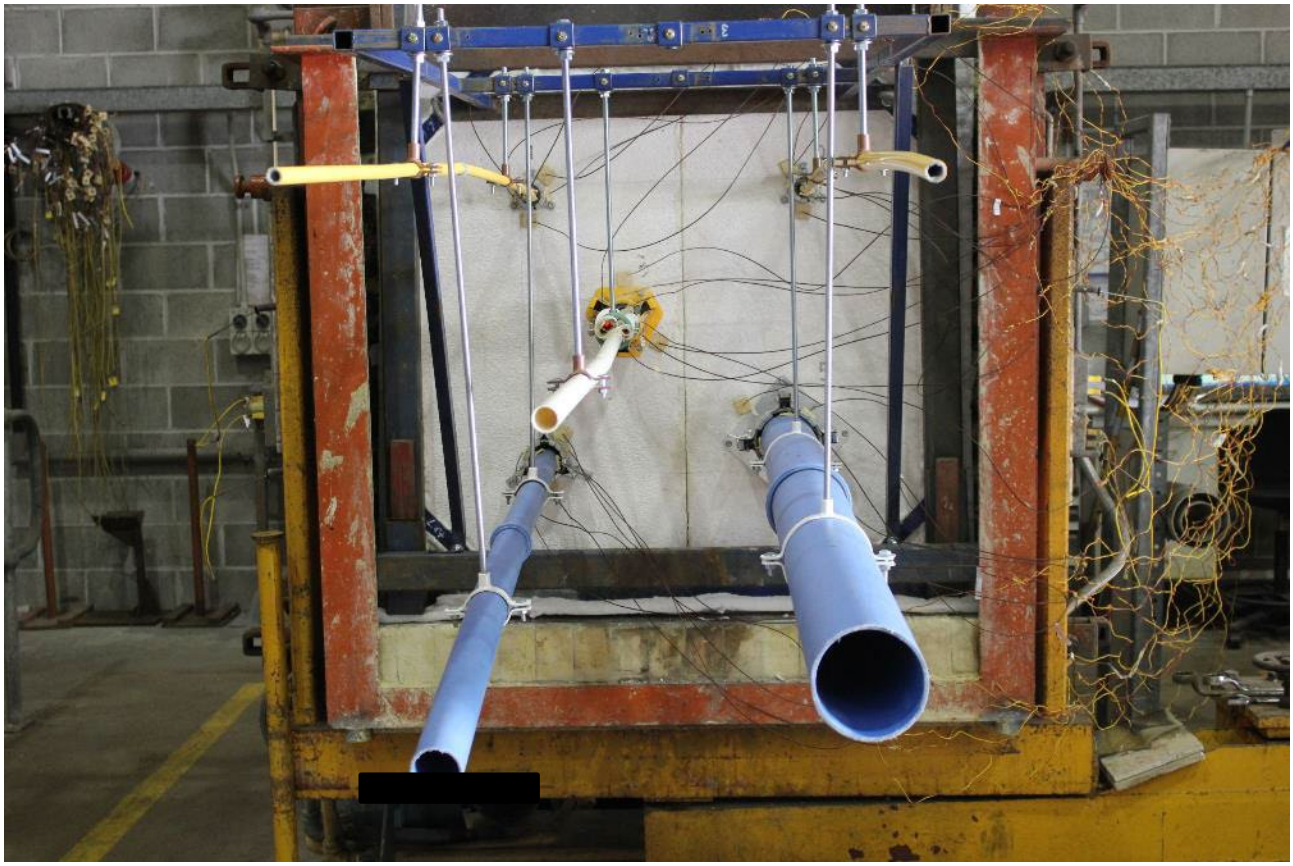
PHOTOGRAPH 3 – SPECIMEN 5 AFTER 5 MINUTES OF TESTING



PHOTOGRAPH 4 – SPECIMEN 3 AFTER 20 MINUTES OF TESTING

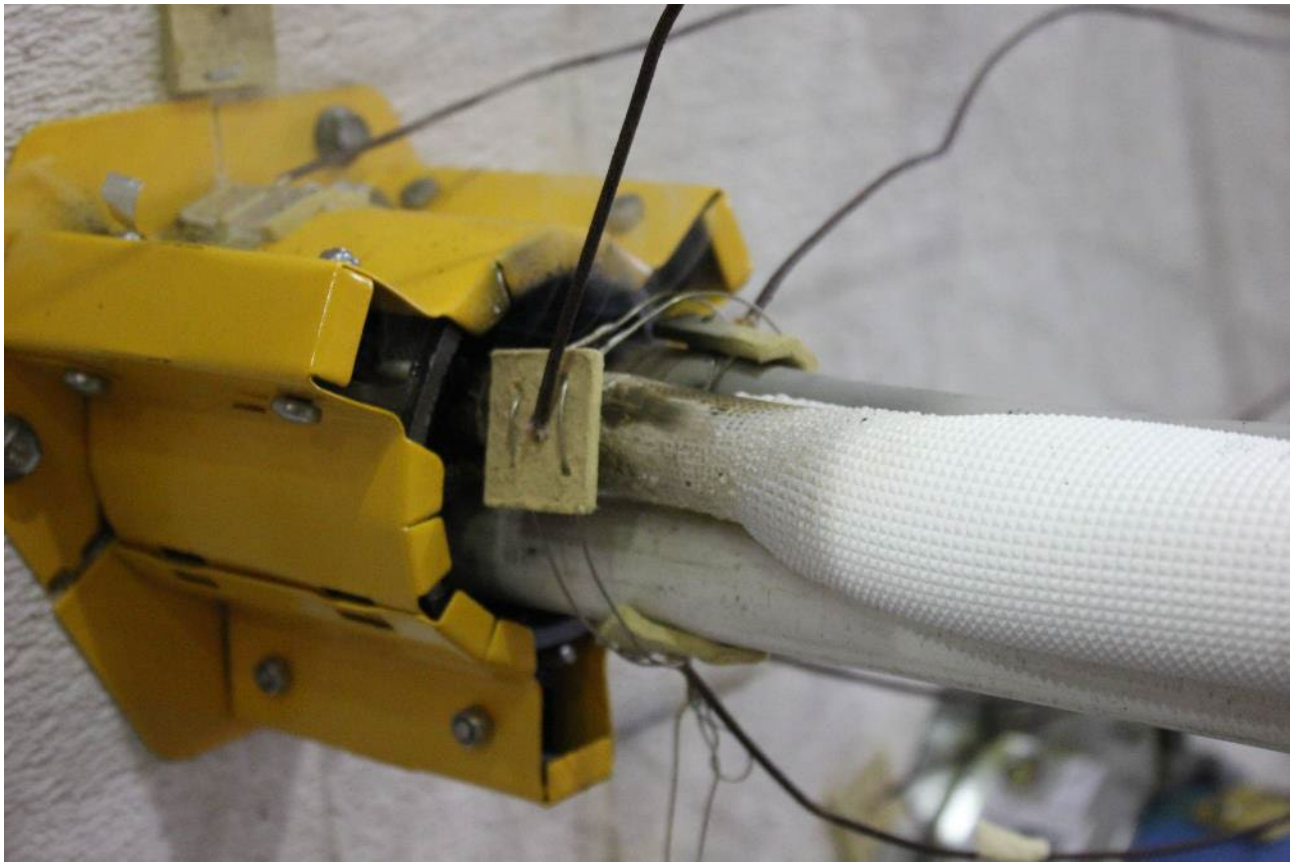


PHOTOGRAPH 5 – SPECIMEN 3 AFTER 26 MINUTES OF TESTING

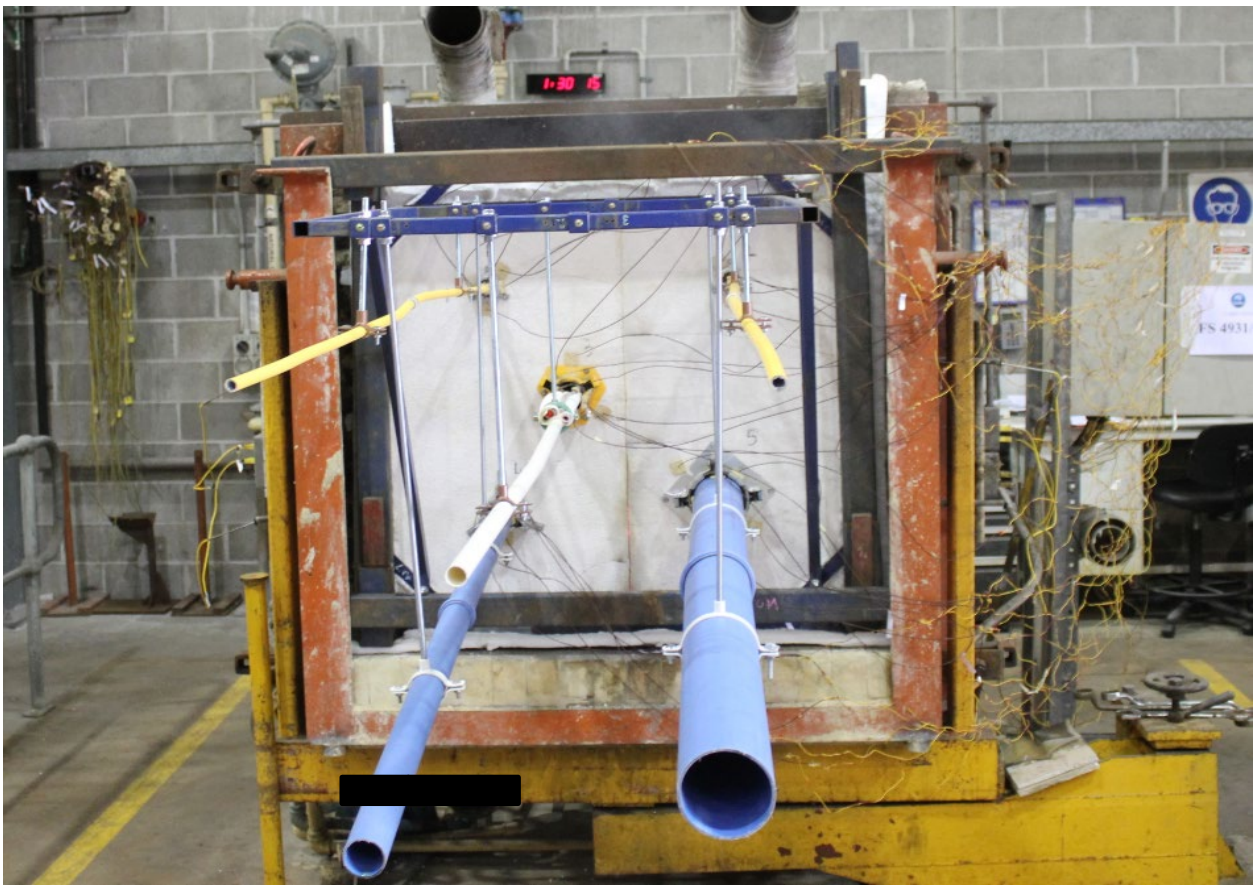


PHOTOGRAPH 6 – SPECIMENS AFTER 30 MINUTES OF TESTING

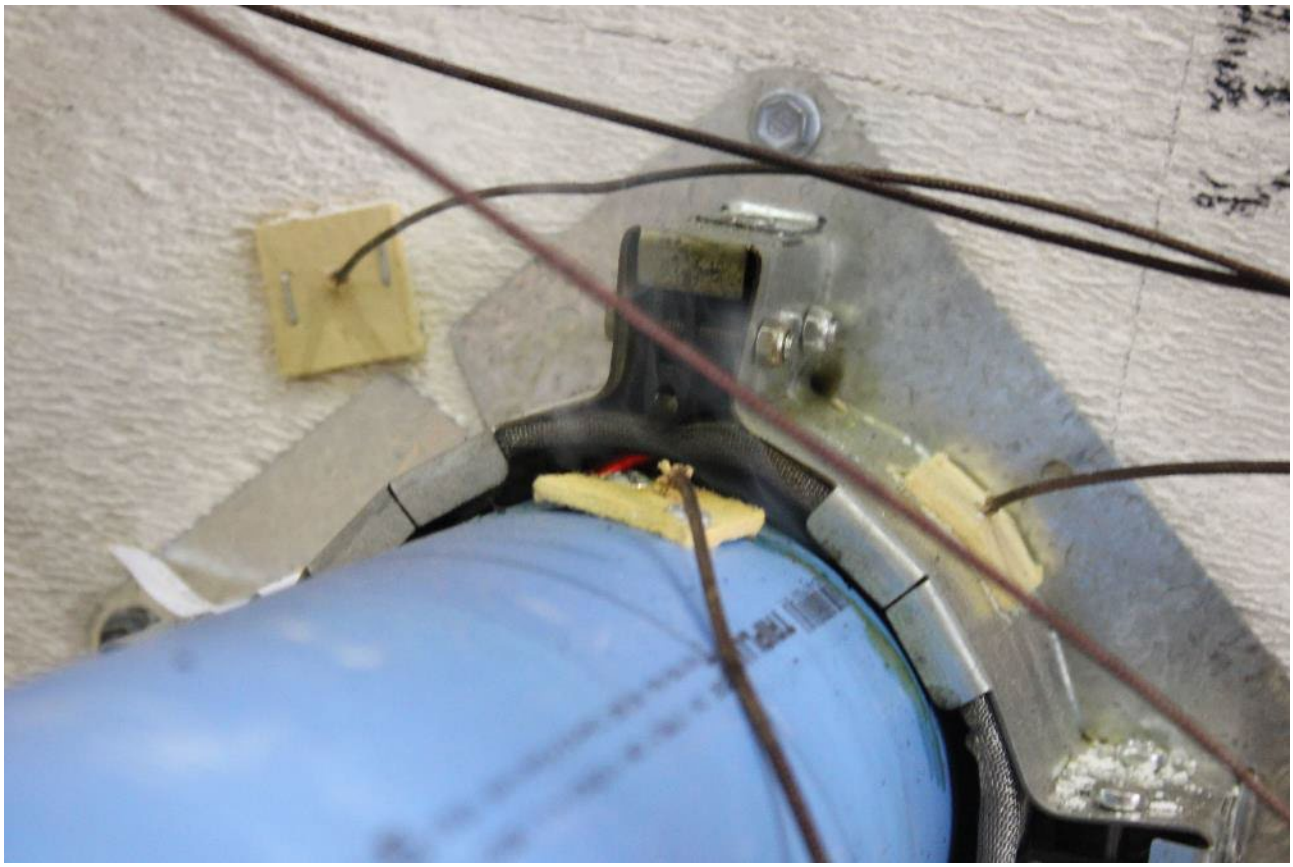
PHOTOGRAPH 7 – SPECIMENS AFTER 60 MINUTES OF TESTING



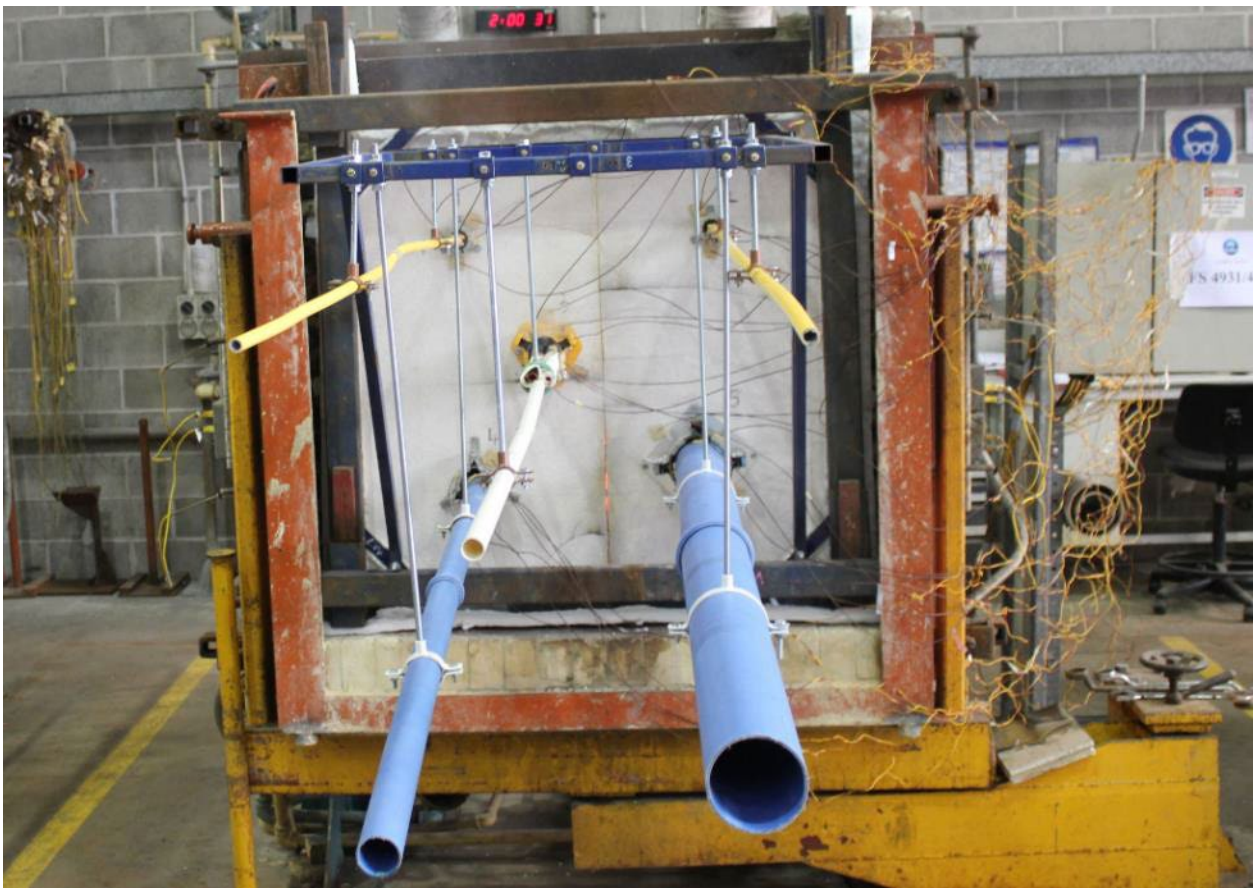
PHOTOGRAPH 8 – SPECIMEN 3 AFTER 76 MINUTES OF TESTING



PHOTOGRAPH 9 – SPECIMENS AFTER 90 MINUTES OF TESTING

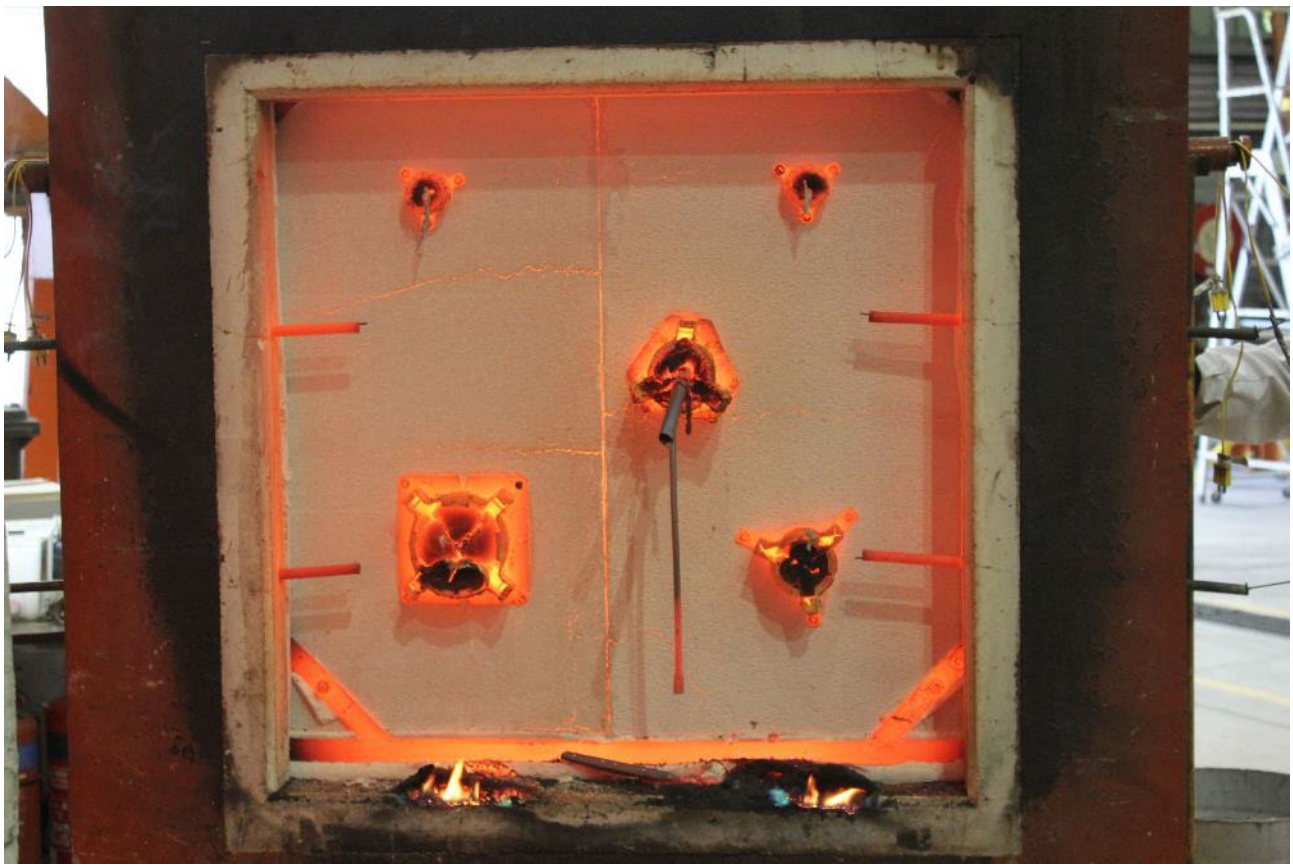


PHOTOGRAPH 10 – SPECIMEN 5 AFTER 119 MINUTES OF TESTING



PHOTOGRAPH 11 – SPECIMENS AFTER 120 MINUTES OF TESTING

PHOTOGRAPH 12 – SPECIMENS AT CONCLUSION OF TESTING



PHOTOGRAPH 13 – EXPOSED FACE OF SPECIMENS AT CONCLUSION OF TESTING

Appendix C – Furnace Temperature

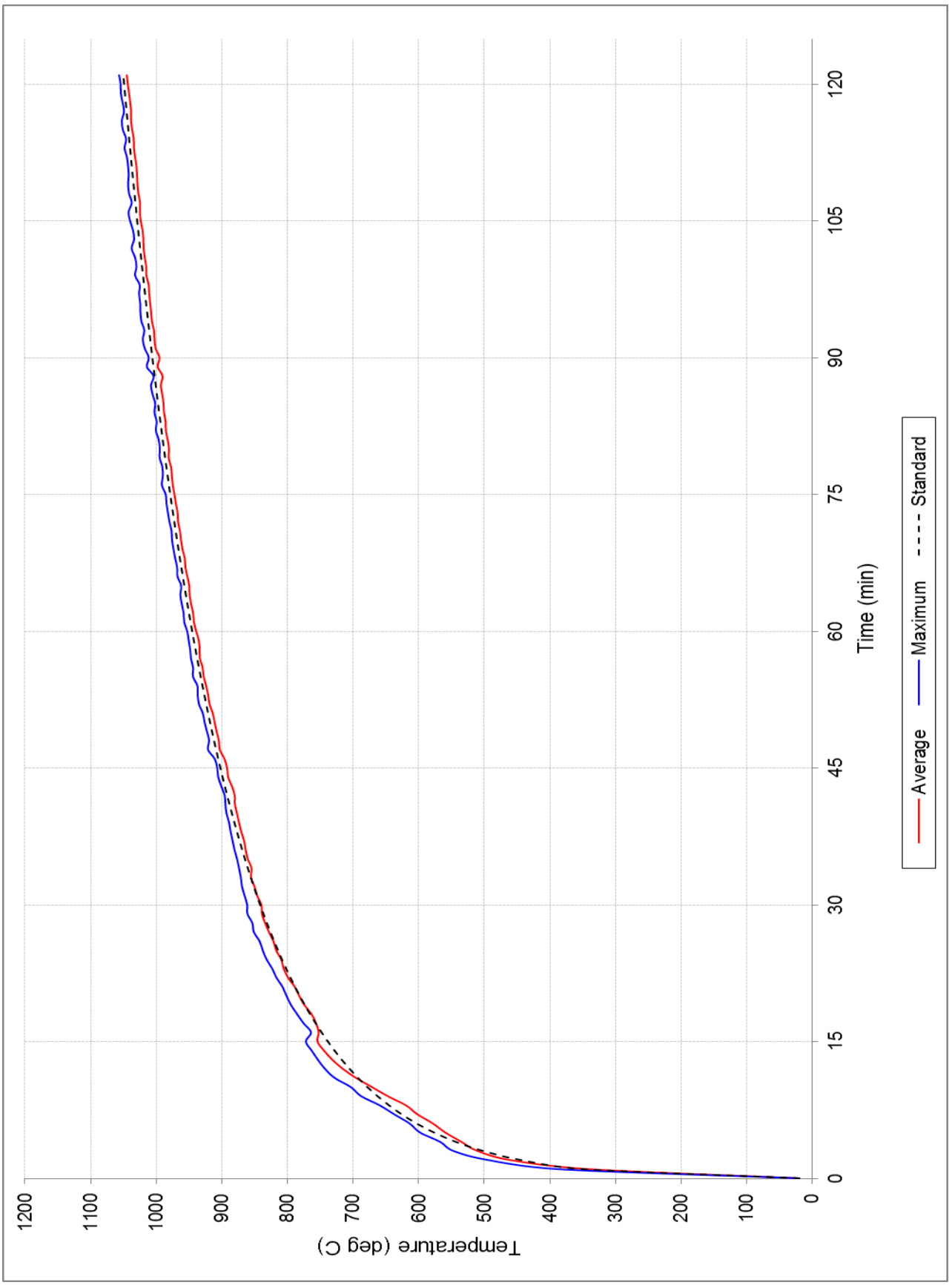


FIGURE 1 – FURNACE TEMPERATURE

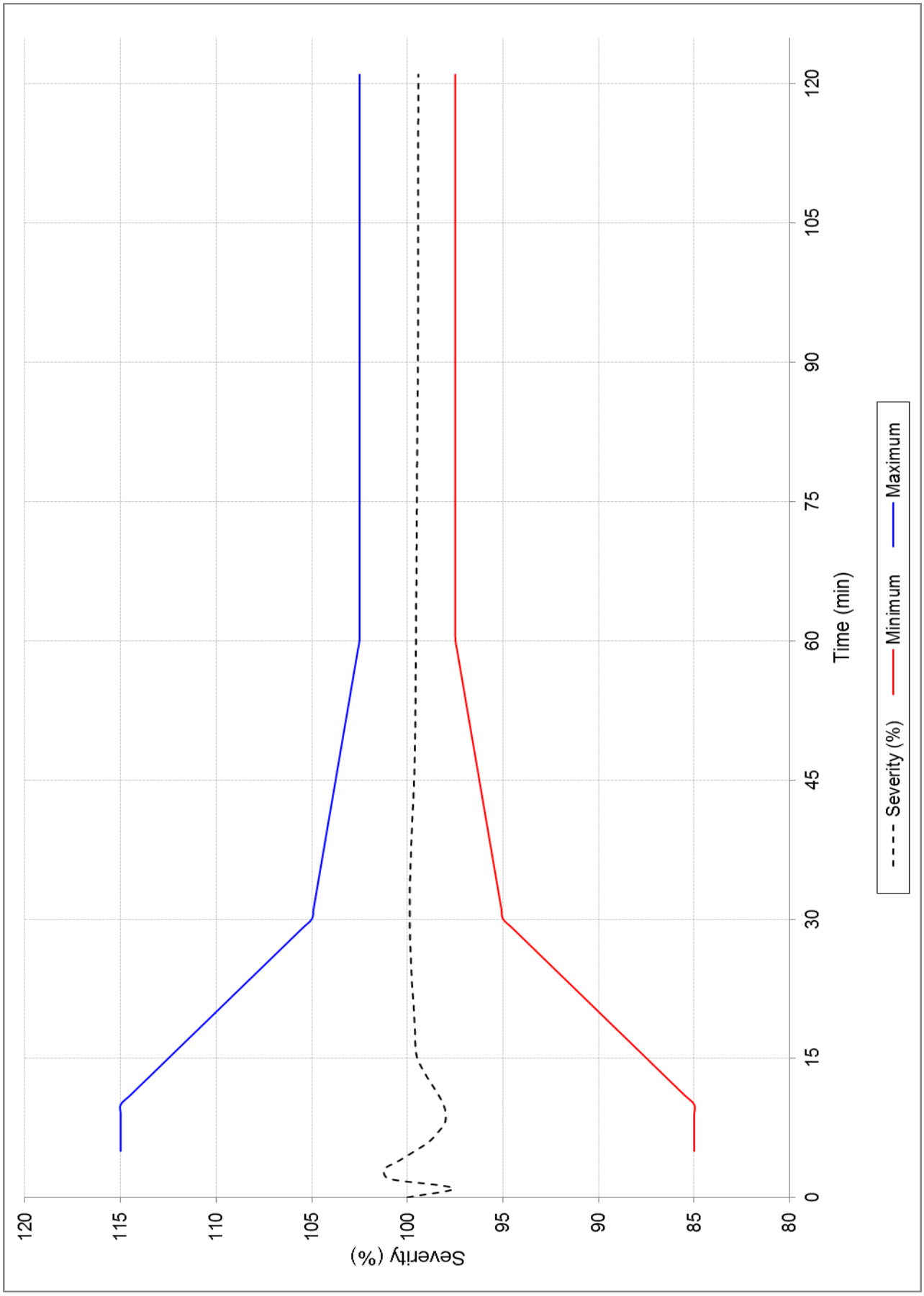


FIGURE 2 – FURNACE SEVERITY

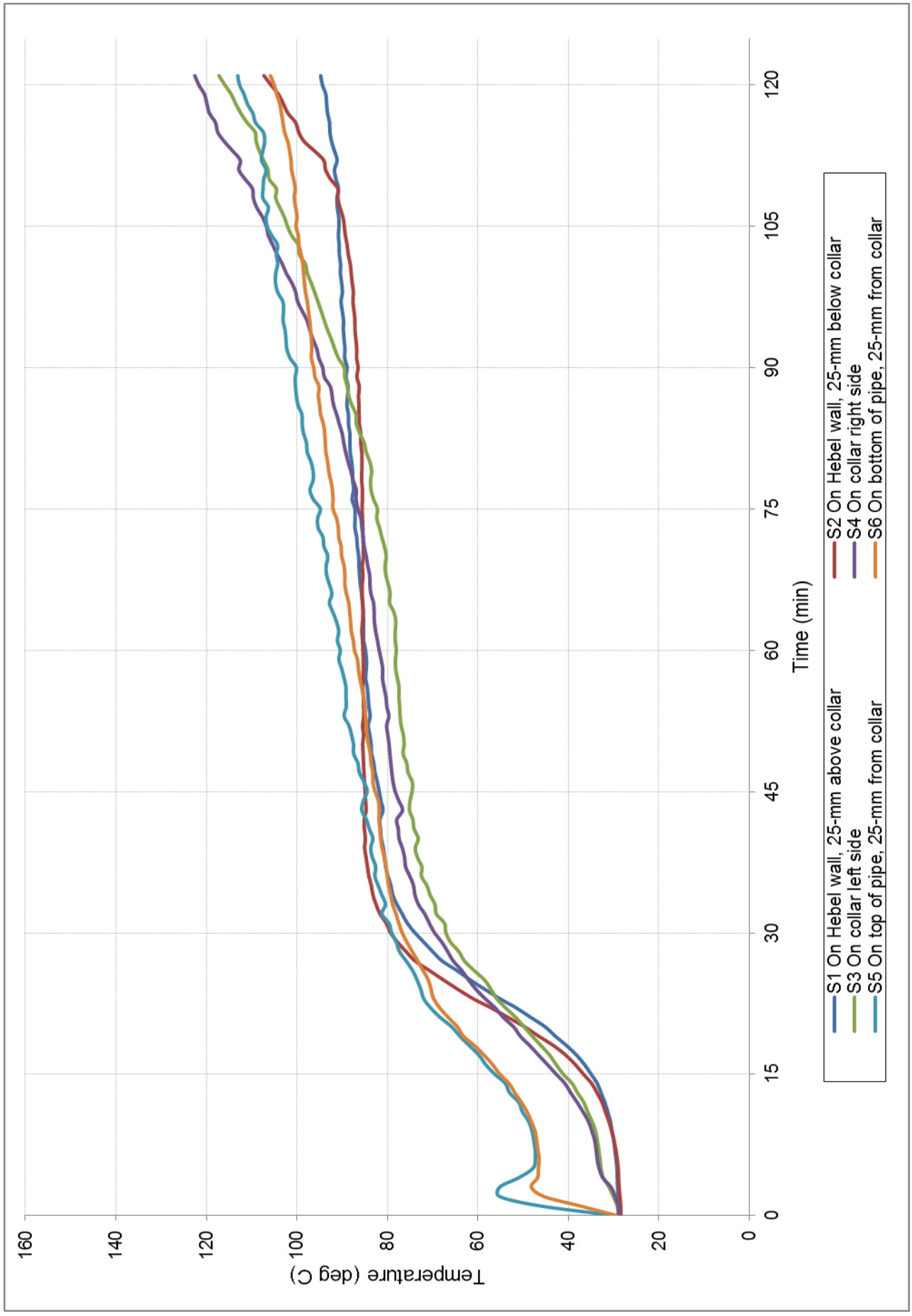


FIGURE 3 - TEMPERATURE VERSUS TIME ASSOCIATED WITH SPECIMEN # 1

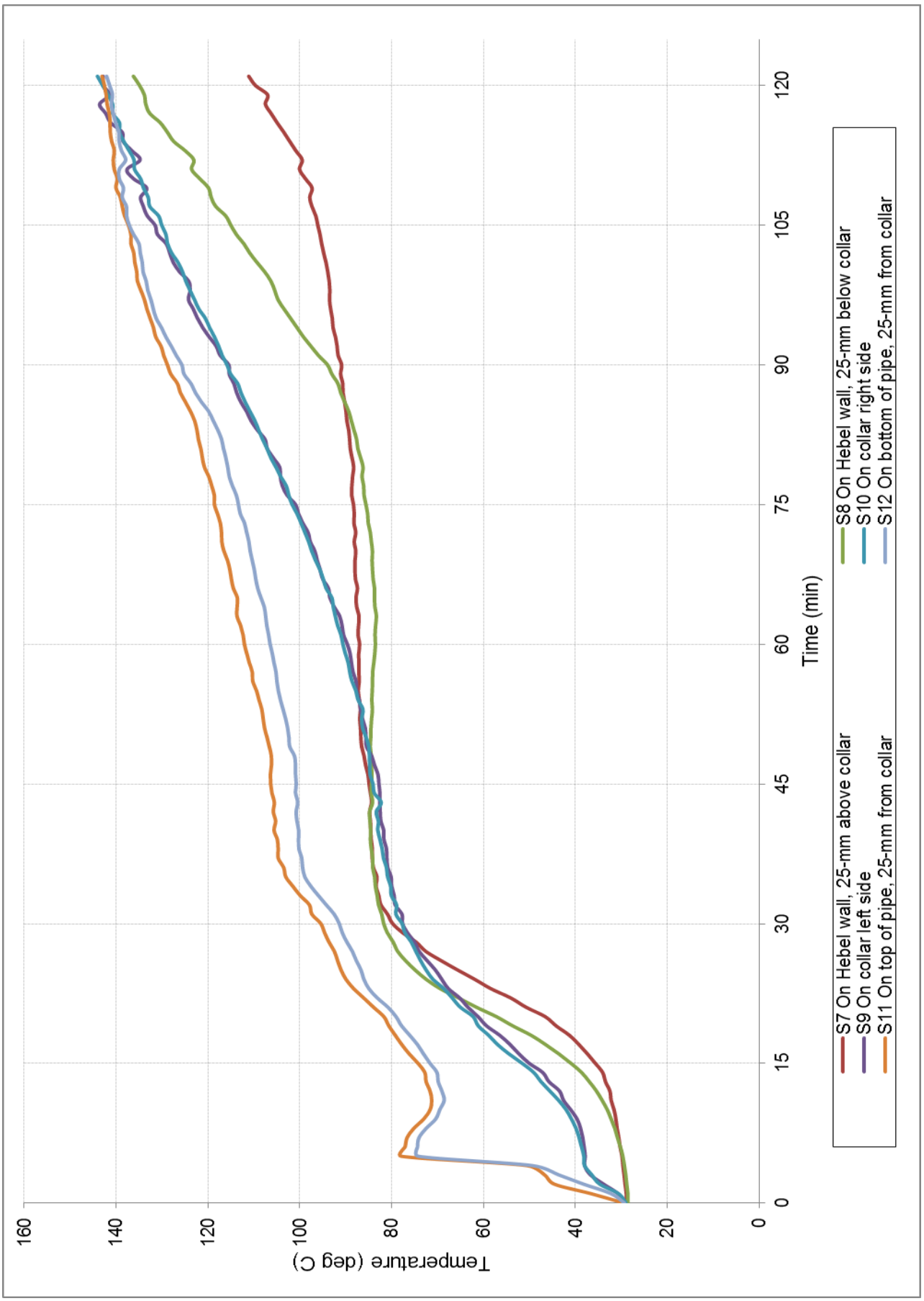


FIGURE 4 - TEMPERATURE VERSUS TIME ASSOCIATED WITH SPECIMEN # 2

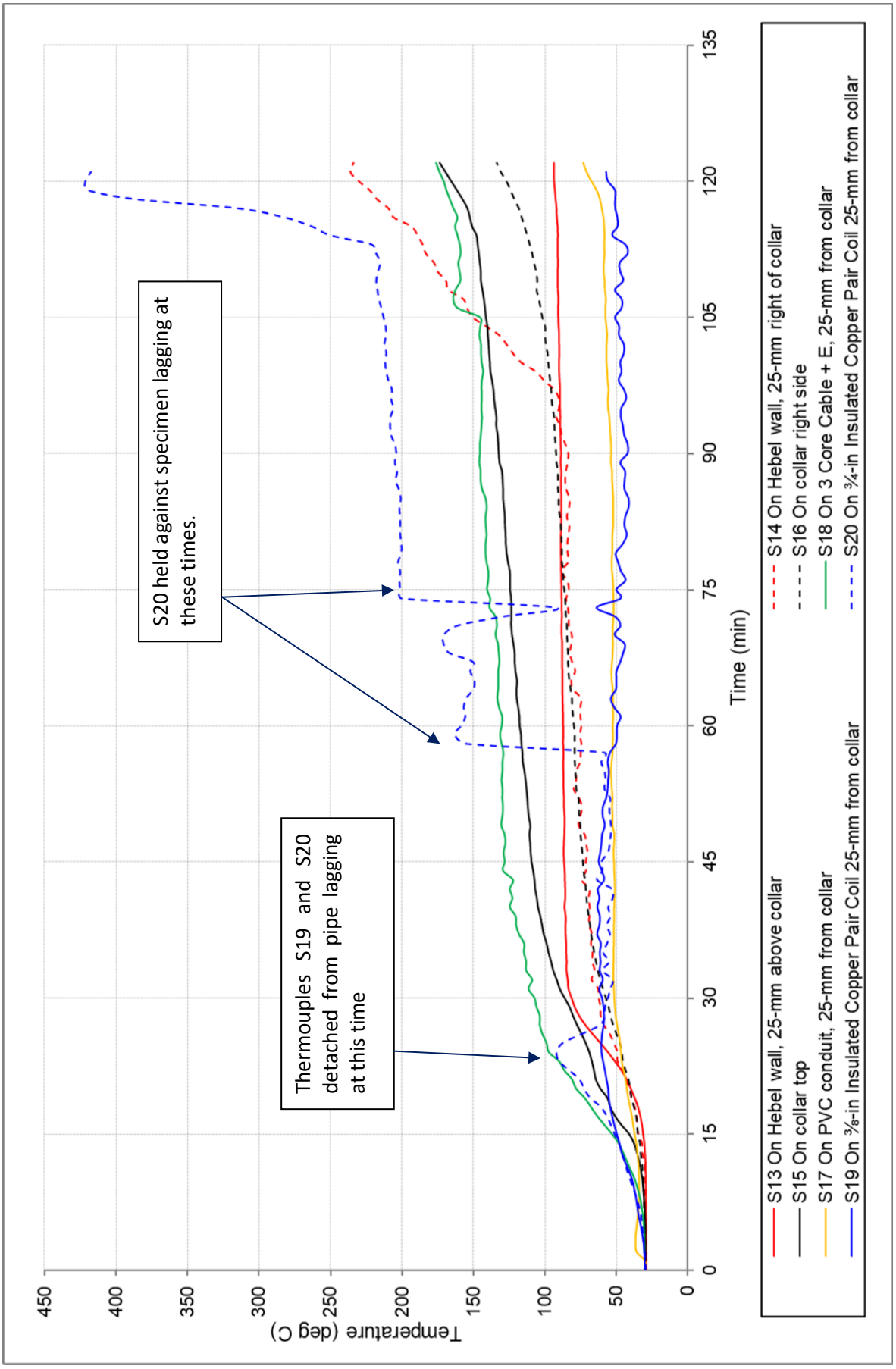


FIGURE 5 - TEMPERATURE VERSUS TIME ASSOCIATED WITH SPECIMEN # 3

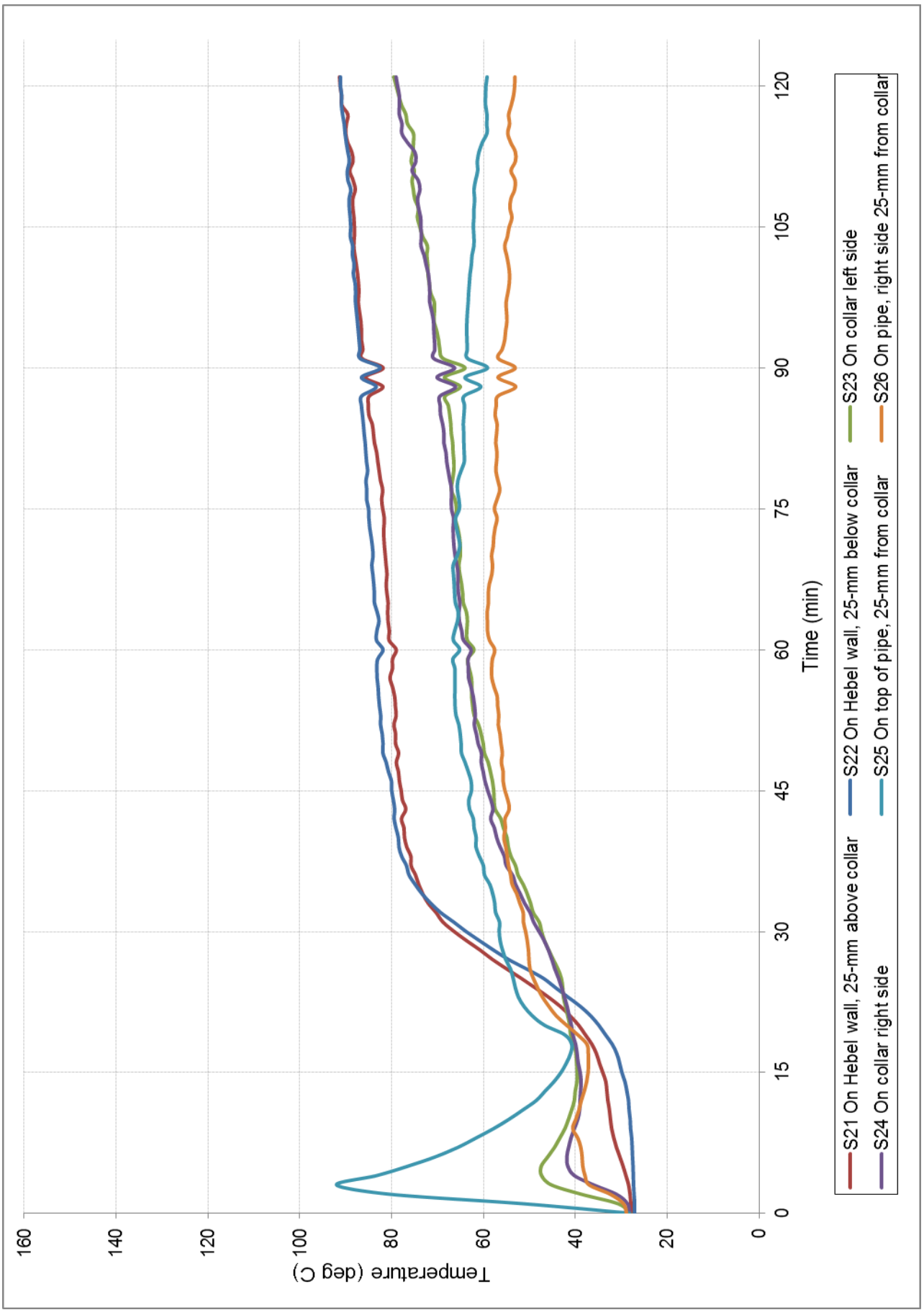


FIGURE 6 - TEMPERATURE VERSUS TIME ASSOCIATED WITH SPECIMEN # 4

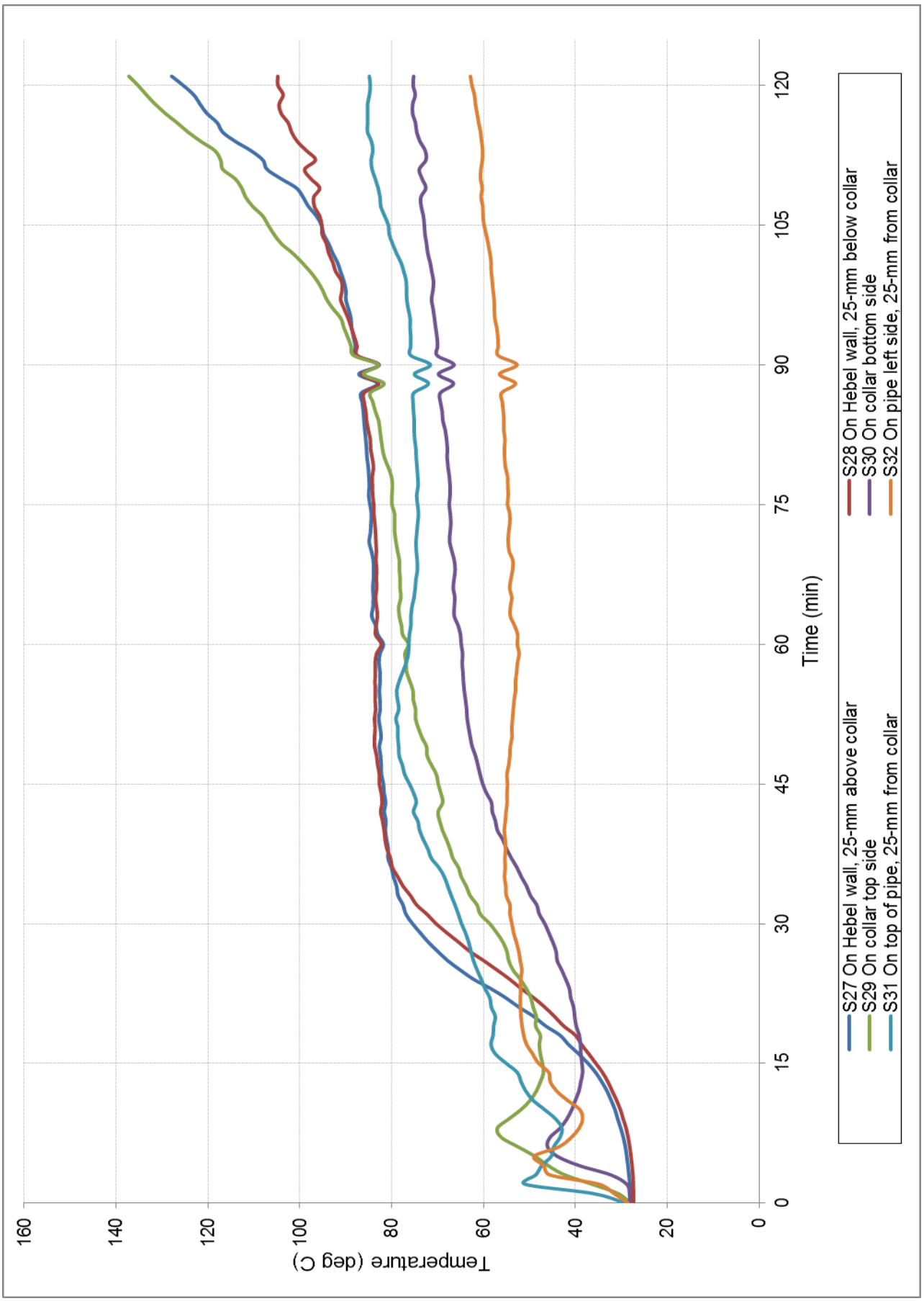
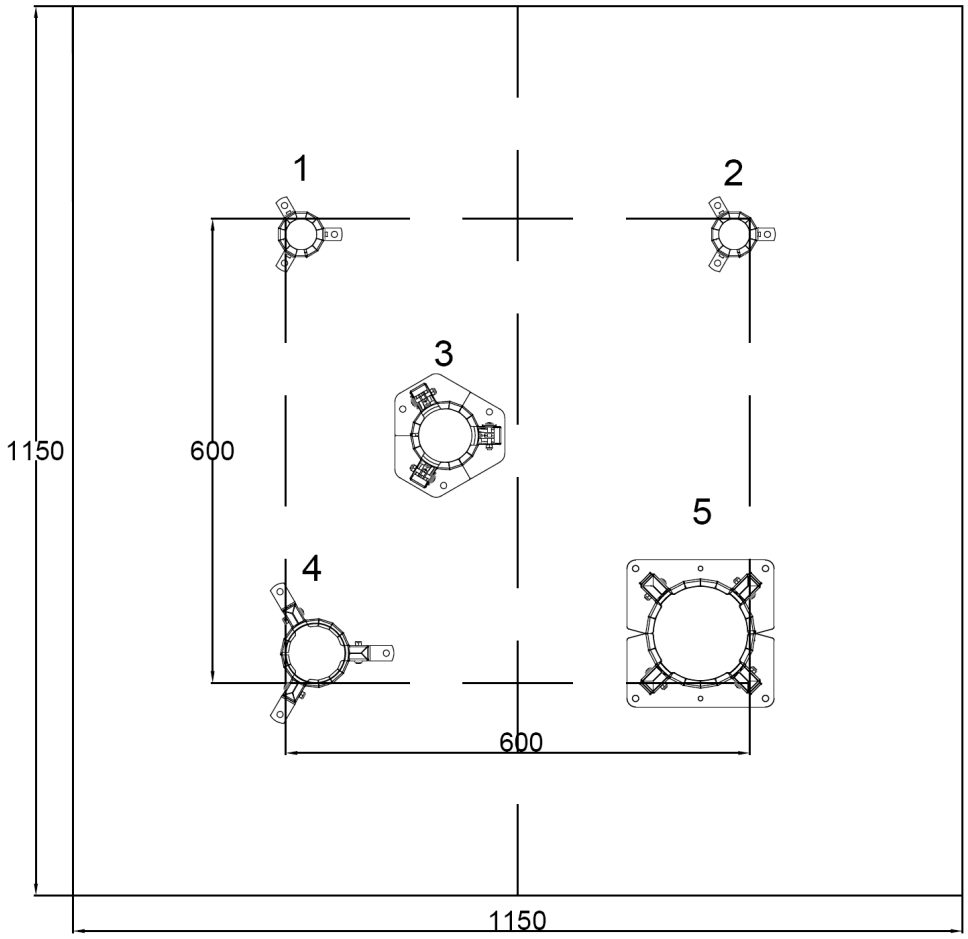


FIGURE 7 - TEMPERATURE VERSUS TIME ASSOCIATED WITH SPECIMEN # 5

Appendix D – Layout and installation drawings

Snap Fire Systems Pty Ltd
Test Slab W-19-G Layout
Date: 02 OCT 2019



Penetration	Collar Code	Pipe Type	Pipe Diameter (mm)	Fitting
1	32R	CXL Pex-Al-Pex	16	N/A
2	32R	GasPex Pex-Al-Pex	20	N/A
3	MS70R	Pair Coil + Pressure PVC + Cable	¾ & ⅜ Pair Coil, 25mm Pipe, 2.5mm² 3C+E Cable	N/A
4	LP50R	Triplus	50	N/A
5	LP100R-D	Triplus	110	N/A

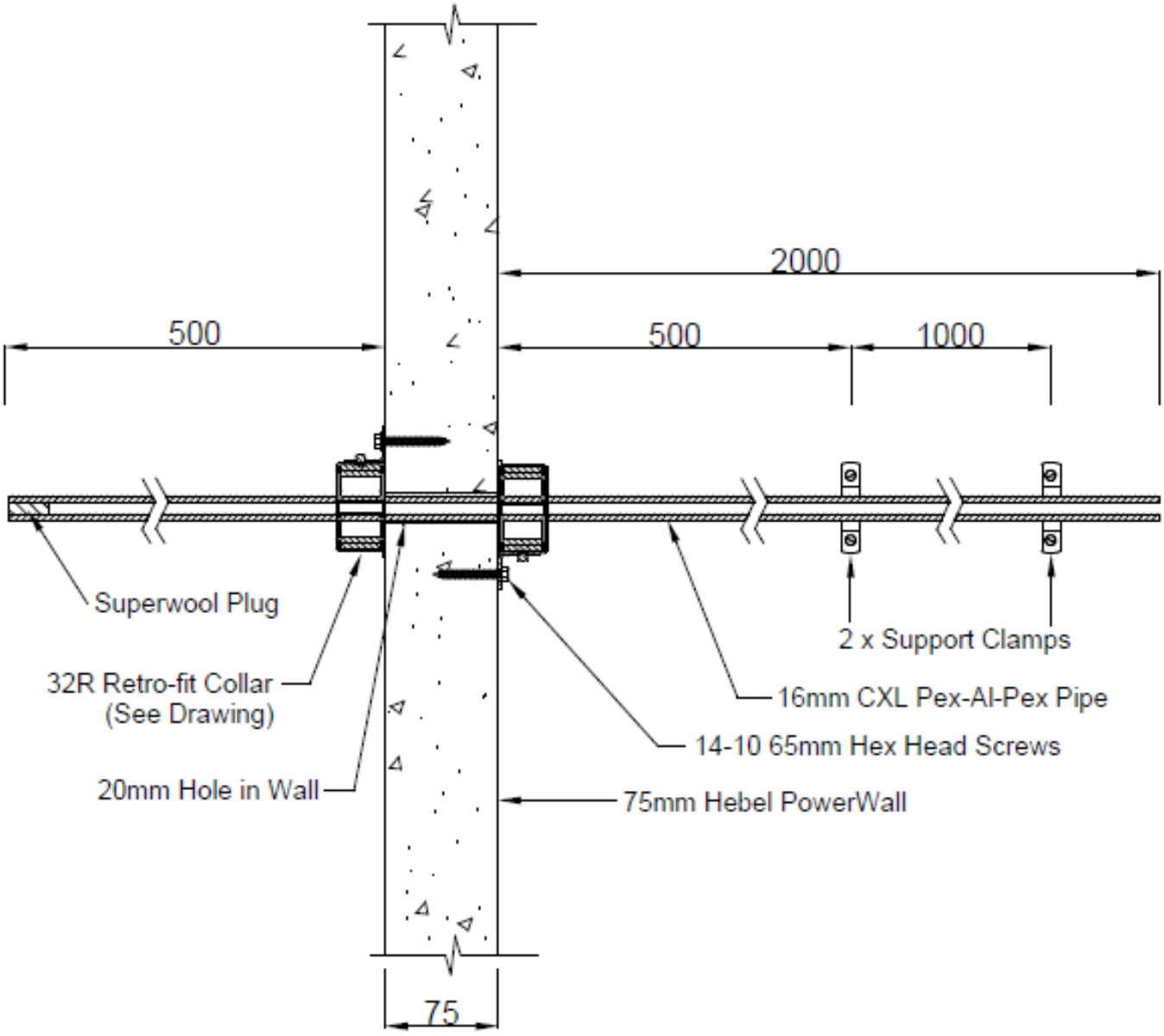
DRAWING TITLED "TEST WALL W-19-G LAYOUT, DATED 2 OCTOBER 2019, PROVIDED BY SNAP FIRE SYSTEMS PTY LTD.

Snap Fire Systems Pty Ltd

Specimen #1

16mm CXL Pex-Al-Pex Stack & 32R

Date: 02 OCT 2019



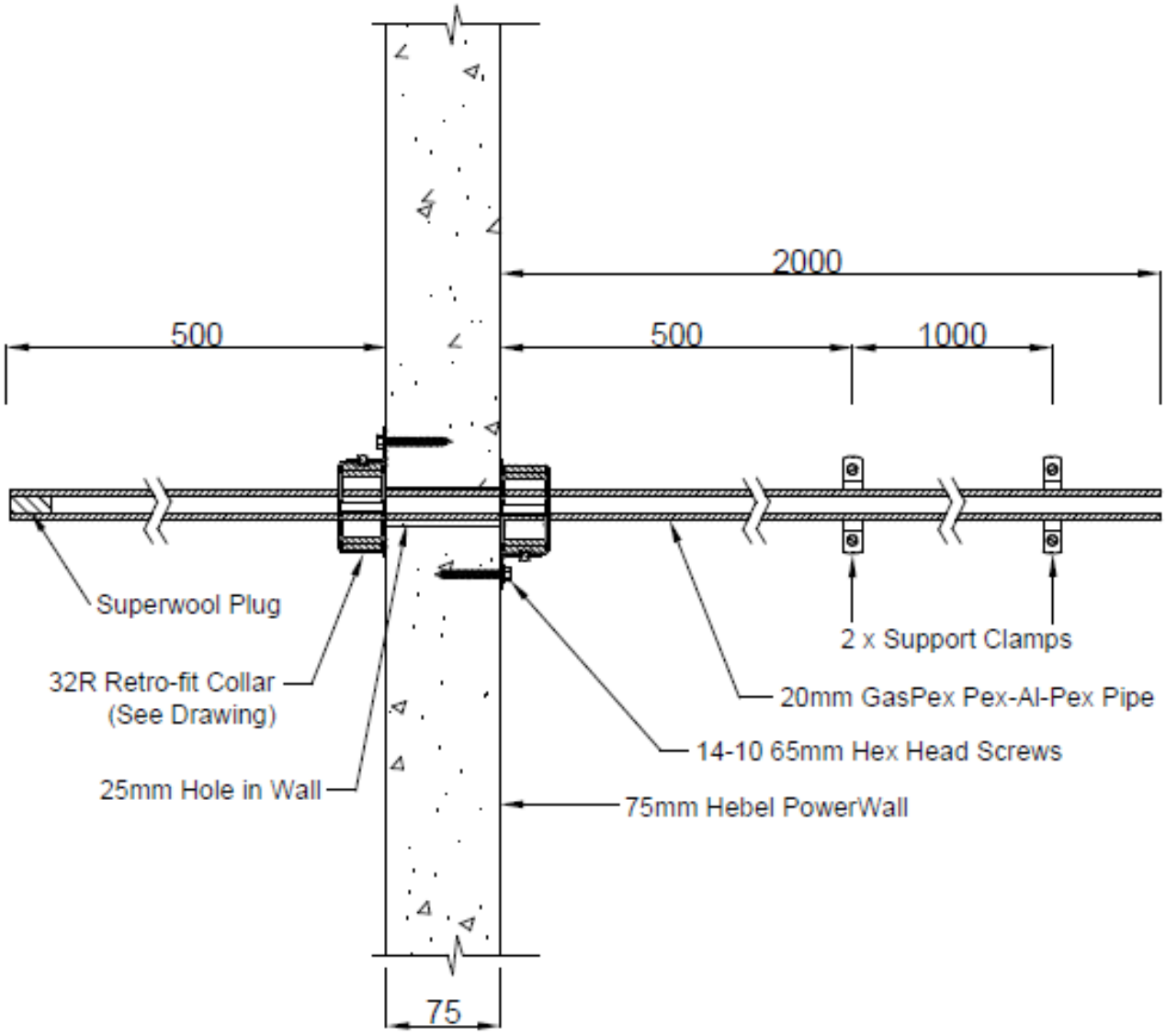
DRAWING TITLED "SPECIMEN # 1, 16MM CXL PEX-AL-PEX STACK PIPE & 32R", DATED 2OCTOBER 2019, PROVIDED BY SNAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd

Specimen #2

20mm GasPex Pex-Al-Pex Stack & 32R

Date: 02 OCT 2019



DRAWING TITLED "SPECIMEN #2, 20MM CXL PEX-AL-PEX STACK PIPE & 32R", DATED 2 OCTOBER 2019, PROVIDED BY SNAP FIRE SYSTEMS PTY LTD

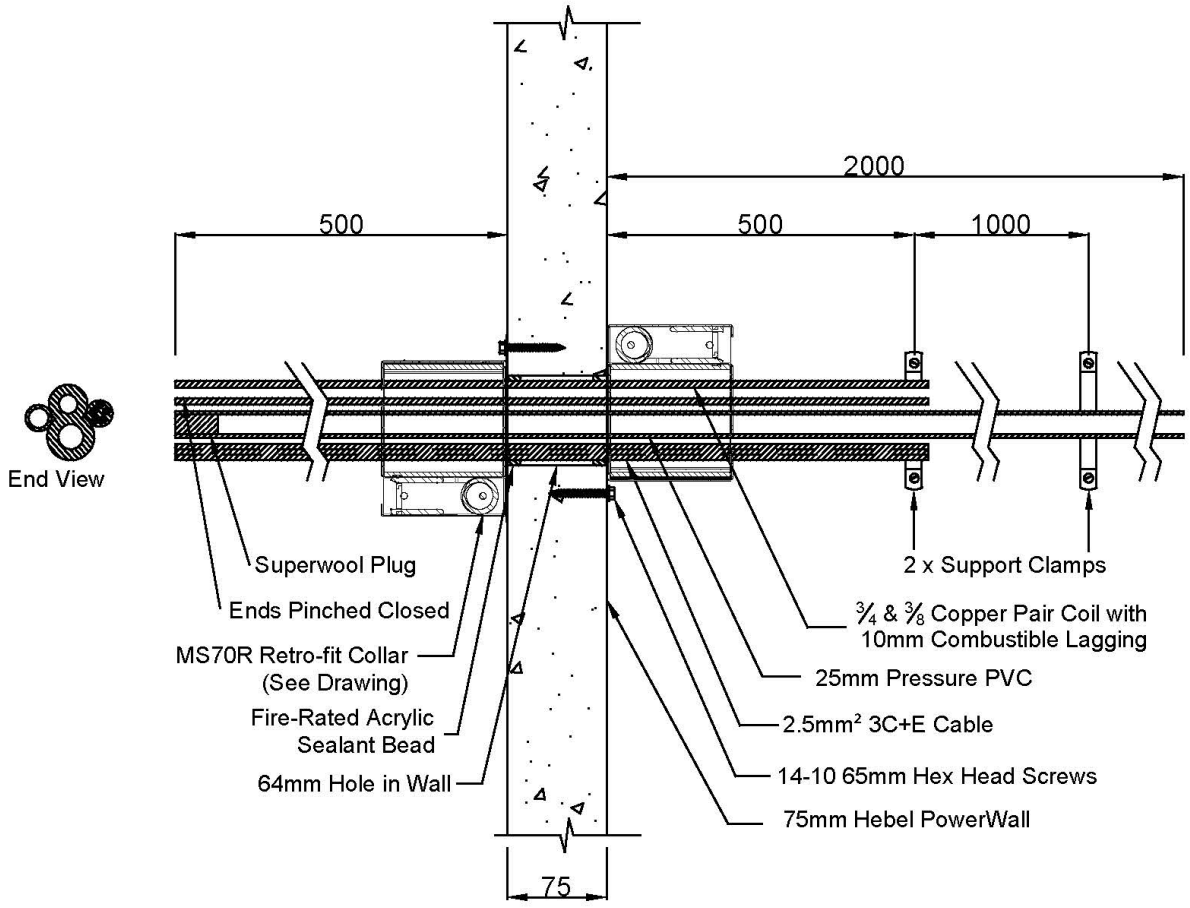
Snap Fire Systems Pty Ltd

Specimen #3

¾-in & ⅜-in Insulated Copper Pair Coil, 25mm Pressure PVC,

2.5mm² 3C+E Cable & MS70R

Date: 02 OCT 2019



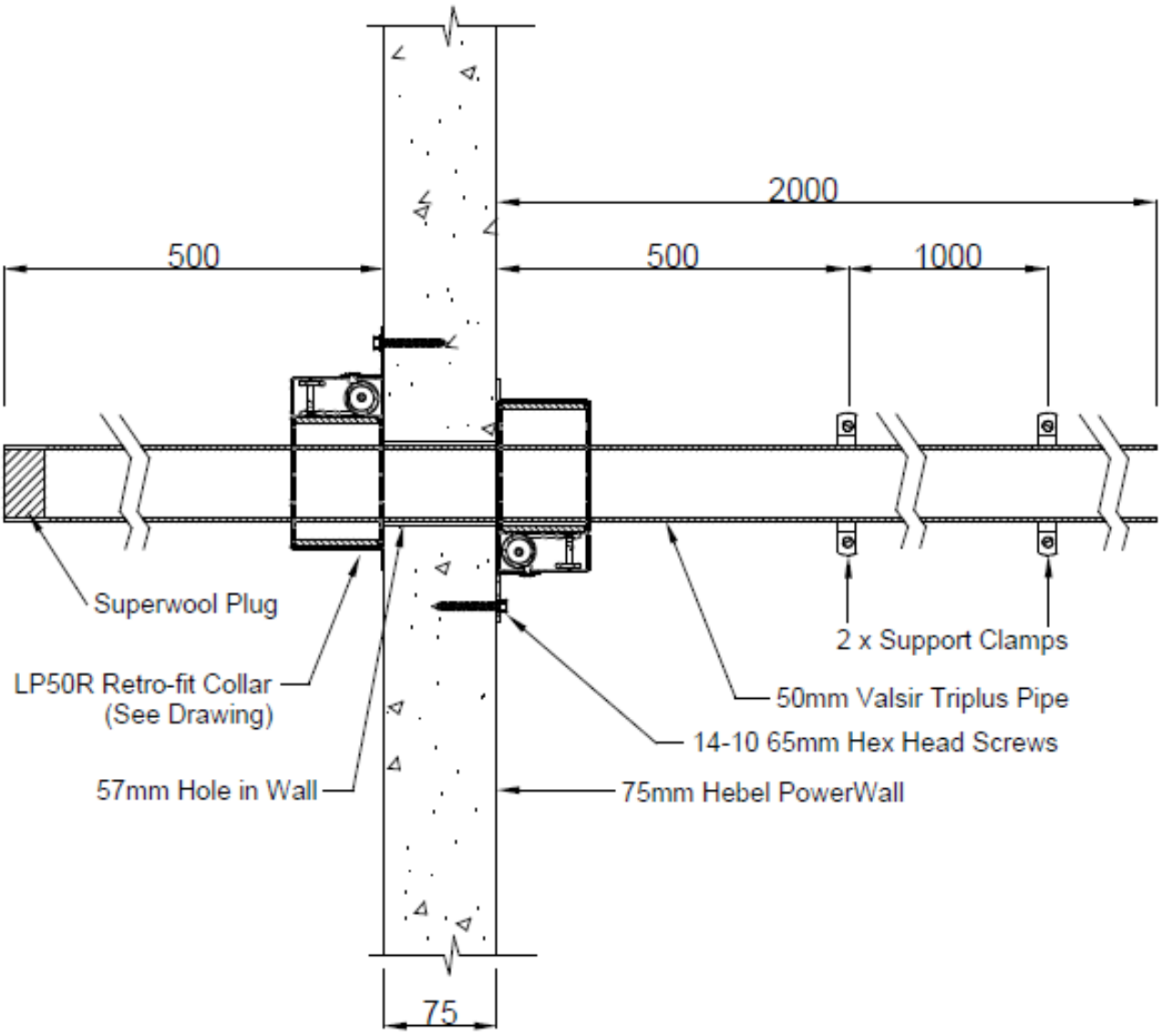
DRAWING TITLED "SPECIMEN #3 ¾-IN & ⅜-IN INSULATED COPPER PAIR COIL, 25MM PRESSURE PVC , 3 CORE CABLE + E & MS70R", DATED 2 OCTOBER 2019", PROVIDED BY SNAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd

Specimen #4

50mm Valsir Triplus Stack & LP50R

Date: 02 OCT 2019



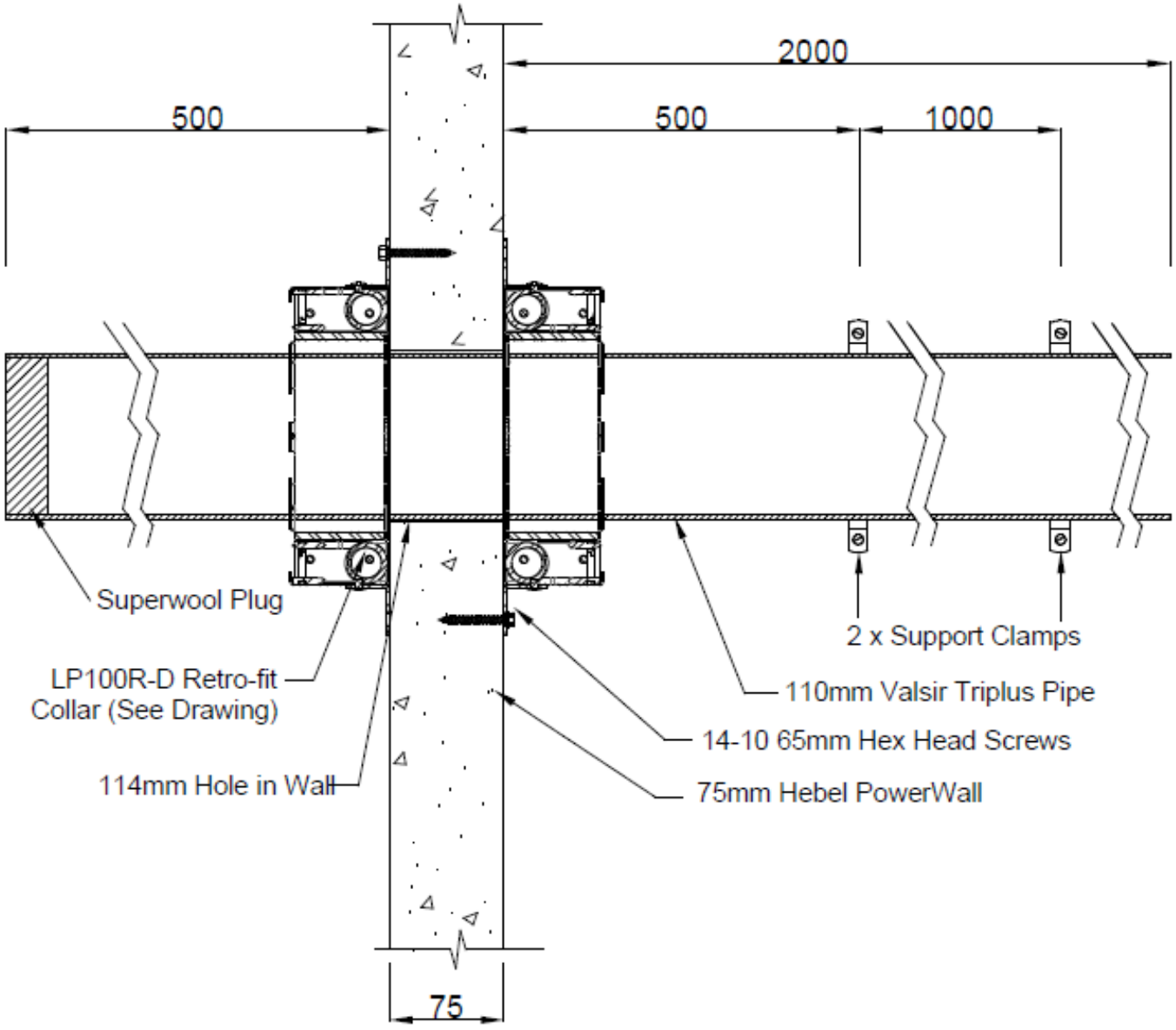
DRAWING TITLED "SPECIMEN # 4, 50MM VALSIR TRIPLUS STACK & LP50R", DATED 2 OCTOBER 2019, PROVIDED BY SNAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd

Specimen #5

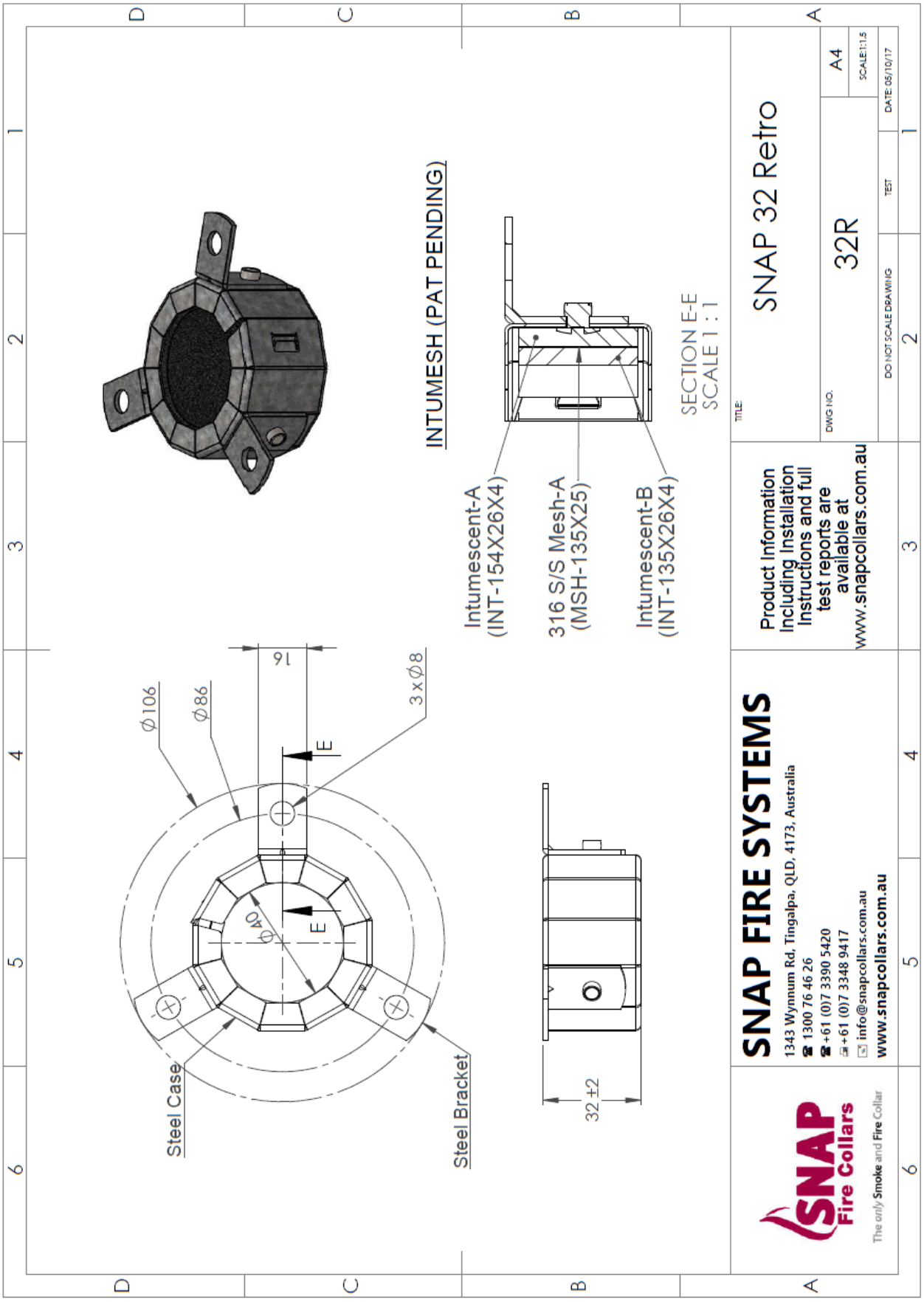
110mm Valsir Triplus Stack & LP100R-D

Date: 02 OCT 2019

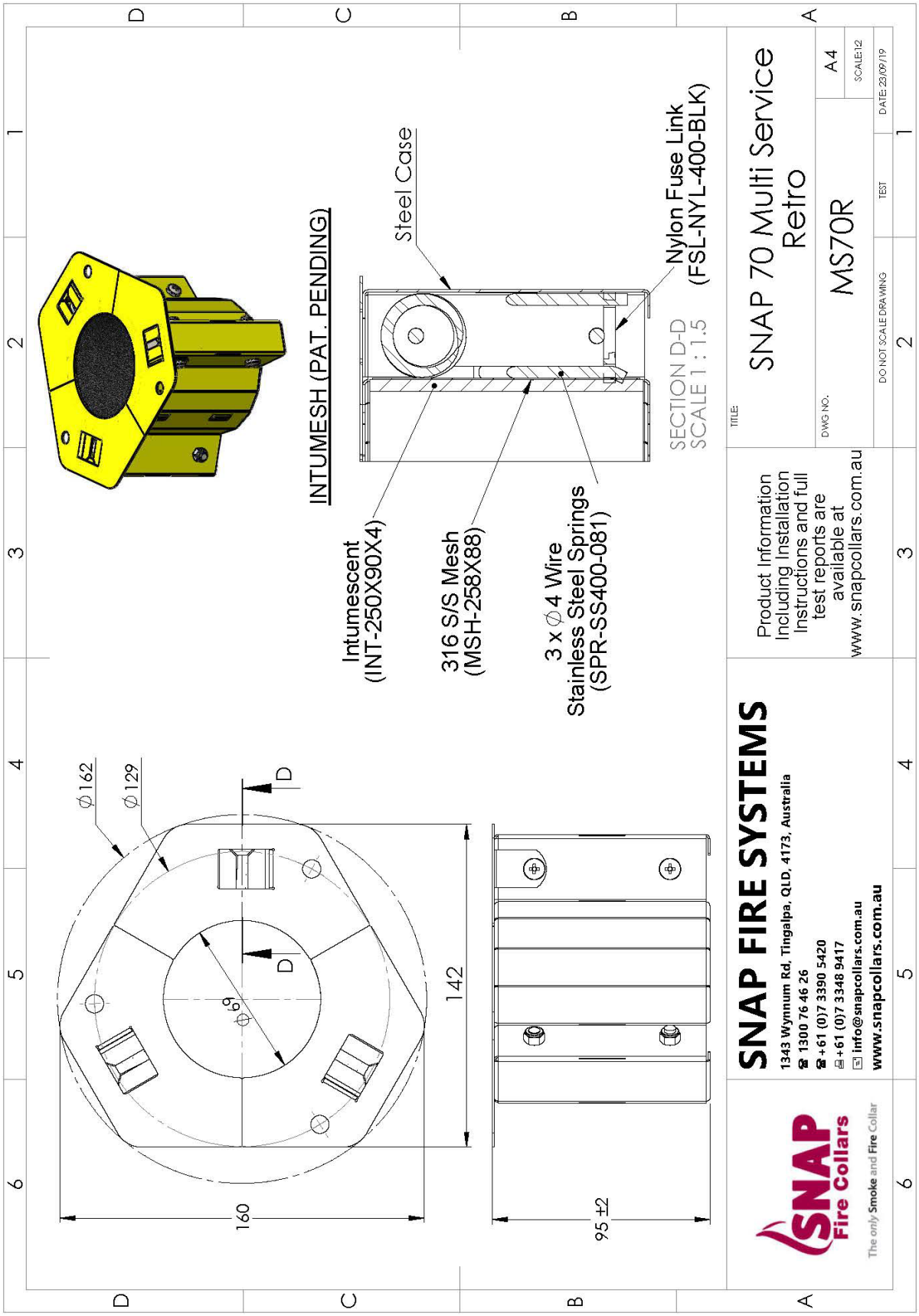


DRAWING TITLED "SPECIMEN # 5, 110MM VALSIR TRIPLUS STACK & LP100R-D", DATED 2 OCTOBER 2019 PROVIDED BY SNAP FIRE SYSTEMS PTY LTD

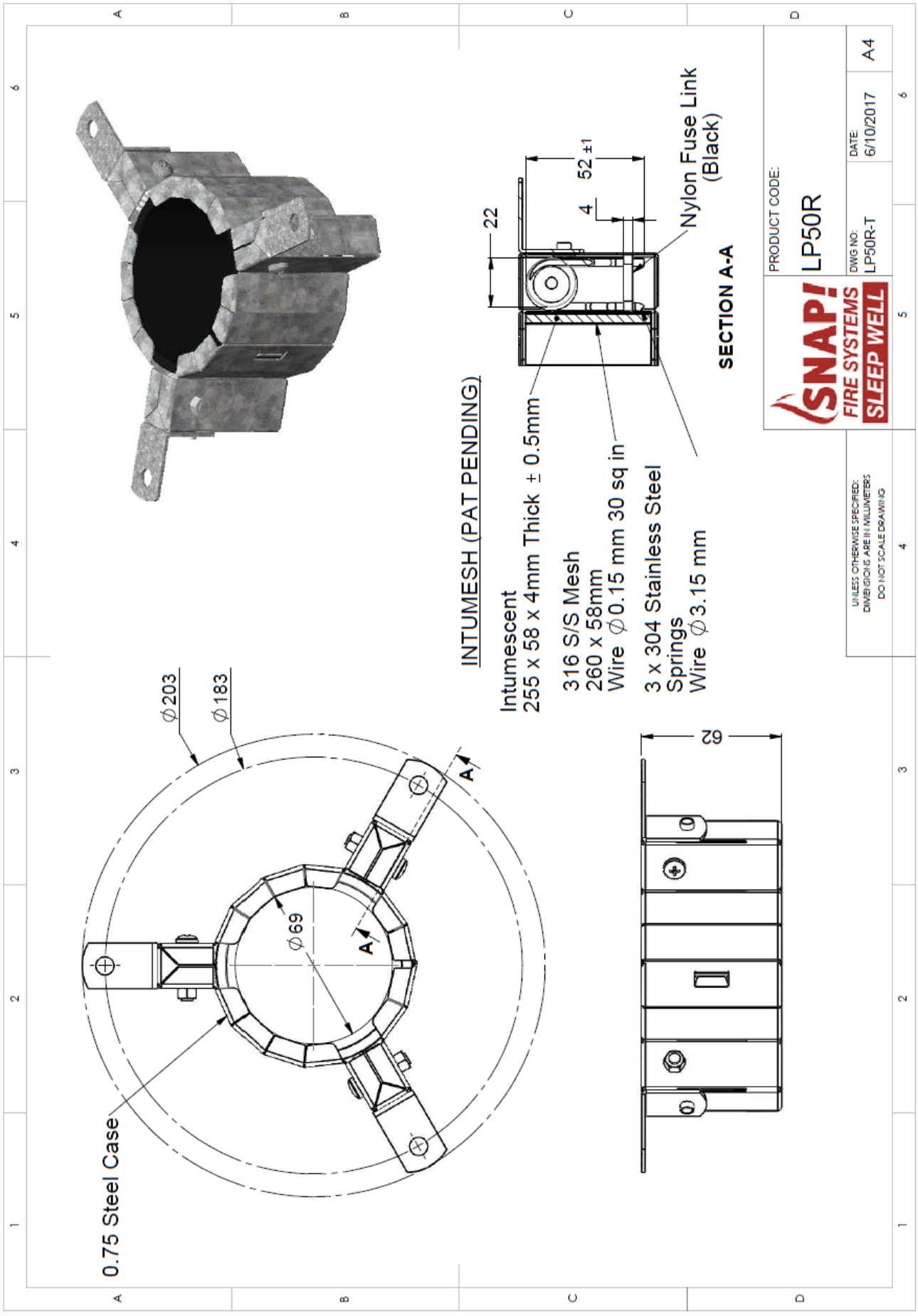
Appendix E – Specimen Drawings



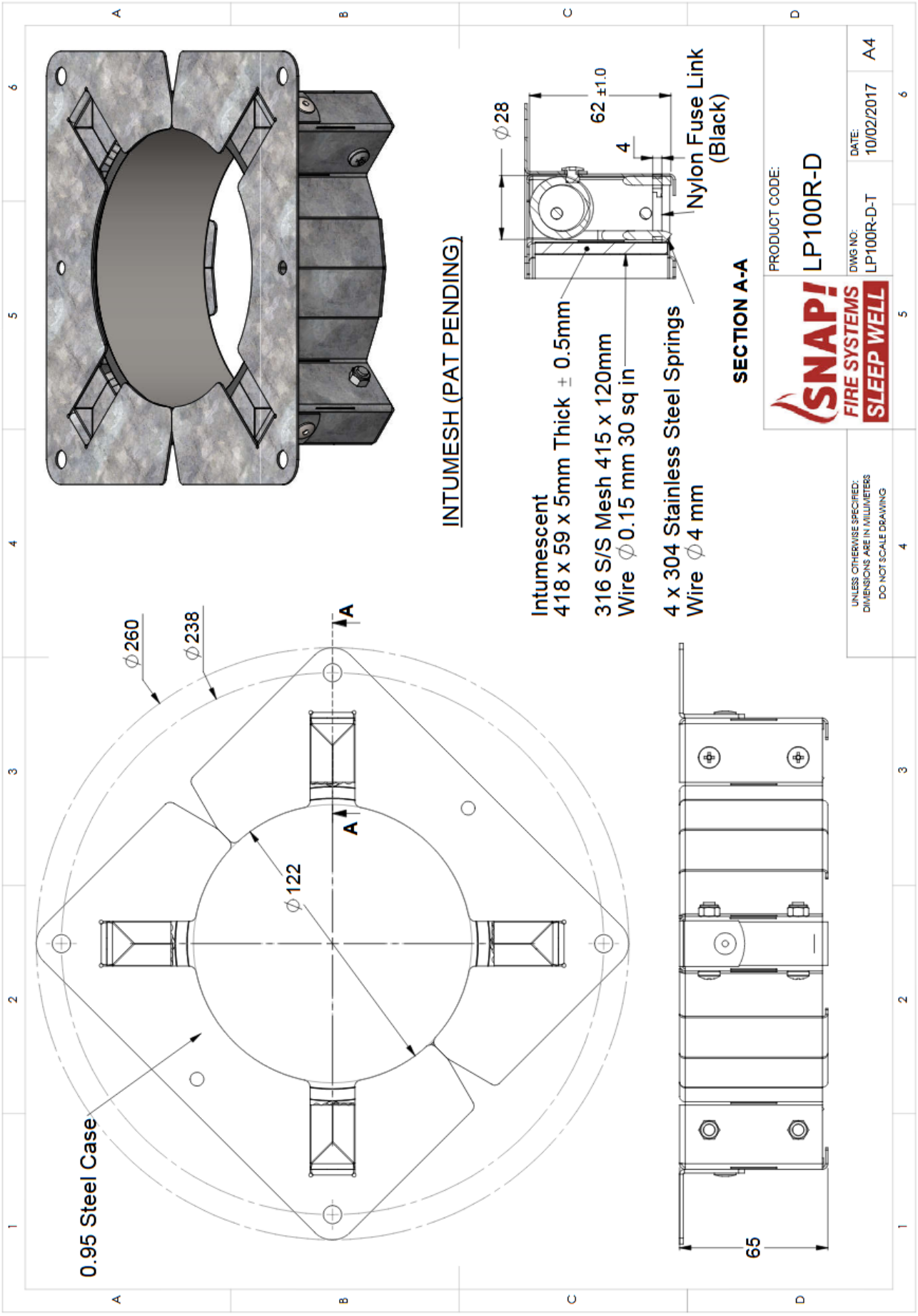
DRAWING TITLE "SNAP 32 RETRO", DATED 5 OCTOBER 2017, BY SNAP FIRE SYSTEMS PTY LTD.



DRAWING TITLED "SNAP 50 MULTI SERVICE RETRO", DATED 23 SEPTEMBER 2019, BY SNAP FIRE SYSTEMS.



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
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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. 3346

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 2058.

Product Name: SNAP 32R Retrofit fire collar protecting a nominal 16-mm CXL Pex Al Pex pipe (Specimen 1)

Description: The specimen comprised an 1150-mm x 1150-mm x 75-mm thick Hebel PowerPanel wall penetrated by a service protected by retro-fitted Snap Fire Systems fire collars. The wall comprised a 75-mm thick Hebel PowerPanel autoclaved aerated concrete (AAC) wall system with an established fire resistance level (FRL) of -/90/90 as detailed in CSIRO test report FSV 0979. 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 a wire mesh diameter of 0.15-mm. The Snap collars were surface mounted around the pipe on both the exposed and unexposed face of the wall and fixed through 3 mounting brackets using 14-10 65-mm hex head screws. The penetrating service comprised a 16-mm CXL Pex-Al-Pex pipe, with a wall thickness of 2.3 mm, penetrating the wall through a 20-mm diameter cut-out hole. The pipes 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 Hebel wall. The pipe was open on the unexposed end and capped with a Superwool plug on the exposed end.

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

Structural Adequacy	-	not applicable
Integrity	-	no failure at 121 minutes
Insulation	-	no failure at 121 minutes

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

The FRL 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 -/90/90. 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: 7 November 2019

Issued on the 18th day of December 2019 without alterations or additions.

B. Roddy

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. 3346

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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. 3347

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 2058.

Product Name: SNAP 32R Retrofit fire collar protecting a nominal 20-mm Gaspex Pex-Al-Pex pipe (Specimen 2)

Description: The specimen comprised an 1150-mm x 1150-mm x 75-mm thick Hebel PowerPanel wall penetrated by a service protected by retro-fitted Snap Fire Systems fire collars. The wall comprised a 75-mm thick Hebel PowerPanel autoclaved aerated concrete (AAC) wall system with an established fire resistance level (FRL) of -/90/90 as detailed in CSIRO test report FSV 0979. 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. The Snap collars were surface mounted around the pipe on both the exposed and unexposed face of the wall and fixed through 3 mounting brackets using 14-10 65-mm hex head screws. The penetrating service comprised a 20-mm GasPex Pex-Al-Pex pipe, with a wall thickness of 2.3 mm, penetrating the wall through a 25-mm diameter cut-out hole. The pipes projected horizontally, 2000-mm away from the unexposed face of the wall and approximately 500 mm into the furnace chamber. The pipes were supported at nominally 500-mm and 1500-mm from the unexposed face of the Hebel wall. The pipe was open on the unexposed end and capped with a Superwool plug on the exposed end.

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

Structural Adequacy	-	not applicable
Integrity	-	no failure at 121 minutes
Insulation	-	no failure at 121 minutes

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

The FRL 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 -/90/90. 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: 7 November 2019

Issued on the 18th day of December 2019 without alterations or additions.

B. Roddy

Brett Roddy | Manager, Fire Testing and Assessments

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Accreditation No. 165 – Corporate Site No. 3625
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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. 3348 (Revision A)

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 2058 (Revision C).

Product Name: SNAP 32R Retrofit fire collar protecting a nominal 20-mm Gaspex Pex-Al-Pex pipe (Specimen 3)

Description: The specimen comprised an 1150-mm x 1150-mm x 75-mm thick Hebel PowerPanel wall penetrated by a service protected by retro-fitted Snap Fire Systems fire collars. The wall comprised an autoclaved aerated concrete (AAC) wall system with an established fire resistance level (FRL) of -/90/90 as detailed in CSIRO test report FSV 0979. The SNAP Multi Service Retrofit MS70R fire collar comprised a 0.75 mm thick steel casing with a 69 mm inner dia. and a 0.95-mm steel base flange with a 162-mm dia. The 95-mm high collar casing incorporated a closing mechanism which comprised a soft Intumesh intumescent wraps, 4-mm thick x 90-mm wide x 250-mm long lined within the internal circumference of the collar casing. The closing mechanism comprised three stainless steel springs, with a nylon fuse link, and a 258 mm long x 88-mm wide 316 stainless steel mesh located around the intumescent strip. The collars were surface mounted around the pipe on both exposed and unexposed face of wall and fixed through 3 mounting brackets using 14-10 65-mm hex head screws. The penetrating service comprised a cluster of pair coil pipes ¾-in and a ⅜-in copper having a wall thickness of 1-mm and 1.5-mm respectively and both covered with a 10-mm thick crosslinked non fire rated PE foam lagging. Additional services included a 10-mm grey electrical cable (3 core plus Earth) and a 25-mm PVC pressure pipe with a wall thickness of 2.2 mm; which all penetrated the wall through a 64-mm dia. cut-out hole. The 25-mm pressure PVC conduct projected horizontally 2000-mm away from unexposed face of wall and approximately 500 mm into furnace chamber, and was supported at nominally 500-mm, and 1500-mm from unexposed face of the wall. The ¾-in and ⅜-in copper lagged pair coil pipes and the electrical cable projected horizontally 500-mm away from the unexposed face of the wall and approx. 500 mm into the furnace chamber and were supported at nominally 500-mm from the wall. The 25-mm pressure PVC pipe was open on the unexposed end and capped with a Superwool plug on the exposed end. The ¾-in and a ⅜-in copper pipes were left open on the unexposed face and crimped closed on the exposed end.

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

Structural Adequacy	-	not applicable
Integrity	-	no failure at 121 minutes
Insulation	-	99 minutes

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

The FRL 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 -/90/90. 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: 7 November 2019

Issued on the 21st day of September 2020. This Certificate supersedes issue dated 18th December 2019.

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. 3348 (REVISION A)

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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. 3349

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 2058.

Product Name: SNAP LP50R Retrofit fire collar protecting a nominal 50-mm polypropylene (Triplus) pipe (Specimen 4)

Description: The specimen comprised an 1150-mm x 1150-mm x 75-mm thick Hebel PowerPanel wall penetrated by a service protected by retro-fitted Snap Fire Systems fire collars. The wall comprised an autoclaved aerated concrete (AAC) wall system with an established fire resistance level (FRL) of -/90/90 as detailed in CSIRO test report FSV 0979. 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. The collars were surface mounted around the pipe on both the exposed and unexposed face of the wall and fixed through 3 mounting brackets using 14-10 65-mm hex head screws. The penetrating service comprised a 50-mm outside diameter polypropylene pipe, with a wall thickness of 2.7 mm which penetrated the wall through a 56-mm diameter cut-out hole. 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 wall. The pipe was open on the unexposed end and capped with a Superwool plug on the exposed end.

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

Structural Adequacy	-	not applicable
Integrity	-	no failure at 121 minutes
Insulation	-	no failure at 121 minutes

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

The FRL 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 -/90/90. 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: 7 November 2019

Issued on the 18th day of December 2019 without alterations or additions.

Brett Roddy | Manager, Fire Testing and Assessments

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

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Certificate of Test

No. 3350

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 2058.

Product Name: SNAP LP100R-D Retrofit fire collar protecting a nominal 110-mm polypropylene (Triplus) pipe (Specimen 5)

Description: The specimen comprised an 1150-mm x 1150-mm x 75-mm thick Hebel PowerPanel wall penetrated by a service protected by retro-fitted Snap Fire Systems fire collars. The wall comprised an autoclaved aerated concrete (AAC) wall system with an established fire resistance level (FRL) of -/90/90 as detailed in CSIRO test report FSV 0979. The SNAP Retrofit LP100R-D fire collar comprised a 0.95-mm steel casing with a 118 mm inner diameter and a 260-mm diameter base flange. The 65-mm high collar casing incorporated a closing mechanism that was comprised of a soft Intumesh intumescent strip and wire mesh lined within the internal circumference of the collar casing. The intumescent strip was 5-mm thick x 59-mm wide x 418-mm long with a folded over a layer of 316 stainless steel mesh, 415-mm long x 120-mm wide with a mesh wire diameter of 0.15-mm. The Snap collars were surface mounted around the pipe on both the exposed and unexposed face of the wall and fixed through 4 mounting brackets using 14-10 65-mm hex head screws. The penetrating service comprised a 110-mm outside diameter polypropylene pipe, with a wall thickness of 3.7 mm fitted through the collar's sleeve. The pipe penetrated the wall through a 114 mm diameter opening and 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 on the exposed end with Superwool.

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

Structural Adequacy	-	not applicable
Integrity	-	no failure at 121 minutes
Insulation	-	no failure at 121 minutes

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

The FRL 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 -/90/90. 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: 7 November 2019

Issued on the 18th day of December 2019 without alterations or additions.

B. Roddy

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. 3350

References

The following informative documents are referred to in this Report:

AS 1530.4-2014	Methods for fire tests on building materials, components and structures Part 4: Fire-resistance tests of elements of building construction.
AS 4072.1-2005	Components for the protection of openings in fire-resistant separating elements. Part 1: Service penetrations and control joints.

CONTACT US

t 1300 363 400
+61 3 9545 2176
e enquiries@csiro.au
w www.csiro.au

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FOR FURTHER INFORMATION

Infrastructure Technologies
Brett Roddy
Team Leader, Fire Testing and Assessments
t +61 2 94905449
e brett.roddy@csiro.au
w https://www.csiro.au/en/Do-business/Services/Materials-infrastructure/Fire-safety