Fire-resistance test on fire collars protecting a concrete slab 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	Chris Wojcik	Brett Roddy
		
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Fire-resistance test on fire collars protecting a concrete slab penetrated by services

Sponsored Investigation No. FSP 2135

1 Introduction

1.1 Identification of specimen

The sponsor identified the specimen as seven SNAP fire collars protecting a 150-mm thick concrete floor slab penetrated by seven services.

1.2 Sponsor

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

1.3 Manufacturers

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

1.4 Test standard

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

Section 10: Service penetrations and control joints.

1.5 Reference standard

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

1.6 Test number

CSIRO Reference test number FS 5008/4555

1.7 Test date

The fire-resistance test was conducted on 6 August 2020.

2 Description of specimen

2.1 General

The specimen comprised an 1150-mm x 1150-mm x 150-mm thick concrete slab. The slab was penetrated by multiple services protected by six (6) retrofit and one (1) cast-in fire collars.

The 150-mm thick concrete slab was reinforced with a single layer of steel reinforcement providing a Fire Resistance Period (FRP) for insulation of 180 minutes in accordance with table 5.5.1 of AS 3600:2018 - Concrete structures.

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

- AS/NZS 1477:2017 PVC pipes and fittings for pressure applications;
- AS 1432:2004 Copper tubes for plumbing, gas fitting and drainage applications;
- AS/NZS 5000.1:2005 (R2017): Electric cables - Polymeric insulated - For working voltages up to and including 0.6/1 (1.2) kV and
- AS/NZS 7671:2010 Plastics piping systems for soil and waste discharge (low and high temperature) inside buildings— Polypropylene (PP)

For the purpose of the test, the penetrations were referenced as Specimen 1, 2, 3, 4, 5, 6 and 7. Only five (5) specimens are the subject of this report (Specimens 1, 2, 3, 4 and 7). Documents containing a complete description of each specimen were supplied by the sponsor and are retained on file.

Specimen 1 - SNAP MS70R Multi Services Retrofit fire collar protecting a nominal 50-mm diameter polyvinyl chloride (PVC-U) conduit incorporating two 6-mm^2 3C+E and two 16-mm^2 3C+E power cables.

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 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. The Snap collar was surface mounted around the conduit on the exposed face (underside) of the concrete slab and was fixed through three mounting holes using 5-mm x 30-mm long concrete screw bolts.

A cast in SNAP 50 blank casing was used to provide the opening in the concrete slab. The SNAP 50 blank comprised a 1.6-mm thick polypropylene casing with an inside diameter of 63-mm on the unexposed face and an inside diameter of 80-mm on the exposed face as shown in drawing titled 'SNAP 50 Blank', dated 3 August 2020, by Snap Fire Systems Pty Ltd.

The penetrating service comprised a 60-mm outside diameter Telstra PVC-U conduit with a wall thickness of 2.71-mm incorporating two 6-mm^2 3-core + E power cables and two 16-mm^2 3-core + E power cables running through the inside of the conduit. All the cables were manufactured by General Cables. The PVC conduit and four power cables were fitted inside the MS70R collar's sleeve and penetrated the slab through the SNAP 50 blank as shown in drawing titled 'Specimen #1 50 PVC Conduit with 16mm² 3C + E & 6mm² 3C + E Power Cables & MS70R', dated 28 July, provided by Snap Fire Systems Pty Ltd. The conduit and cables projected vertically approximately 2000-mm above the slab and 500-mm below into the furnace chamber. The conduit was supported at 500-mm and 1500-mm above the slab. The conduit was open at the unexposed end and plugged with ceramic fibre (Superwool) on the exposed end.

Specimen 2 - SNAP MS70R Multi Services Retrofit fire collar protecting a bundle of 100 Category 5e network cables.

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 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. The Snap collar was surface mounted around the cables on the exposed face (underside) of the concrete slab and was fixed through three mounting holes using 5-mm x 30-mm long concrete screw bolts.

The penetrating service comprised a bundle of 100 x 5-mm diameter ADC Krone Category 5e network cables. The cables were fitted through the collar's sleeve and penetrated the concrete slab through a 70-mm diameter cut-out hole as shown in drawing titled 'Specimen #2 100% Full of Cat5e Cables & MS70R', dated 28 July 2020, provided by Snap Fire Systems Pty Ltd. The cables projected vertically 550-mm above the concrete and approximately 500-mm below into the furnace chamber. The cables were supported at nominally 500-mm above the concrete slab.

Specimen 3 - SNAP MS70R Multi Services Retrofit fire collar protecting a bundle of 20 Category 5e network cables.

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 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. The Snap collar was surface mounted around the cables on the exposed face (underside) of the concrete floor slab and was fixed through three mounting holes using 5-mm x 30-mm long concrete screw bolts.

The penetrating service comprised a bundle of 20 x 5-mm diameter ADC Krone Category 5e network cables. The cables were fitted through the collar's sleeve and penetrated the concrete slab through a 70-mm diameter cut-out hole, as shown in drawing titled 'Specimen #3 20% Full of Cat5e Cables & MS70R', dated 28 July 2020, provided by Snap Fire Systems Pty Ltd. The annular gap around the pipe and concrete slab on the unexposed face was fitted with a 22-mm diameter PE backing rod and filled with a 6-mm deep bead H.B Fullers Firesound sealant. The cables projected vertically 550-mm above the concrete and approximately 500-mm below into the furnace chamber. The cables were supported at nominally 500-mm above the concrete slab.

Specimen 4 - SNAP MS70R Multi Services Retrofit fire collar protecting a nominal 50 PN6 polyvinyl chloride (PVC-U) pipe.

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 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. The Snap collar was surface mounted around the cables on the exposed face (underside) of the concrete slab and was fixed through three mounting holes using 5-mm x 30-mm long concrete screw bolts.

A cast in SNAP 50 blank casing was used to provide an opening in the concrete slab. The SNAP 50 blank comprised a 1.6-mm thick polypropylene casing with an inside diameter of 63-mm on the unexposed face and an inside diameter of 80-mm on the exposed face as shown in drawing titled 'SNAP 50 Blank', dated 3 August 2020, by Snap Fire Systems Pty Ltd.

The penetrating service comprised a 60.32-mm outside diameter Vinidex PN6 (PVC-U) pipe with a wall thickness of 1.84-mm. The pipe was fitted through the MS70R collar's sleeve and penetrated the slab inside the Snap 50 blank collar casing as shown in drawing titled 'Specimen #4 50 PN6 PVC Pipe & MS70R', dated 28 July 2020, by Snap Fire Systems Pty Ltd'. The pipe projected vertically 2000-mm above the concrete slab and approximately 500 mm below into the furnace chamber. The pipe was supported at nominally 500-mm and 1500-mm above the slab. The pipe was open at the unexposed end and plugged with ceramic fibre (Superwool) on the exposed end.

Specimen 7 – SNAP H150S-RR High Top Stack fire collar protecting a nominal 160-mm diameter polypropylene (Valsir Triplus) pipe.

The SNAP H150S-RR High Top Stack fire collar comprised a 2-mm thick polypropylene casing with a 180-mm inner diameter and a 292-mm diameter base flange. The 250-mm high collar casing incorporated a 600-mm wide x 110-mm wide x 6-mm thick intumescent material. The closing mechanism comprised four x 4-mm diameter galvanised steel springs, a nylon fuse link and a 640-mm x 109-mm 316 stainless steel mesh as shown in drawing titled 'SNAP 150 High-Top Stack', dated 29 September 2017, by SNAP Fire Systems.

The penetrating service comprised a 160-mm outside diameter Valsir Triplus polypropylene pipe with a wall thickness of 5-mm fitted through the collar's sleeve. The annular gap between the pipe and the inside collar was protected with a 10-mm deep bead of Fullers Firesound sealant, as shown in drawing titled 'Specimen #7, 160 Triplus & H150S-RR', dated 28 July 2020, provided by Snap Fire Systems Pty Ltd. The pipe projected vertically 2000-mm above from the unexposed face of the concrete slab and 500-mm into the furnace chamber. The pipe was supported at nominally 500-mm and 1500-mm from the unexposed face of the slab. The pipe was open at the unexposed end and closed with a ceramic fibre (Superwool) plug on the exposed end.

2.2 Dimensions

The specimen comprised an 1150-mm x 1150-mm x 150-mm thick concrete slab to suit the opening in the specimen containing frame.

2.3 Orientation

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

2.4 Conditioning

The concrete slab was left to cure for a period longer than 30 days. The specimen was delivered on 3 August 2020 and stored under standard laboratory atmospheric conditions until the test date.

2.5 Selection, construction and installation of the specimen and the supporting construction

The supporting floor construction and specimen installation was organised by the sponsor. CSIRO was not involved in the selection of the materials.

3 Documentation

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

Drawing titled 'Test Slab S-20-F Layout', dated 22 July 2020 by Snap Fire Systems Pty Ltd.

Drawing titled 'Specimen #1 Specimen #1 50 PVC Conduit with 16mm² 3C+E & 6mm² 3C+E Power Cables & MS70R', dated 28 July 2020, by Snap Fire Systems Pty Ltd.

Drawing titled 'Specimen #2 100% Full of Cat5e Cables & MS70R', dated 28 July 2020, by Snap Fire Systems Pty Ltd.

Drawing titled 'Specimen #3 20% Full of Cat5e Cables & MS70R', dated 28 July 2020, by Snap Fire Systems Pty Ltd.

Drawing titled 'Specimen #4 50 PN6 PVC Pipe & MS70R', dated 28 July 2020, by Snap Fire Systems Pty Ltd.

Drawing titled 'Specimen #7 160 Triplus & H150S-RR', dated 28 July 2020, 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 Blank', dated 3 August 2020, by Snap Fire Systems Pty Ltd.

Drawing titled 'SNAP 150 High-Top Stack', dated 29 September 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 14°C at the commencement of the test.

6 Departure from standard

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

7 Termination of test

The test was terminated at 241 minutes by the agreement with the sponsor.

8 Test results

8.1 Critical observations

The following observations were made during the fire-resistance test:

Time	Observation
30 seconds -	Smoke is being emitted at the base of Specimens 2 and 3.
2 ½ minutes -	Smoke has begun fluing from the end of the PVC conduit of Specimen 1.
3 minutes -	Smoke is being emitted at the base of Specimen 4. The level of smoke fluing at the base of Specimen 2 has reduced.
4 minutes -	Light smoke has begun fluing from the end of the pipe of Specimen 7. Discolouration (smoke staining) is visible on the conduit and pipe at the base of Specimens 1 and 4 (Photograph 4).
5 minutes -	A large volume of smoke is fluing from the end of the pipe of Specimen 7. The level of smoke fluing from the base of Specimen 3 has reduced.

6 minutes -	Smoke has ceased fluing from the end of the conduit of Specimen 1. The level of smoke fluing from the pipe Specimen 7 has reduced.
8 minutes -	Smoke has ceased fluing at the base of specimen 3.
16 minutes -	Smoke has resumed fluing from the base of Specimen 1.
20 minutes -	Smoke has ceased fluing from the end of the pipe of Specimen 7.
24 minutes -	Water has begun to pool at top of the slab around Specimens 1, 4 and 7.
30 minutes -	Steam is being emitted from the stab.
41 minutes -	The level of smoke fluing at the base of specimen 1 has reduced.
54 minutes -	The sealant around the pipe at the base of Specimen 7 has begun to swell.
56 minutes -	Smoke continues to vent from at the base of Specimens 1 and 4.
130 minutes -	Light smoke has resumed fluing from the end of the conduit of Specimen 1.
146 minutes -	The orange sheath on the cables at the base of Specimen 4 has distorted, discoloured and pushed thermocouple #22 upwards (Photograph 11).
180 minutes -	The sealant around the pipe at the base of Specimen 3 has begun to swell.
241 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 7.

8.5 Performance

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

Specimen 1 – SNAP MS70R Multi Services Retrofit fire collar protecting a nominal 50-mm diameter polyvinyl chloride (PVC-U) conduit incorporating two 6-mm^2 3C+E and two 6-mm^2 3C+E power cables

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

Specimen 2 – SNAP MS70R Multi Services Retrofit fire collar protecting a bundle of 100 Category 5e network cables

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

Specimen 3 – SNAP MS50R Multi Services Retrofit fire collar protecting a bundle of 20 Category 5e network cables

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

Specimen 4 – SNAP MS70R Multi Services Retrofit fire collar protecting a nominal 50-mm diameter polyvinyl chloride (PVC-U) pipe

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

Specimen 7 – SNAP H150S-RR High-Top Stack fire collar protecting a nominal 160 Valsir Triplus polypropylene pipe

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

This report details methods of construction, the test conditions and the results obtained when the specific element of construction described herein was tested following the procedure outlined in AS 1530.4. Any significant variation with respect to size, construction details, loads, stresses, edge of end conditions, other than that allowed under the field of direct application in the relevant test method, is not covered by this report.

Because of the nature of Fire resistance testing and the consequent difficulty in quantifying the uncertainty of the measurement of fire resistance, it is not possible to provide a stated degree for accuracy of the result.

9 Fire-resistance level (FRL)

For the purpose of building regulations in Australia, the FRL's of the test specimens were as follows:

Specimen 1	-	-/240/180*;
Specimen 2	-	-/240/180*;
Specimen 3	-	-/240/180*;
Specimen 4	-	-/240/180*and
Specimen 7	-	-/240/180*.

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

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

For the purposes of AS 1530.4-2014, the results of these fire tests may be used to directly assess fire hazard, but it should be noted that a single test method will not provide a full assessment of fire hazard under all fire conditions.

10 Field of direct application of test results

The results of the fire test contained in this test report are directly applicable, without reference to the testing authority, to similar constructions where one or more changes listed in Clause 10.12 of AS 1530.4-2014, have been made provided no individual component is removed or reduced.

11 Tested by

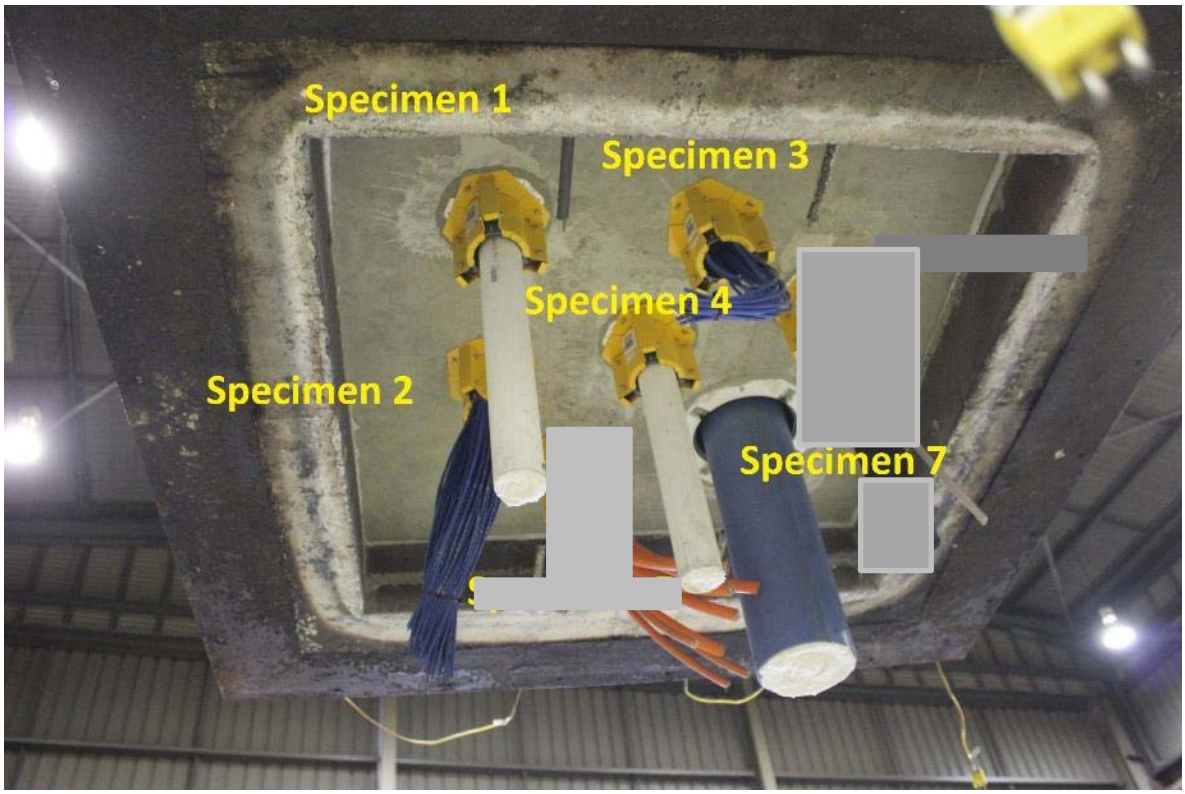
Peter Gordon
Testing Officer

Appendices

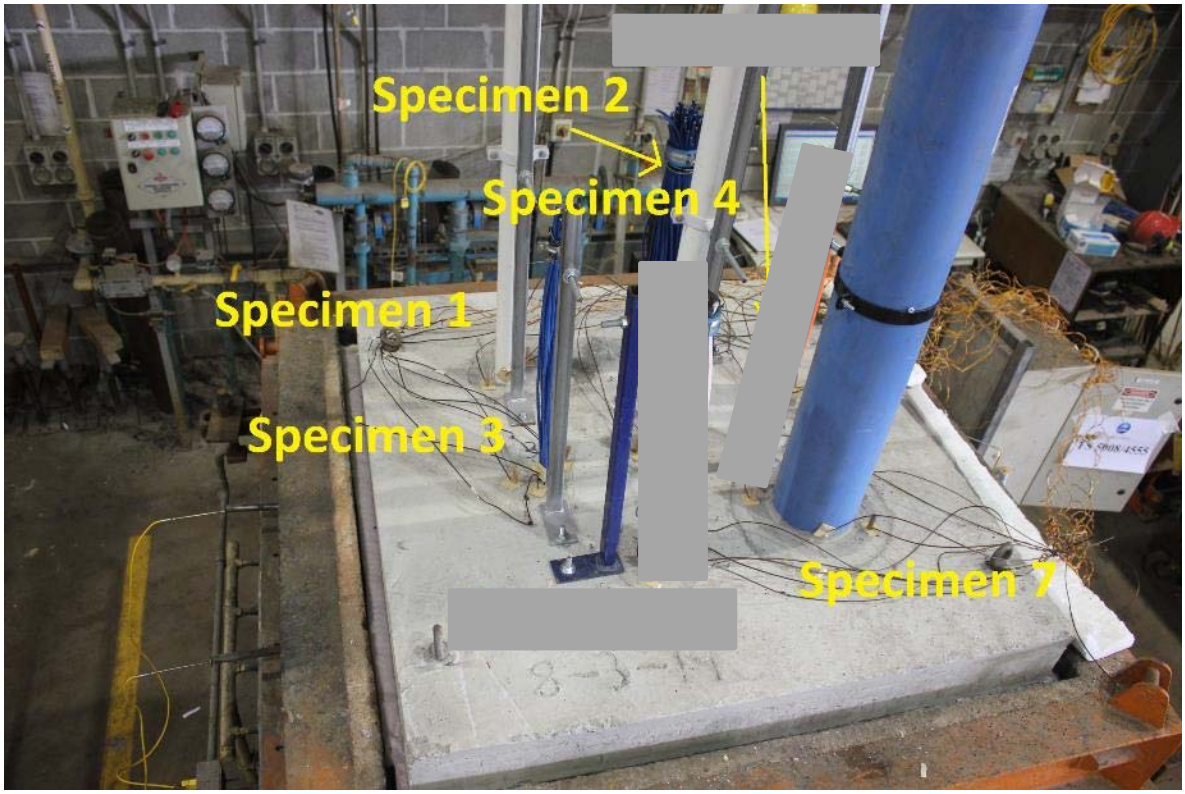
Appendix A – Measurement location

Specimen	T/C Position	T/C designation
Specimen 1 – SNAP MS70R Multi Services Retrofit fire collar protecting a nominal 50-mm diameter PVC conduit incorporating two 6-mm^2 3C+E and two 6-mm^2 3C+E power cables.	On slab 25-mm from pipe NE	S1
	On slab 25-mm from pipe SW	S2
	On pipe 25-mm above Slab North	S3
	On pipe 25-mm above Slab South	S4
Specimen 2 – SNAP MS70R Multi Services Retrofit fire collar protecting a bundle of 100 Category 5e network cables.	On slab 25-mm from cables North	S5
	On slab 25-mm from cables South	S6
	On cables 25-mm above slab NW	S7
	On cables 25-mm above slab South	S8
Specimen 3 – SNAP MS50R Multi Services Retrofit fire collar protecting a bundle of 20 Category 5e network cables.	On slab 25-mm from sealant West	S9
	On slab 25-mm from sealant East	S10
	On sealant – North	S11
	On sealant – SW	S12
	On pipe 25-mm above sealant West	S13
	On pipe 25-mm above sealant East	S14
Specimen 4 – SNAP MS70R Multi Services Retrofit fire collar protecting a nominal 50 polyvinyl chloride (PVC-U) pipe.	On slab 25-mm from pipe NE	S15
	On slab 25-mm from pipe SW	S16
	On pipe 25-mm above slab East	S17
	On pipe 25-mm above slab South	S18
Specimen 7 – SNAP H150S-RR High-Top Stack fire collar protecting a nominal 160-mm diameter polypropylene (Valsir Triplus) pipe.	On slab 25-mm from pipe NW	S28
	On slab 25-mm from pipe SE	S29
	On pipe 25-mm above slab North	S30
	On pipe 25-mm above slab South	S31
Rover	Rover	S32
Ambient	Ambient	S33

Appendix B – Photographs



PHOTOGRAPH 1 – EXPOSED FACE OF SPECIMENS PRIOR TO TESTING



PHOTOGRAPH 2 – UNEXPOSED FACE OF SPECIMEN PRIOR TO TESTING

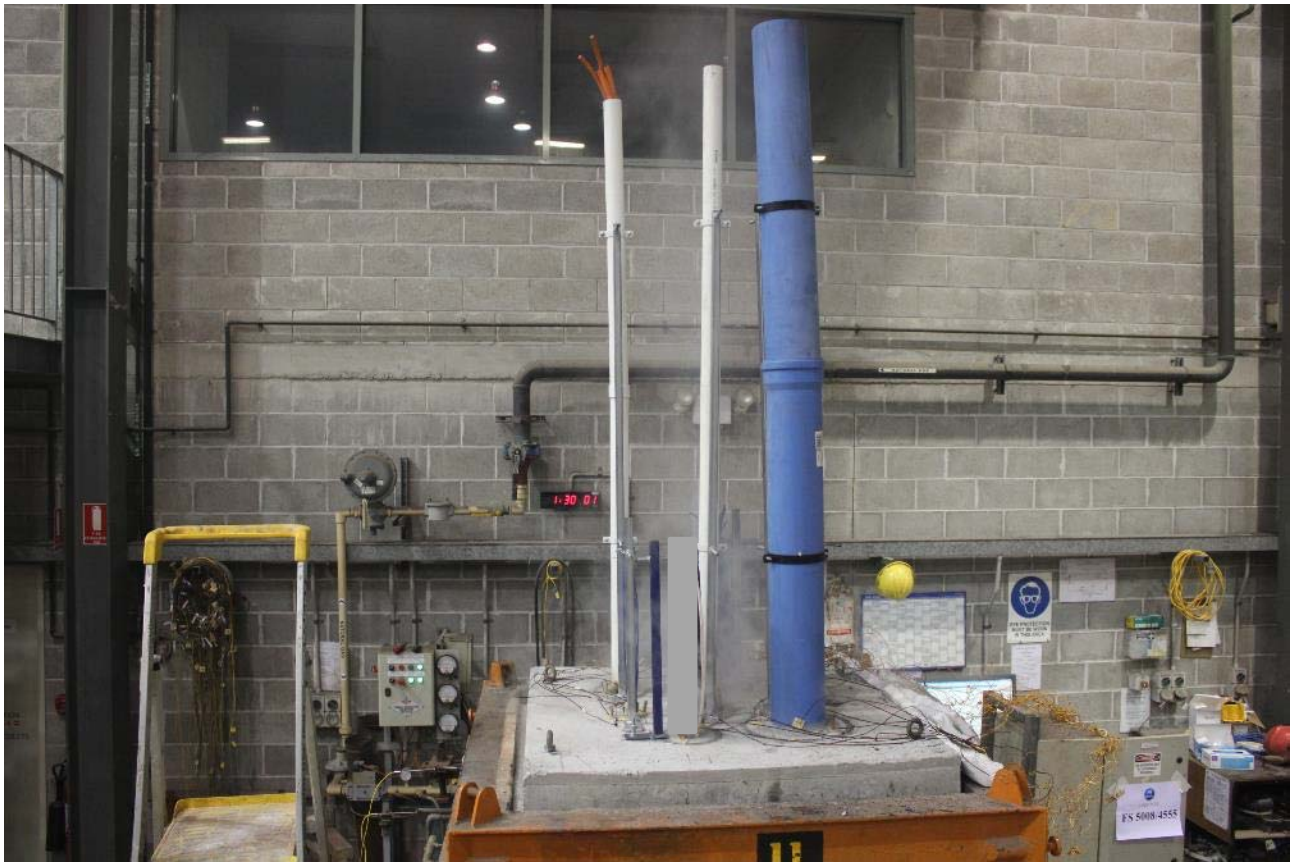
PHOTOGRAPH 3 – UNEXPOSED FACE OF SPECIMEN 3 PRIOR TO TESTING

PHOTOGRAPH 4 – SPECIMENS AFTER 4 MINUTES OF TESTING

PHOTOGRAPH 5 – SPECIMENS AFTER 12 MINUTES OF TESTING

PHOTOGRAPH 6 – SPECIMENS AFTER 30 MINUTES OF TESTING

PHOTOGRAPH 7 – SPECIMENS AFTER 60 MINUTES OF TESTING



PHOTOGRAPH 8 – SPECIMENS AFTER 90 MINUTES OF TESTING

PHOTOGRAPH 9 – SPECIMENS 7 AFTER 111 MINUTES OF TESTING

PHOTOGRAPH 10 – SPECIMENS AFTER 120 MINUTES OF TESTING

PHOTOGRAPH 11 – SPECIMENS AFTER 180 MINUTES OF TESTING

PHOTOGRAPH 12 – SPECIMENS AFTER 240 MINUTES OF TESTING

PHOTOGRAPH 13 – SPECIMENS AT THE CONCLUSION OF TESTING

PHOTOGRAPH 14 – EXPOSED FACE OF SPECIMENS AT THE CONCLUSION OF TESTING

Appendix C – Test Data charts

FIGURE 1 – FURNACE TEMPERATURE

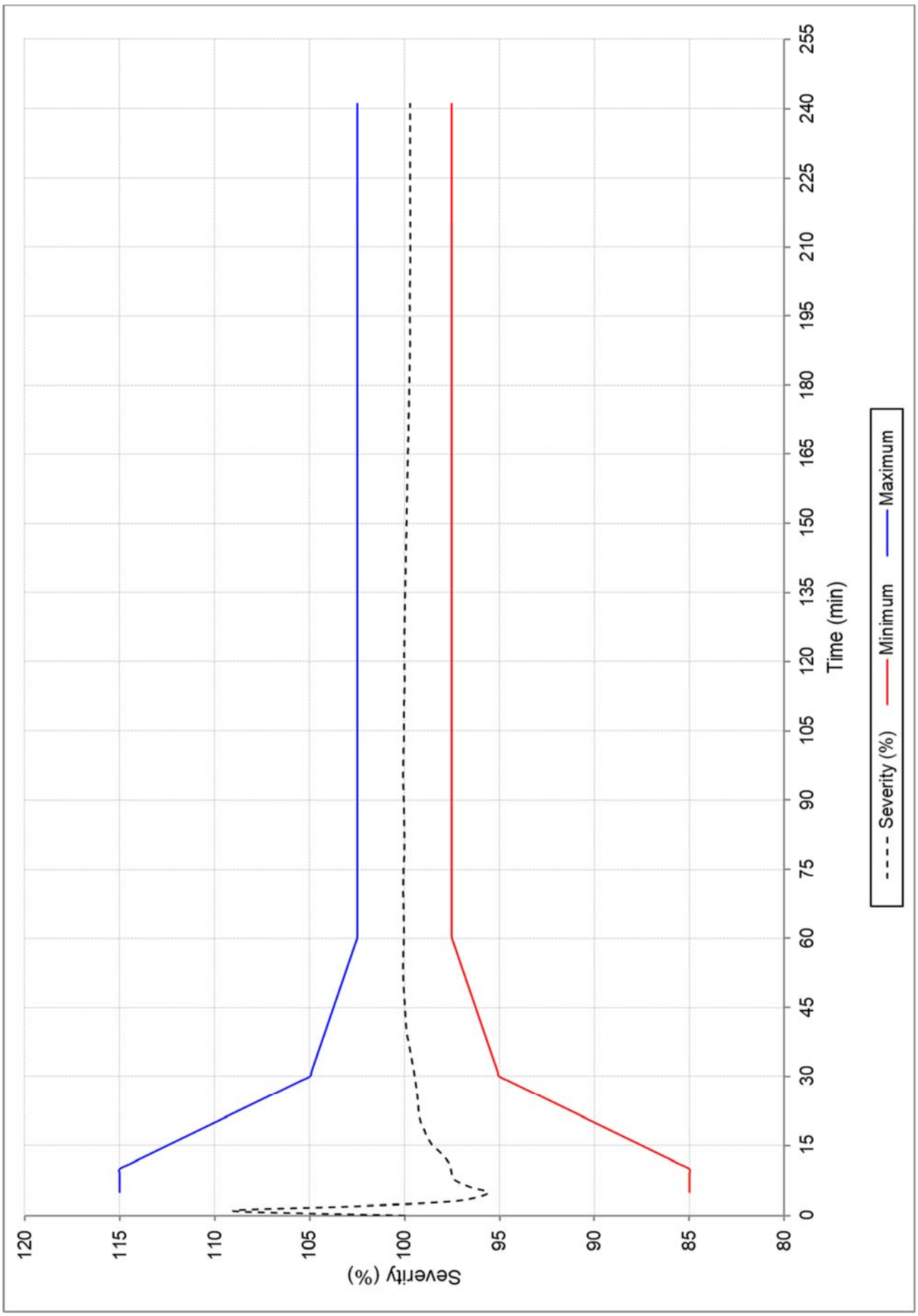


FIGURE 2 – FURNACE SEVERITY

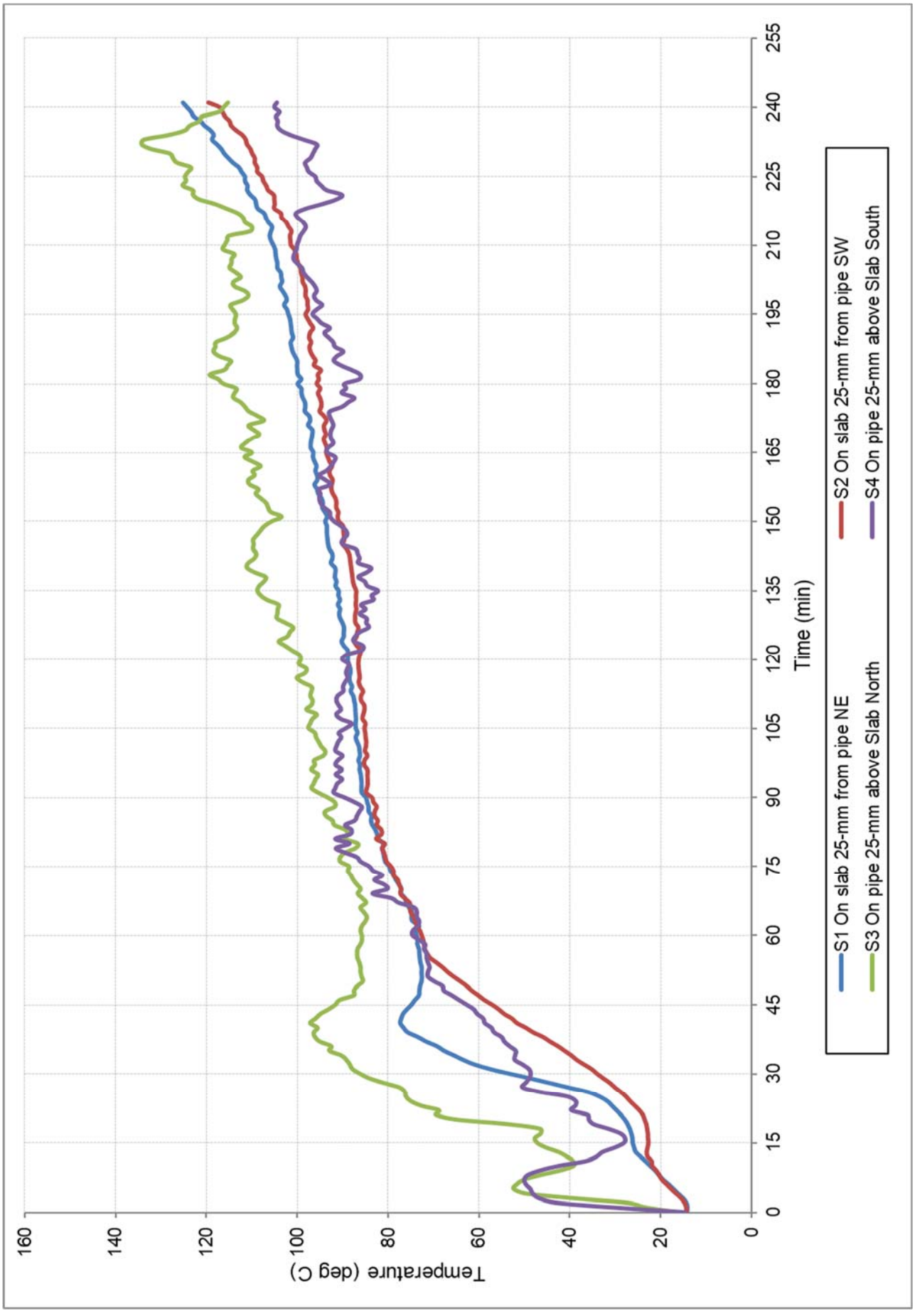


FIGURE 3 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 1

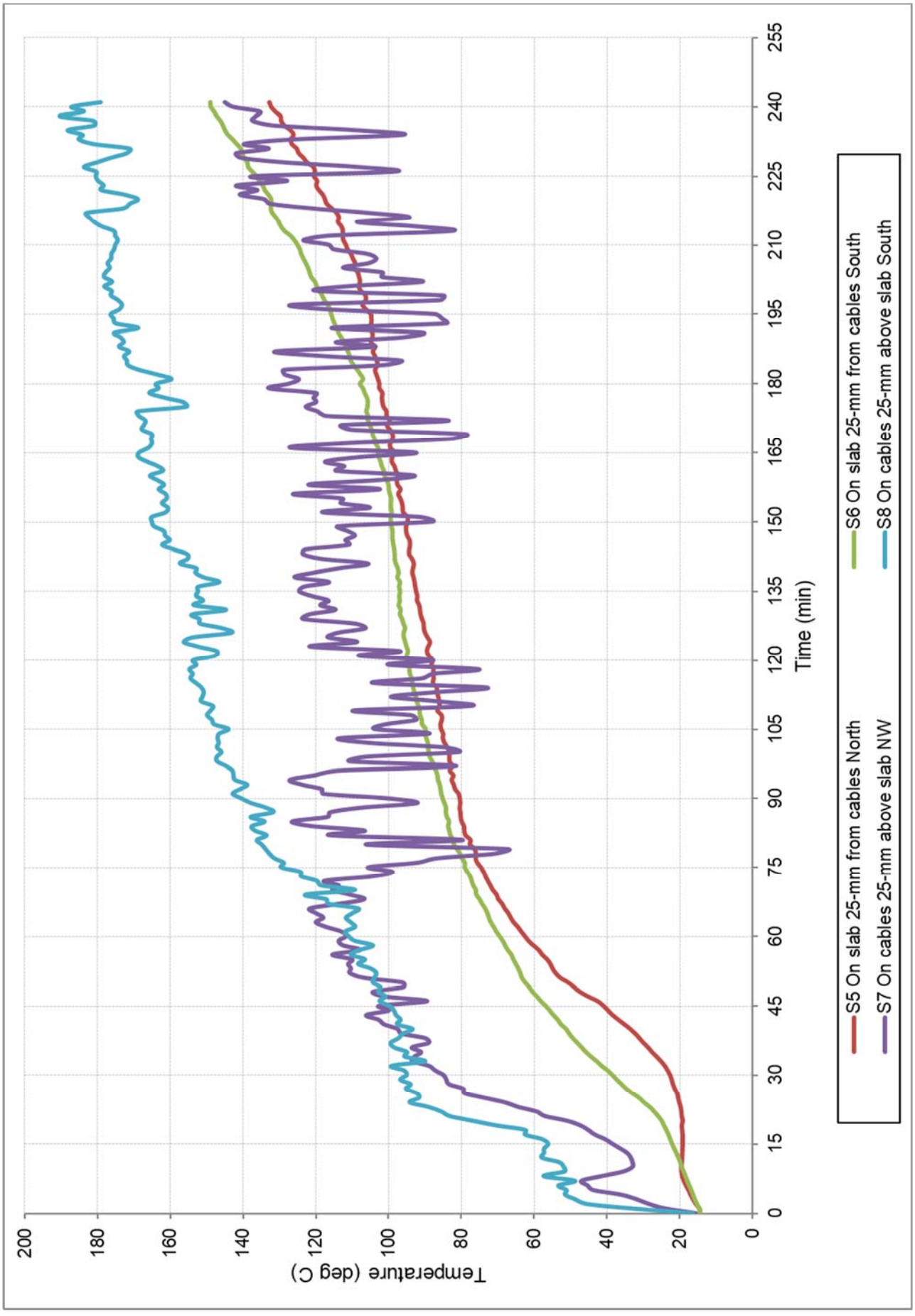


FIGURE 4 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 2

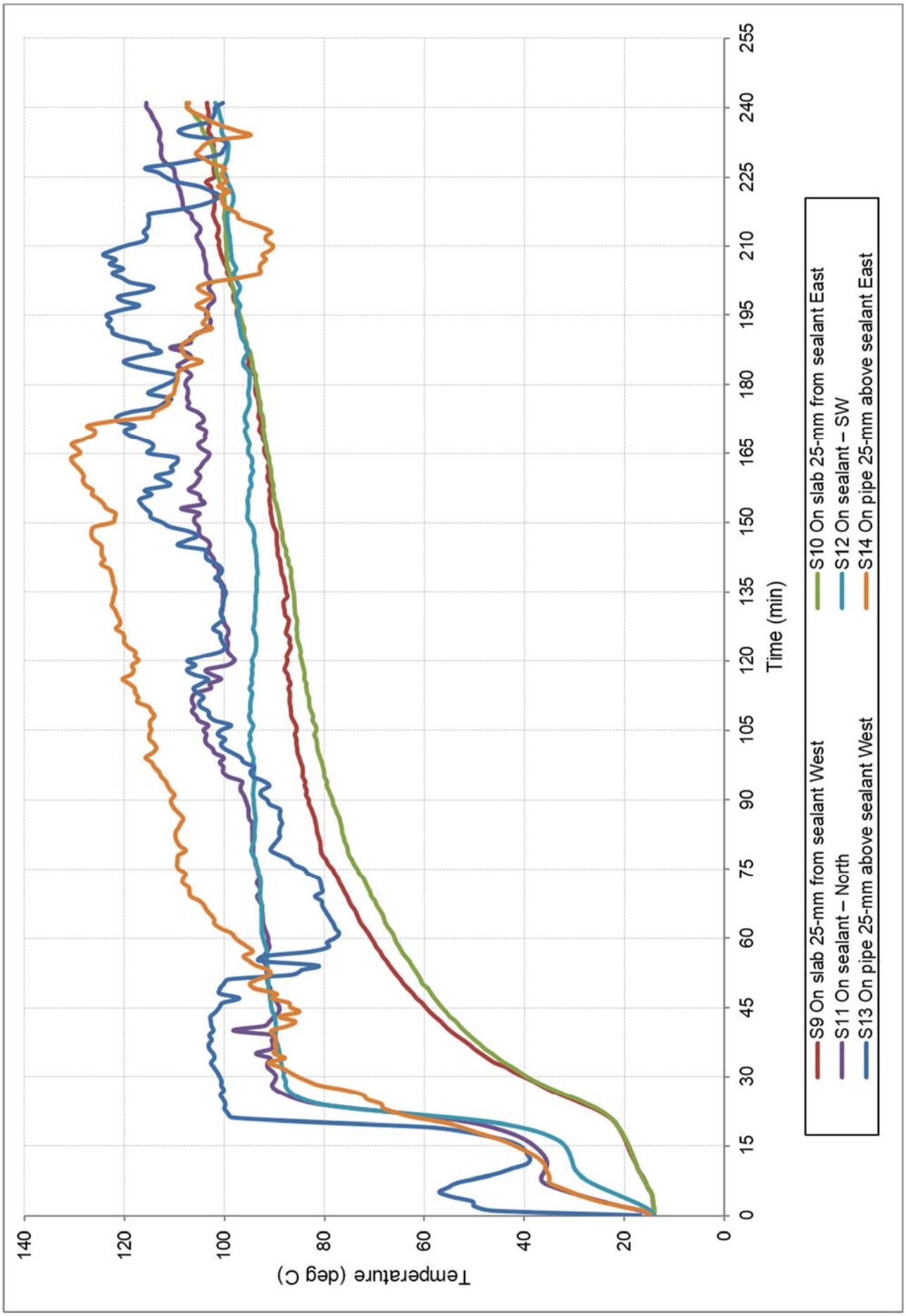


FIGURE 5 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 3

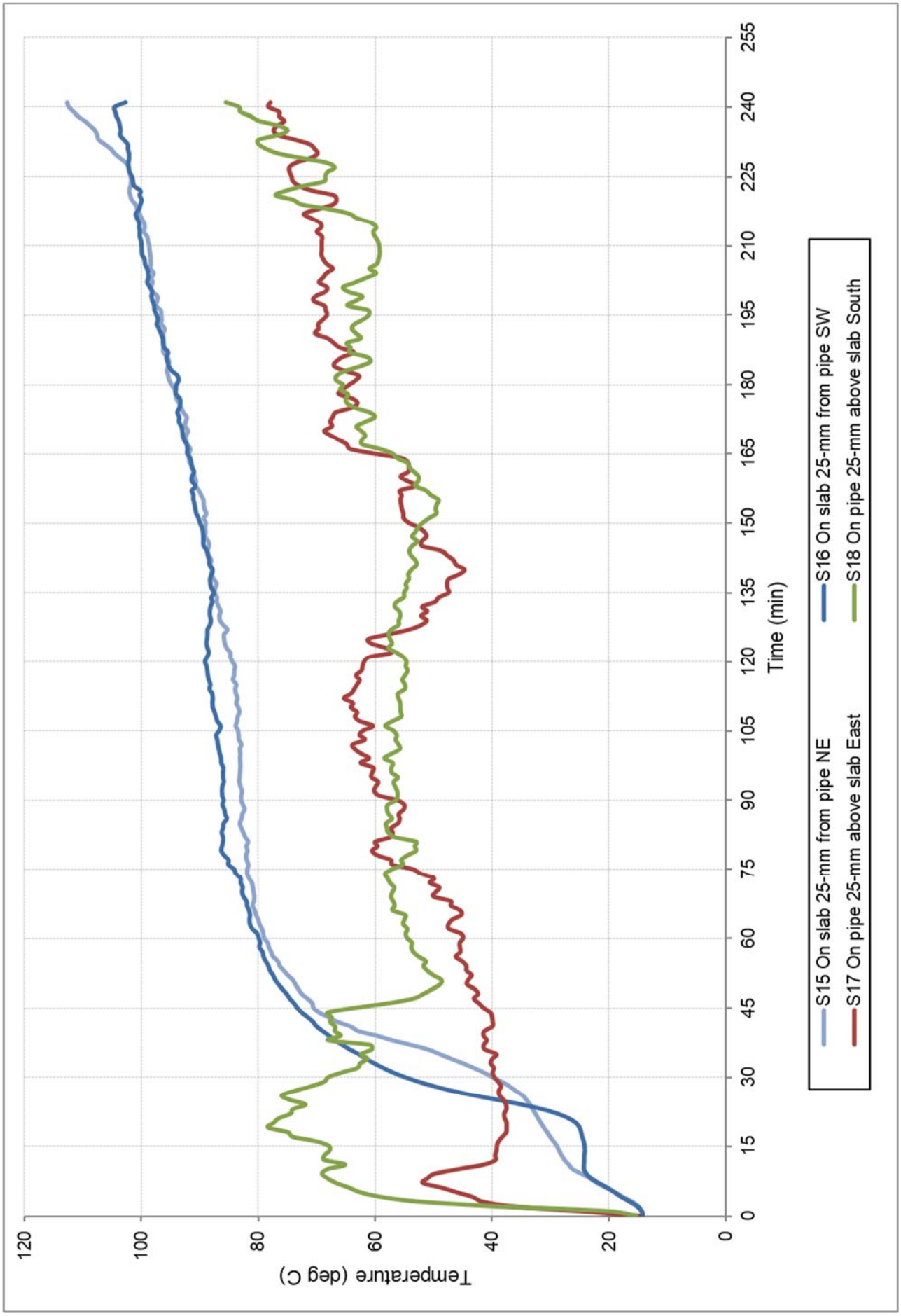


FIGURE 6 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 4

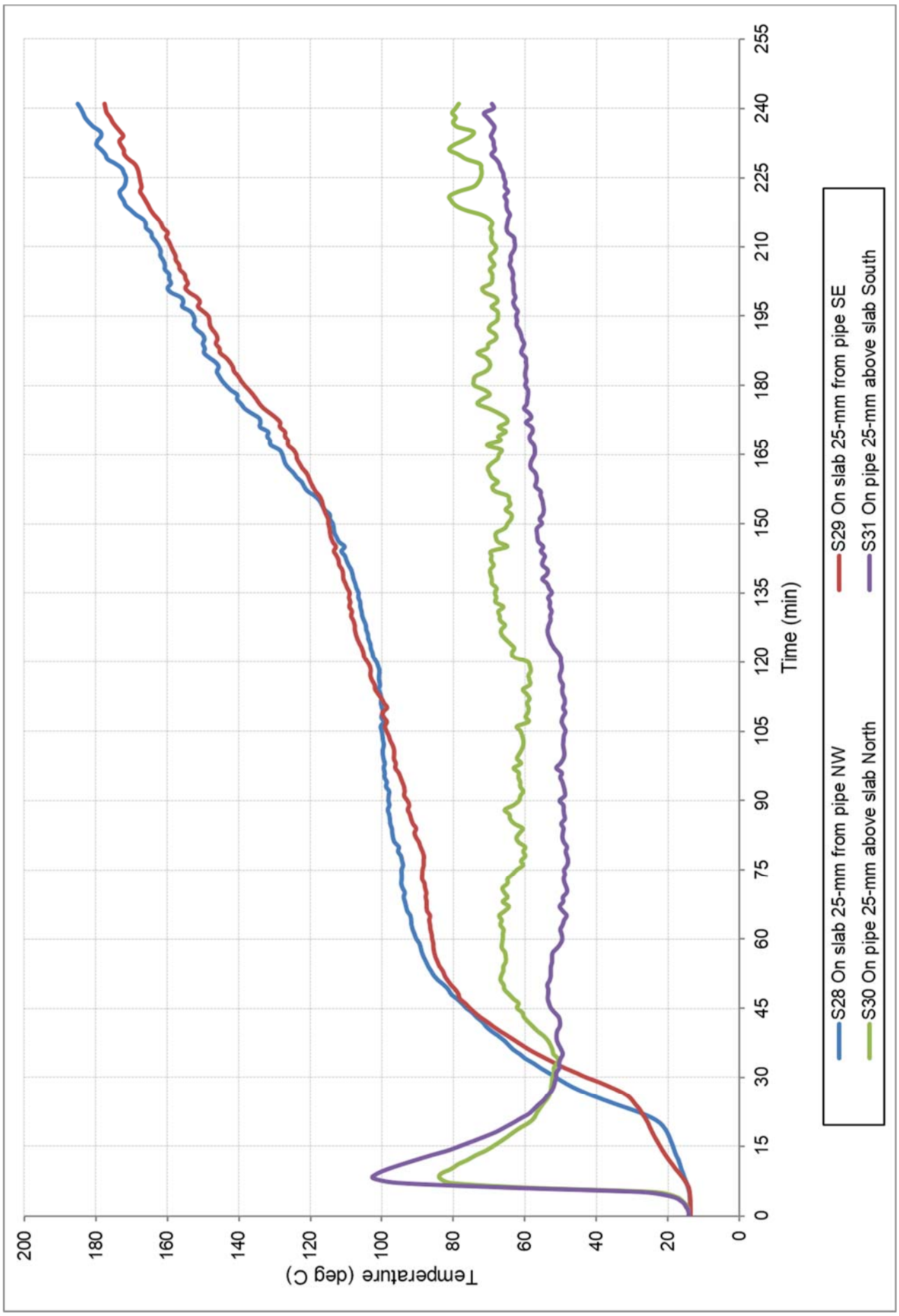


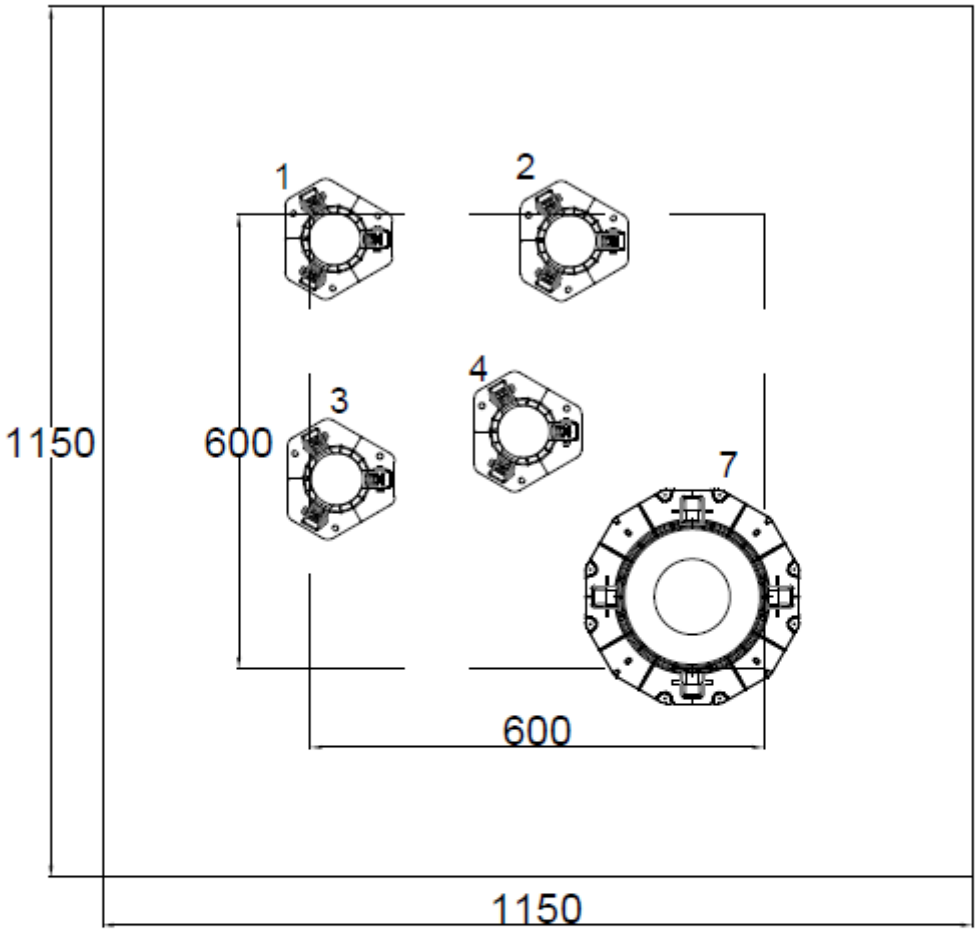
FIGURE 7 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 7

Appendix D – Installation drawings

Snap Fire Systems Pty Ltd

Test Slab S-20-F Layout

Date: 22 JUL 2020

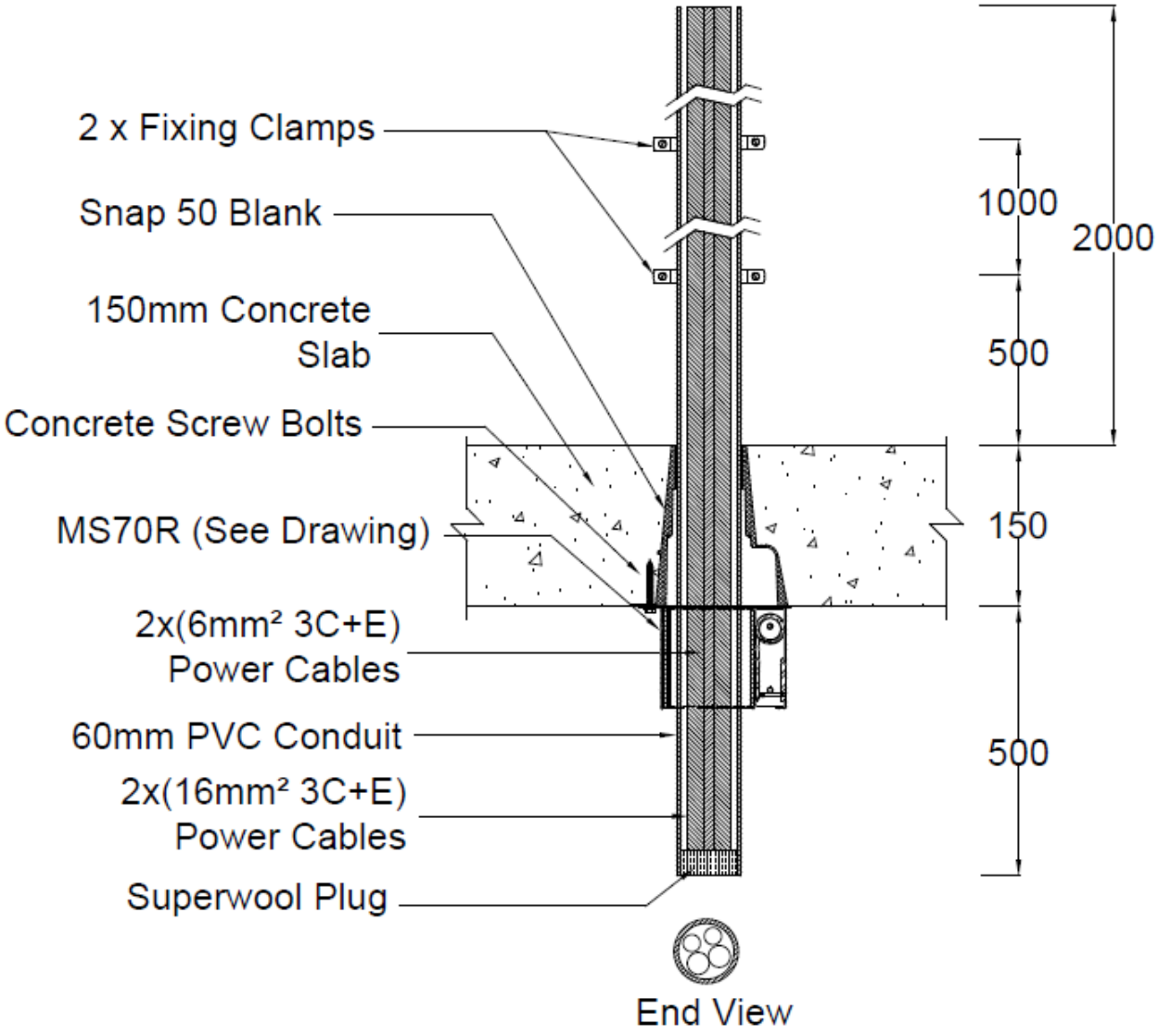


Penetration	Collar Code	Pipe Type	Pipe Diameter
1	MS70R	Medium Duty PVC Conduit with Orange Power Cables	50, 2x(16mm² 3C+E) & 2x(6mm² 3C+E)
2	MS70R	100xCat5e Cables	
3	MS70R	20xCat5e Cables	
4	MS70R	PN6 Pressure PVC	50
7	H150S-RR	Triplus	160

DRAWING TITLED 'TEST SLAB S-20-F LAYOUT', DATED 22 JULY 2020, BY SNAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd

Specimen #1
50 PVC Conduit with 16mm² 3C+E &
6mm² 3C+E Power Cables & MS70R
Date: 28 JUL 2020



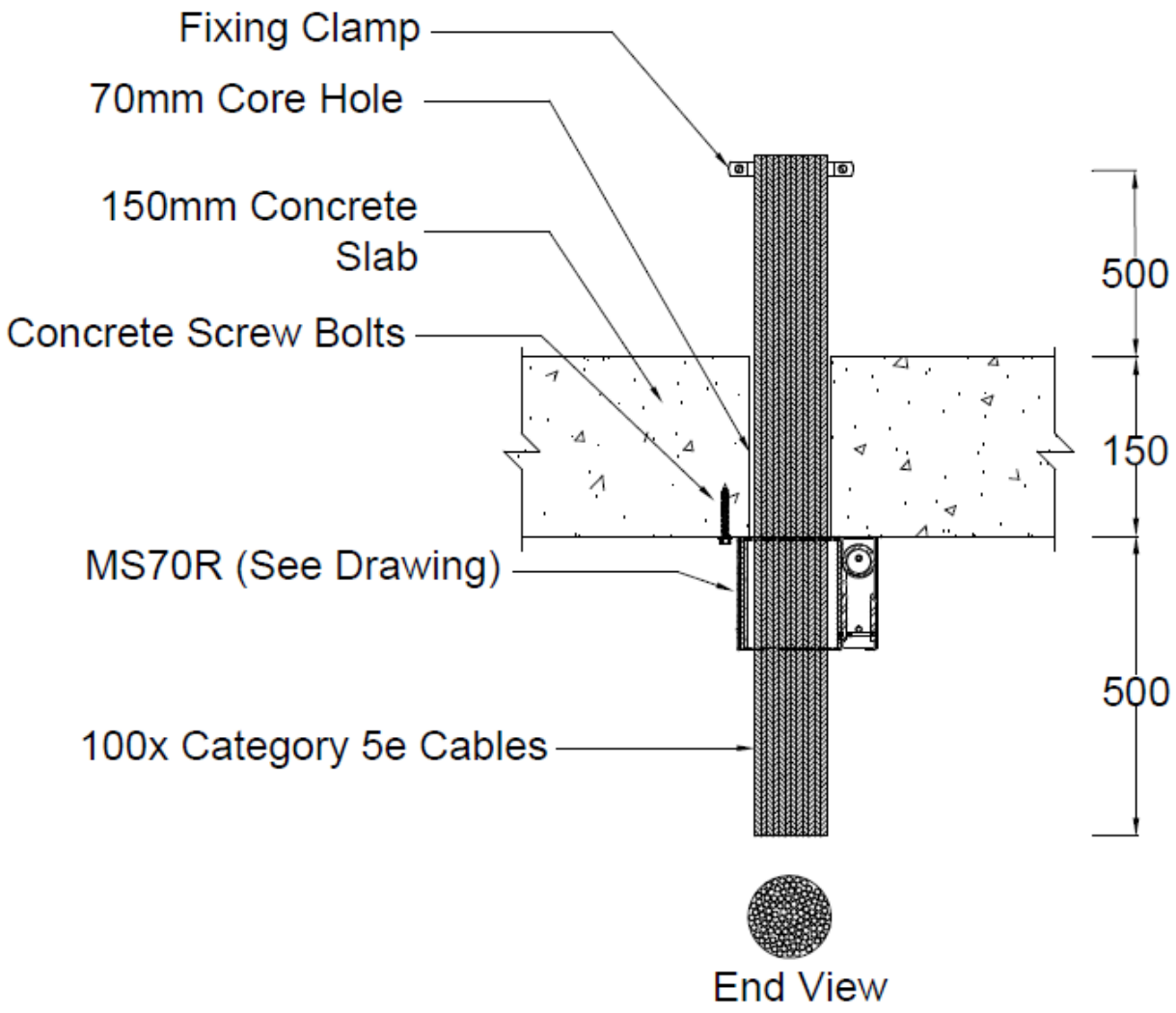
DRAWING TITLED 'SPECIMEN #1 50 PVC CONDUIT WITH 16MM² 3C+E & 6MM² 3C+E POWER CABLES & MS70R', DATED 28 JULY 2020, PROVIDED BY SNAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd

Specimen #2

100% Full of Cat5e Cables & MS70R

Date: 28 JUL 2020



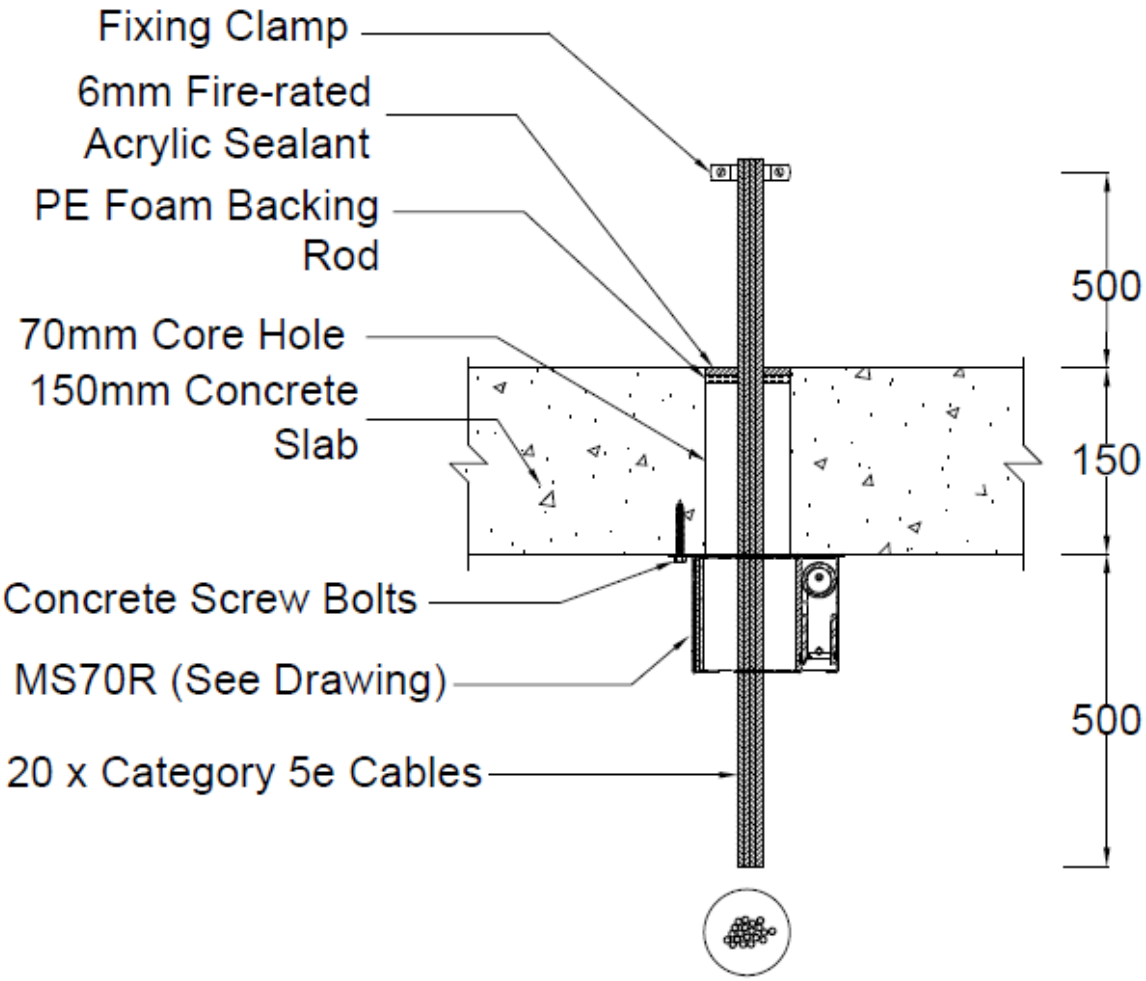
DRAWING TITLED 'SPECIMEN #2 100% FULL OF CAT5E CABLES & MS70R', DATED 28 JULY 2020, PROVIDED BY SNAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd

Specimen #3

20% Full of Cat5e Cables & MS70R

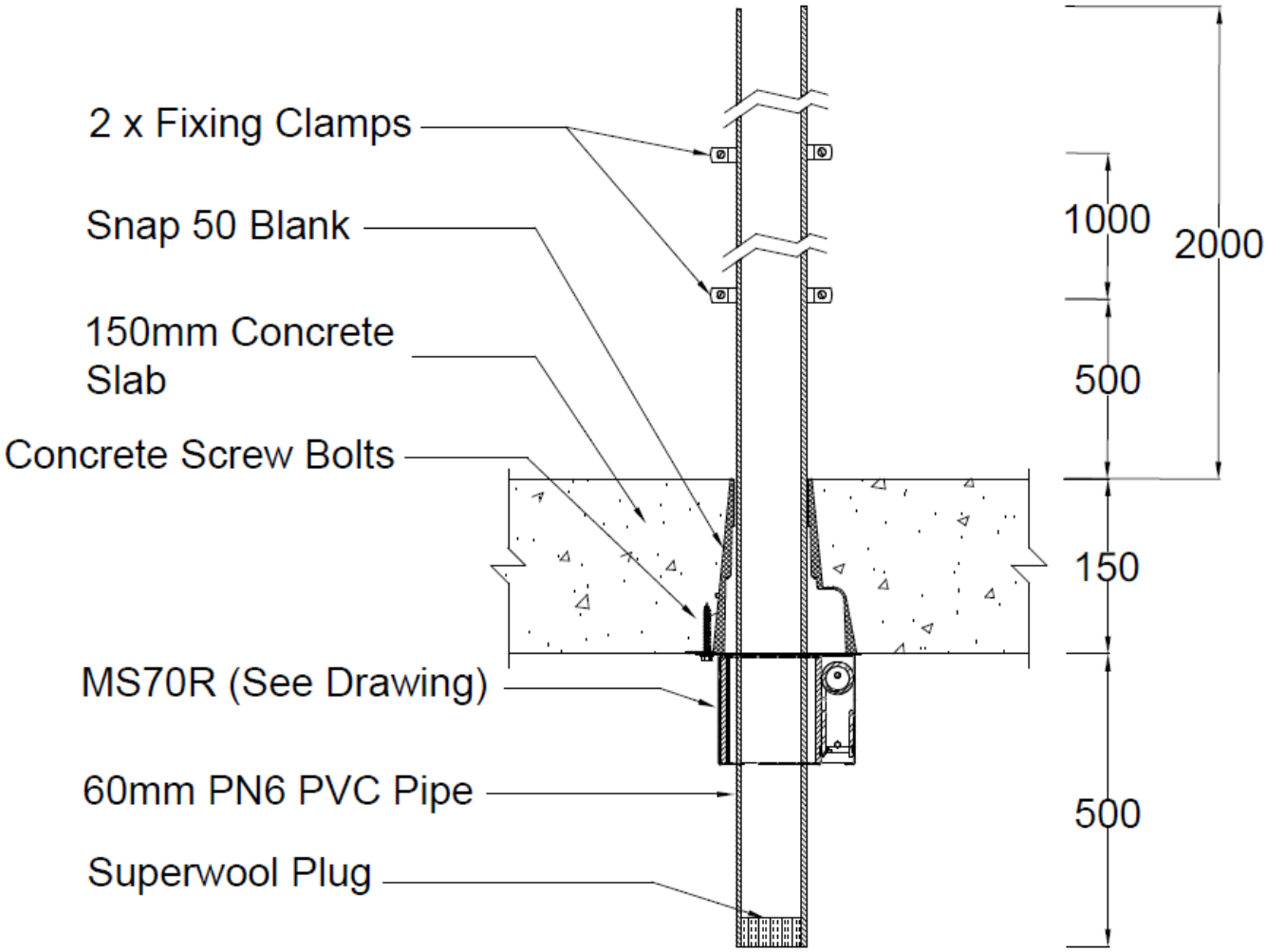
Date: 28 JUL 2020



DRAWING TITLED 'SPECIMEN #3 20% FULL OF CAT5E CABLES & MS70R', DATED 28 JULY 2020, PROVIDED BY SNAP FIRE SYSTEMS PTY LTD

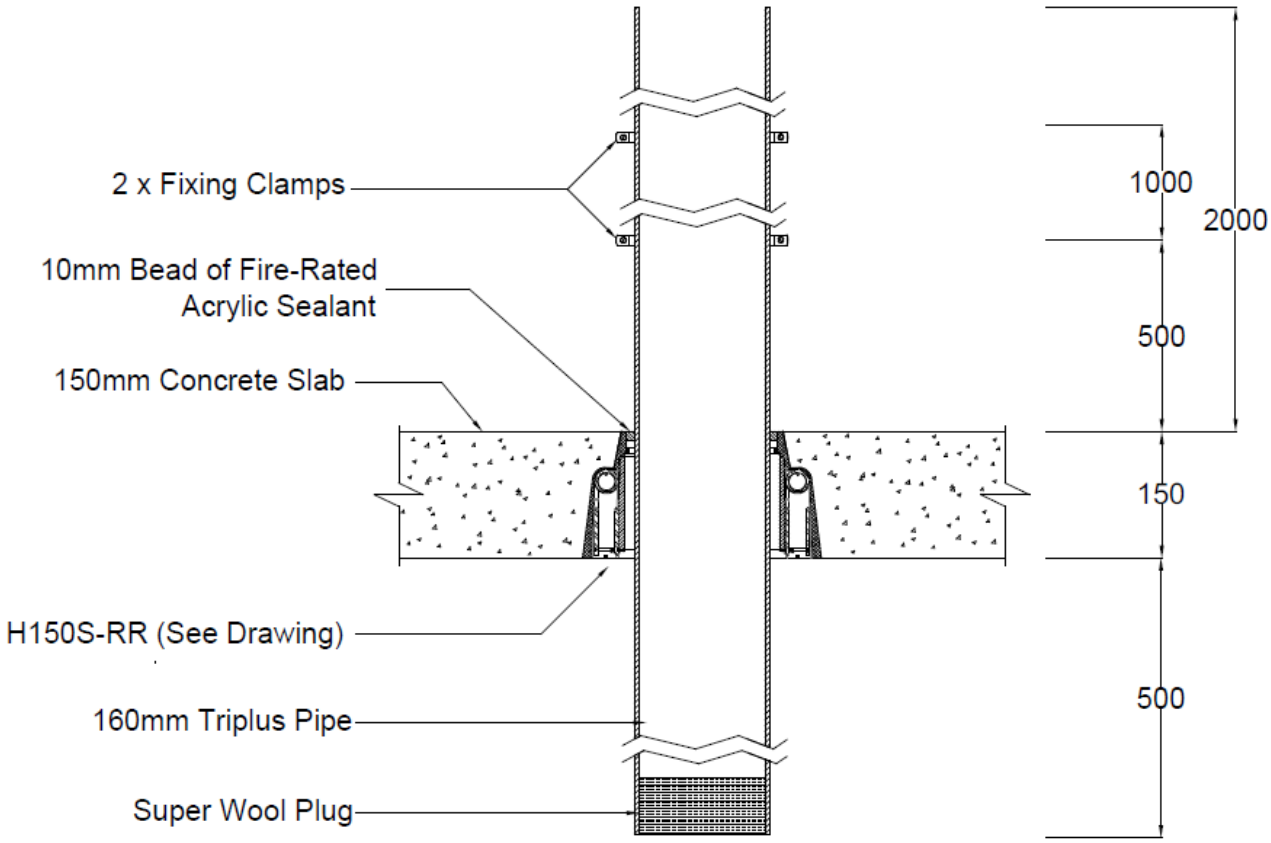
Snap Fire Systems Pty Ltd

Specimen #4
50 PN6 PVC Pipe & MS70R
Date: 28 JUL 2020



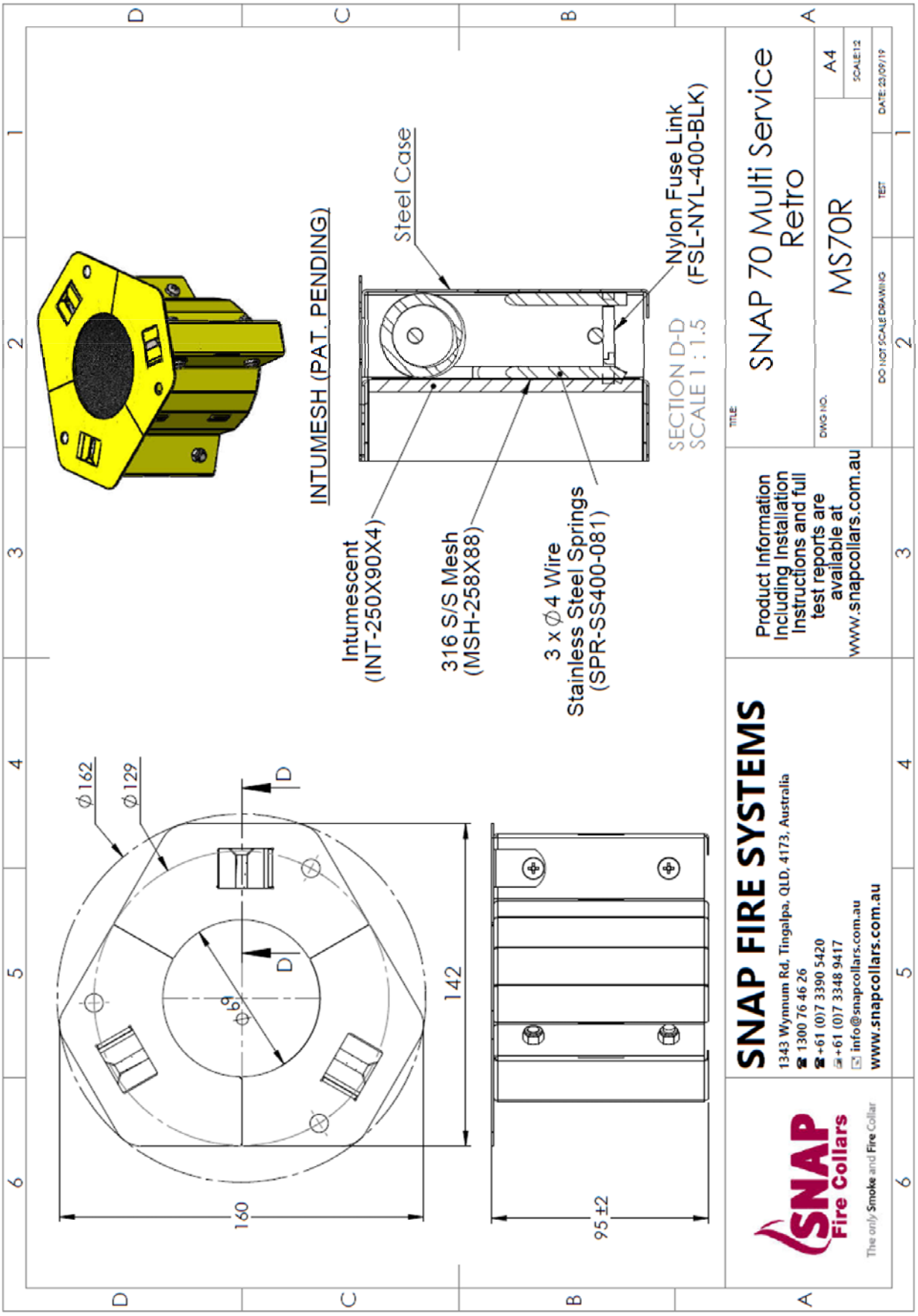
DRAWING TITLED 'SPECIMEN #4 50 PN6 PVC PIPE & MS70R', DATED 28 JULY 2020, PROVIDED BY SNAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd
Specimen #7
160 Triplus & H150S-RR
Date: 28 JUL 2020

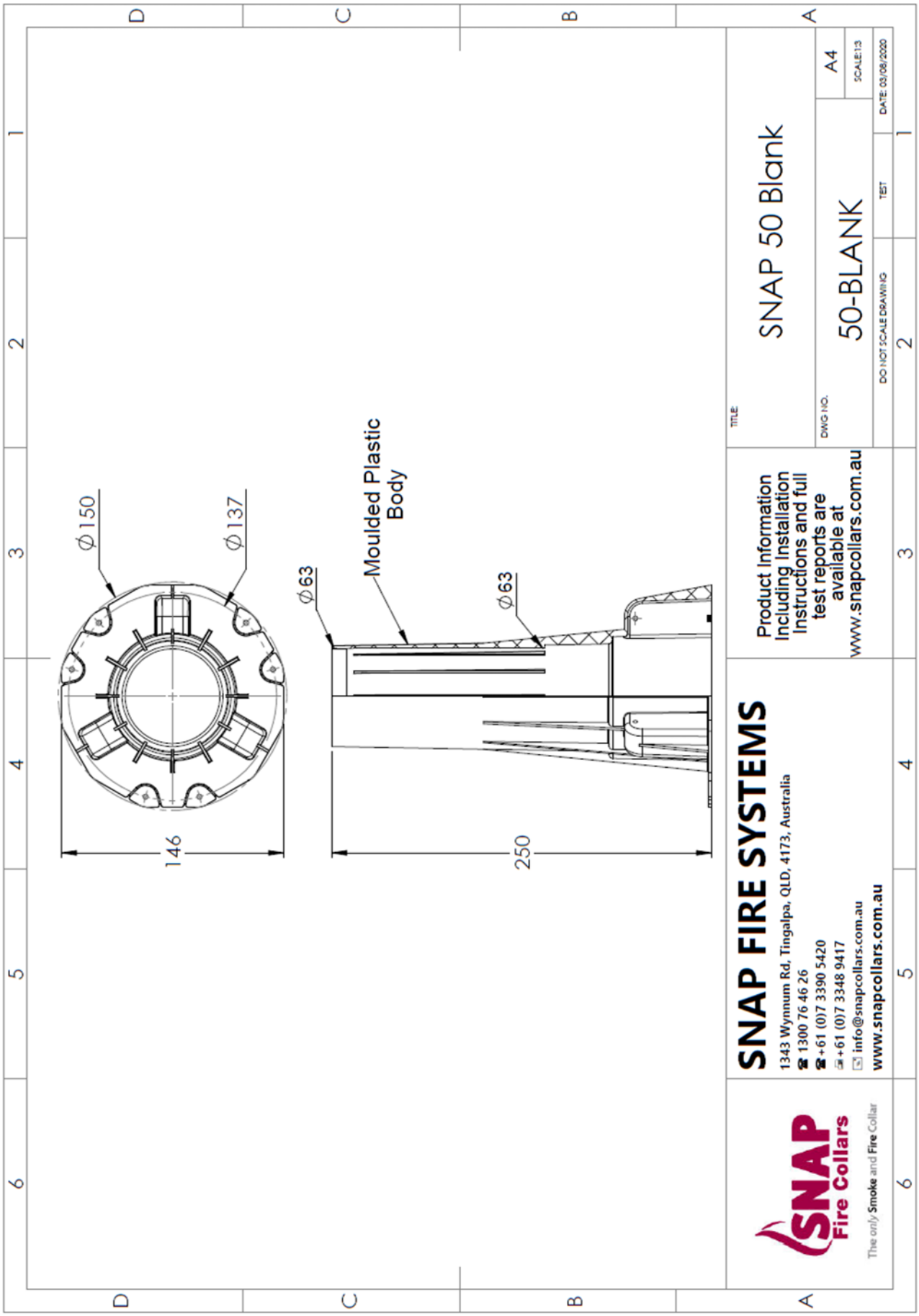


DRAWING TITLED 'SPECIMEN #7 160 TRIPLUS & H150S-RR', DATED 28 JULY 2020, PROVIDED BY SNAP FIRE SYSTEMS PTY LTD

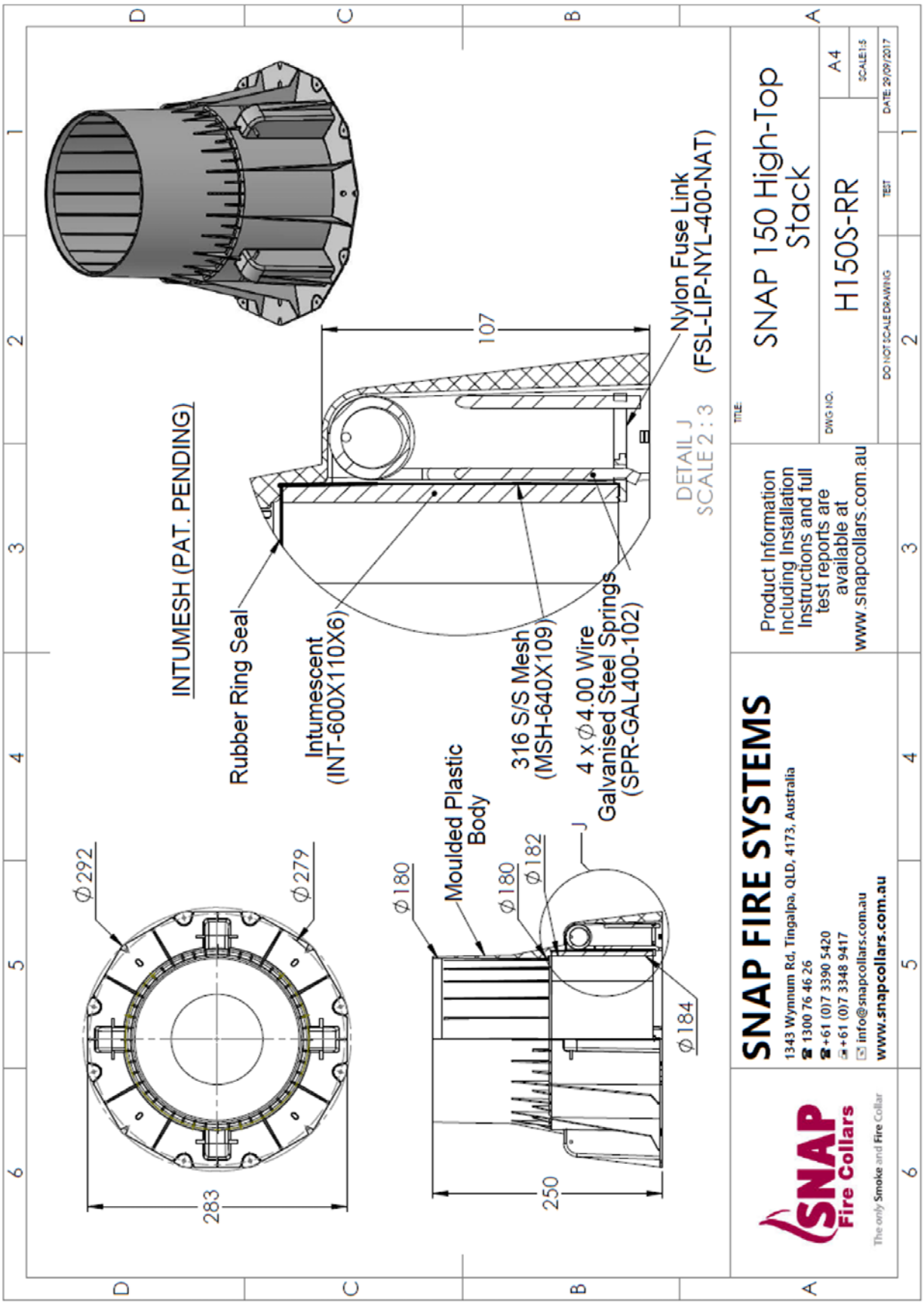
Appendix E – Specimen Drawings



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



DRAWING TITLED 'SNAP 50 BLANK', DATED 3 AUGUST 2020, BY SNAP FIRE SYSTEMS PTY LTD



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

Appendix F – Certificate(s) of Test

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PO Box 52, North Ryde NSW 1670, Australia
T (02) 9490 5444 • **ABN** 41 687 119 230

Certificate of Test

No. 3491

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 2135.

Product Name: SNAP MS70R Multi Services Retrofit fire collar protecting a nominal 50-mm diameter polyvinyl chloride (PVC-U) conduit incorporating two 6-mm^2 3C+E and two 16-mm^2 3C+E power cables (Specimen 1)

Description: The specimen comprised an 1150-mm x 1150-mm x 150-mm thick concrete slab. The slab was penetrated by a service protected by a retrofit fire collar. The 150-mm thick concrete slab was reinforced with a single layer of steel reinforcement providing a Fire Resistance Period (FRP) for insulation of 180 minutes in accordance with Table 5.5.1 of AS 3600:2018 - Concrete structures. The SNAP 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 thick steel base flange with a 162-mm diameter as shown in drawing titled "SNAP 70 Multi Service Retro", dated 23 September 2019, by Snap Fire Systems Pty Ltd. The Snap collar was surface mounted around the conduit on the exposed face (underside) of the concrete slab and was fixed through three mounting holes. A cast in SNAP 50 blank casing was used to provide the opening in the concrete slab as shown in drawing titled "SNAP 50 Blank", dated 3 August 2020, by Snap Fire Systems Pty Ltd. The penetrating service comprised a 60-mm outside diameter Telstra PVC-U conduit with a wall thickness of 2.71-mm incorporating two 6-mm^2 3-core + E power cables and two 16-mm^2 3-core + E power cables running through the inside of the conduit as shown in drawing titled "Specimen #1 50 PVC Conduit with 16mm^2 3C + E & 6mm^2 3C + E Power Cables & MS70R Collar", dated 28 July, provided by Snap Fire Systems Pty Ltd. The conduit and cables projected vertically approximately 2000-mm above the slab and 500-mm below into the furnace chamber. The conduit was supported at 500 mm and 1500-mm above the slab. The conduit was open at 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 241 minutes
Insulation	-	no failure at 241 minutes

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

The fire-resistance level (FRL) of the specimen is applicable when the system is exposed to fire from the same direction as tested. The test on the specimen was conducted in a concrete slab with a Fire Resistance Period (FRP) for insulation of 180 minutes in accordance with Table 5.5.1 of AS 3600:2018 - Concrete structures. The maximum FRL of any test specimen cannot exceed the FRL achieved by the concrete slab in which it was installed. For the purposes of AS 1530.4-2014, the results of these fire tests may be used to directly assess fire hazard, but it should be noted that a single test method will not provide a full assessment of fire hazard under all fire conditions. 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: 6 August 2020

Issued on the 10th day of September 2020 without alterations or additions.

Brett Roddy | Manager, Fire Testing and Assessments

COPY OF CERTIFICATE OF TEST – NO. 3491

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. 3492

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 2135.

Product Name: SNAP MS70R Multi Services Retrofit fire collar protecting a bundle of 100 Category 5e network cables (Specimen 2)

Description: The specimen comprised an 1150-mm x 1150-mm x 150-mm thick concrete slab. The slab was penetrated by a service protected by a retrofit fire collar. The 150-mm thick concrete slab was reinforced with a single layer of steel reinforcement providing a Fire Resistance Period (FRP) for insulation of 180 minutes in accordance with Table 5.5.1 of AS 3600:2018 - Concrete structures. The SNAP 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 thick steel base flange with a 162-mm diameter as shown in drawing titled "SNAP 70 Multi Service Retro", dated 23 September 2019, by Snap Fire Systems Pty Ltd. The Snap collar was surface mounted around the cables on the exposed face (underside) of the concrete slab and was fixed through three mounting holes. The penetrating service comprised a bundle of 100 x 5-mm diameter ADC Krone Category 5e network cables as shown in drawing titled "Specimen #2 100% Full of Cat5e Cables & MS70R Collar", dated 28 July 2020, provided by Snap Fire Systems Pty Ltd. The cables projected vertically 550-mm above the concrete and approximately 500 mm below into the furnace chamber. The cables were supported at nominally 500-mm above the concrete slab.

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

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

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

The fire-resistance level (FRL) of the specimen is applicable when the system is exposed to fire from the same direction as tested. The test on the specimen was conducted in a concrete slab with a Fire Resistance Period (FRP) for insulation of 180 minutes in accordance with Table 5.5.1 of AS 3600:2018 - Concrete structures. The maximum FRL of any test specimen cannot exceed the FRL achieved by the concrete slab in which it was installed. For the purposes of AS 1530.4-2014, the results of these fire tests may be used to directly assess fire hazard, but it should be noted that a single test method will not provide a full assessment of fire hazard under all fire conditions. 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: 6 August 2020

Issued on the 10th day of September 2020 without alterations or additions.

Brett Roddy | Manager, Fire Testing and Assessments

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

COPY OF CERTIFICATE OF TEST – NO. 3492

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. 3493

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 2135.

Product Name: SNAP MS70R Multi Services Retrofit fire collar protecting a bundle of 20 Category 5e network cables (Specimen 3)

Description: The specimen comprised an 1150-mm x 1150-mm x 150-mm thick concrete slab. The slab was penetrated by a service protected by a retrofit fire collar. The 150-mm thick concrete slab was reinforced with a single layer of steel reinforcement providing a Fire Resistance Period (FRP) for insulation of 180 minutes in accordance with Table 5.5.1 of AS 3600:2018 - Concrete structures. The SNAP 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 thick steel base flange with a 162-mm diameter as shown in drawing titled "SNAP 70 Multi Service Retro", dated 23 September 2019, by Snap Fire Systems Pty Ltd. The Snap collar was surface mounted around the cables on the exposed face (underside) of the concrete floor slab and was fixed through three mounting holes. The penetrating service comprised a bundle of 20 x 5-mm diameter ADC Krone Category 5e network cables as shown in drawing titled "Specimen #3 20% Full of Cat5e Cables & MS70R Collar", dated 28 July 2020, provided by Snap Fire Systems Pty Ltd. The annular gap around pipe and concrete slab on the unexposed face was fitted with a 22-mm diameter PE backing rod and filled with a 6-mm deep bead H.B Fullers Firesound sealant. The cables projected vertically 550-mm above the concrete and approximately 500 mm below into the furnace chamber. The cables were supported at nominally 500-mm above the concrete slab.

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

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

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

The fire-resistance level (FRL) of the specimen is applicable when the system is exposed to fire from the same direction as tested. The test on the specimen was conducted in a concrete slab with a Fire Resistance Period (FRP) for insulation of 180 minutes in accordance with Table 5.5.1 of AS 3600:2018 - Concrete structures. The maximum FRL of any test specimen cannot exceed the FRL achieved by the concrete slab in which it was installed. For the purposes of AS 1530.4-2014, the results of these fire tests may be used to directly assess fire hazard, but it should be noted that a single test method will not provide a full assessment of fire hazard under all fire conditions. 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: 6 August 2020

Issued on the 10th day of September 2020 without alterations or additions.

Brett Roddy | Manager, Fire Testing and Assessments

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Certificate of Test

No. 3494

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 2135.

Product Name: SNAP MS70R Multi Services Retrofit fire collar protecting a nominal 50 PN6 polyvinyl chloride (PVC-U) pipe (Specimen 4)

Description: The specimen comprised an 1150-mm x 1150-mm x 150-mm thick concrete slab. The slab was penetrated by a service protected by a retrofit fire collar. The 150-mm thick concrete slab was reinforced with a single layer of steel reinforcement providing a Fire Resistance Period (FRP) for insulation of 180 minutes in accordance with Table 5.5.1 of AS 3600:2018 - Concrete structures. The SNAP 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 thick steel base flange with a 162-mm diameter as shown in drawing titled "SNAP 70 Multi Service Retro", dated 23 September 2019, by Snap Fire Systems Pty Ltd. The Snap collar was surface mounted around the cables on the exposed face (underside) of the concrete slab and was fixed through three mounting holes. A cast in SNAP 50 blank casing was used to provide an opening in the concrete slab as shown in drawing titled "SNAP 50 Blank", dated 3 August 2020, by Snap Fire Systems Pty Ltd. The penetrating service comprised a 60.32-mm outside diameter Vinidex PN6 (PVC-U) pipe with a wall thickness of 1.84 mm as shown in drawing titled "Specimen #4 50 PN6 PVC Pipe & MS70R Collar", dated 28 July 2020, by Snap Fire Systems Pty Ltd". The pipe projected vertically 2000-mm above the concrete slab and approximately 500 mm below into the furnace chamber. The pipe was supported at nominally 500-mm and 1500-mm above the slab. The pipe was open at 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 241 minutes
Insulation	-	no failure at 241 minutes

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

The fire-resistance level (FRL) of the specimen is applicable when the system is exposed to fire from the same direction as tested. The test on the specimen was conducted in a concrete slab with a Fire Resistance Period (FRP) for insulation of 180 minutes in accordance with Table 5.5.1 of AS 3600:2018 - Concrete structures. The maximum FRL of any test specimen cannot exceed the FRL achieved by the concrete slab in which it was installed. For the purposes of AS 1530.4-2014, the results of these fire tests may be used to directly assess fire hazard, but it should be noted that a single test method will not provide a full assessment of fire hazard under all fire conditions. 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: 6 August 2020

Issued on the 10th day of September 2020 without alterations or additions.

B. Roddy

Brett Roddy | Manager, Fire Testing and Assessments

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Certificate of Test

No. 3497

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 2135.

Product Name: SNAP H150S-RR High Top Stack fire collar protecting a nominal 160-mm diameter polypropylene (Valsir Triplus) pipe (Specimen 7)

Description: The specimen comprised an 1150-mm x 1150-mm x 150-mm thick concrete slab. The slab was penetrated by a service protected by a cast-in fire collar. The 150-mm thick concrete slab was reinforced with a single layer of steel reinforcement providing a Fire Resistance Period (FRP) for insulation of 180 minutes in accordance with Table 5.5.1 of AS 3600:2018 - Concrete structures. The SNAP H150S-RR High Top Stack fire collar comprised a 2-mm thick polypropylene casing with a 180 mm inner diameter and a 292-mm diameter base flange as shown in drawing titled "SNAP 150 High-Top Stack", dated 29 September 2017, by SNAP Fire Systems. The penetrating service comprised a 160-mm outside diameter Valsir Triplus polypropylene pipe with a wall thickness of 5 mm fitted through the collar's sleeve. The annular gap between the pipe and the inside collar was protected with a 10-mm deep bead of Fullers Firesound sealant, as shown in drawing titled "Specimen #7, 160 Triplus & H150S-RR", dated 28 July 2020, provided by Snap Fire Systems Pty Ltd. The pipe projected vertically 2000-mm above from the unexposed face of the concrete slab and 500-mm into the furnace chamber. The pipe was supported at nominally 500 mm and 1500 mm from the unexposed face of the slab. The pipe was open at the unexposed end and closed with a ceramic fibre (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 241 minutes
Insulation	-	no failure at 241 minutes

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

The fire-resistance level (FRL) of the specimen is applicable when the system is exposed to fire from the same direction as tested. The test on the specimen was conducted in a concrete slab with a Fire Resistance Period (FRP) for insulation of 180 minutes in accordance with Table 5.5.1 of AS 3600:2018 - Concrete structures. The maximum FRL of any test specimen cannot exceed the FRL achieved by the concrete slab in which it was installed. For the purposes of AS 1530.4-2014, the results of these fire tests may be used to directly assess fire hazard, but it should be noted that a single test method will not provide a full assessment of fire hazard under all fire conditions. 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: 6 August 2020

Issued on the 10th day of September 2020 without alterations or additions.

Brett Roddy | Manager, Fire Testing and Assessments

COPY OF CERTIFICATE OF TEST – NO. 3497

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 for building construction.
AS 4072.1-2005	Components for the protection of openings in fire-resistant separating elements. Part 1: Service penetrations and control joints.
AS 3600-2018	Concrete structures.

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 www.csiro.au/en/Do-business/Services/Materials-infrastructure/Fire-safety