

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

Test Report

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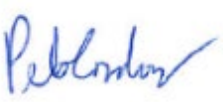


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Fire-resistance test on fire collars protecting a concrete slab penetrated by services

Sponsored Investigation No. FSP 2225

1 Introduction

1.1 Identification of specimen

The sponsor identified the specimens as SNAP fire collars protecting a 150-mm thick concrete floor slab penetrated by seven services comprising; lagged copper pipes, lagged unplasticized polyvinyl chloride (uPVC) pipes, thermoplastic-sheathed (TPS) power cables and Category 7 Network (Cat 7) cables.

1.2 Sponsor

IG6 Pty Ltd as trustee for the IG6 IP Trust
1343 Wynnum Road
Tingalpa QLD

1.3 Manufacturers

Snap Fire Systems Pty Ltd
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 5114/4668

1.7 Test date

The fire-resistance test was conducted on 12 August 2021.

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 three cast-in collars and four retrofit 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.

For the purpose of the test, the penetrations were referenced as Specimen 1, 2, 3, 4, 5, 6, and 7. 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 1432:2004 Copper tubes for plumbing, gas fitting and drainage applications and
- AS/NZS 1477:2017 PVC pipes and fittings for pressure applications

Specimen 1 – A SNAP MS70C Multi Service cast-in fire collar protecting a DN25 copper pipe with 19-mm thick Armaflex fire-rated lagging and a 2.5-mm² 3-core TPS power cable

The SNAP MS70C Multi Service cast-in fire collar comprised a 1.6-mm thick polypropylene casing with a 79 mm inner diameter and a 168-mm outer diameter base flange. The 250-mm high collar casing incorporated a 280-mm x 65-mm x 5-mm thick Intumesh intumescent material and a rubber ring seal. The closing mechanism comprised three stainless-steel springs bound with nylon fuse links and a 322-mm x 63-mm 316 stainless steel mesh as shown in drawing titled 'SNAP 70 Multi Service Cast-In', dated 20 May 2021, by Snap Fire Systems Pty Ltd.

The MS70C fire collar was cast into a 150-mm thick concrete slab with the collar's casing projecting 100-mm vertically above the unexposed face.

The penetrating service comprised a lagged copper pipe and a Prysmian 3-core 2.5-mm² TPS power cable. The Brasshards copper type B pipe had a 25.4-mm (1-inch) outside diameter, a wall thickness of 1.22-mm and was lagged with 19-mm thick Armaflex FRV nitrile rubber insulation. The lagged pipe and cable were fitted through the sleeve of the MS70C collar and penetrated the concrete slab as shown in drawing titled 'Specimen #1 1inch Copper Tube with 19mm Fire-rated Lagging (Armaflex), 2.5mm² 3C TPS Cable & MS70C', dated 7 July 2021, by Snap Fire Systems Pty Ltd.

The lagged pipe and cable projected vertically 550-mm above the concrete slab and approximately 500-mm below into the furnace chamber. The lagged pipe and cable were supported at 500-mm above the unexposed face of the concrete slab. The copper pipe was left open on the unexposed face and crimped closed on the exposed end.

Specimen 2 – A SNAP MS70R Multi Service Retrofit fire collar protecting a nominal 32 (42.3-mm OD) PN12 uPVC pipe with 19-mm thick Armaflex fire-rated lagging penetrating a 67-mm diameter aperture

The SNAP MS70R Multi Service Retrofit fire collar comprised a 0.75-mm thick steel casing with a 69-mm inner diameter and a 0.95-mm thick steel base flange with a 162-mm outer diameter. The 95-mm high collar casing incorporated a 4-mm thick x 90-mm wide x 250-mm long soft Intumesh intumescent wrap which lined 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 MS70R fire collar was centrally located over a 67-mm core hole on the underside (exposed face) of the concrete slab and fixed through the 3 mounting brackets using 6.5-mm x 40-mm long steel sleeved masonry anchors.

The penetrating service comprised a Iplex PN12 uPVC 42.3-mm outside diameter pressure pipe, with a wall thickness of 2.6-mm, lagged with 19-mm thick Armaflex FRV nitrile rubber insulation. The lagged pipe was fitted through the sleeve of the fire collar and penetrated the concrete slab through a 67-mm diameter cut-out hole as shown in drawing titled 'Specimen #2 32 PN12 PVC Pipe with 19mm Fire-Rated Lagging (Armaflex) & MS70R', dated 7 July 2021, by Snap Fire Systems Pty Ltd.

The lagged pipe projected vertically 2000-mm above the unexposed face of the concrete slab and approximately 500-mm below into the furnace chamber. The lagged pipe was supported at nominally 500-mm and 1500-mm above the unexposed face of the concrete slab. The pipe was left open on the unexposed end and plugged with ceramic fibre (Superwool) on the exposed end.

Specimen 3 – A SNAP MS70C Multi Service cast-in fire collar protecting a nominal 32 (42.3-mm OD) PN12 uPVC pipe with 19-mm thick Armaflex fire-rated lagging

The SNAP MS70C Multi Services cast-in fire collar comprised a 1.6-mm thick polypropylene casing with a 79 mm inner diameter and a 168-mm outer diameter base flange. The 250-mm high collar casing incorporated a 280-mm x 65-mm x 5-mm thick Intumesh intumescent material and a rubber ring seal. The closing mechanism comprised three stainless-steel springs bound with nylon fuse links and a 322-mm x 63-mm 316 stainless steel mesh as shown in drawing titled 'SNAP 70 Multi Service Cast-In', dated 20 May 2021, by Snap Fire Systems Pty Ltd.

The MS70C fire collar was cast into a 150-mm thick concrete slab with the collar's casing projecting 100-mm vertically above the unexposed face.

The penetrating service comprised a Iplex PN12 uPVC 42.3-mm outside diameter pressure pipe with a wall thickness of 2.6-mm lagged with 19-mm thick Armaflex FRV nitrile rubber insulation. The lagged pipe was fitted through the sleeve of the fire collar and penetrated the concrete slab as shown in drawing titled 'Specimen #3 32mm PN12 PVC Pipe with 19mm Fire-Rated Lagging (Armaflex) & MS70C', dated 7 July 2021, by Snap Fire Systems Pty Ltd.

The lagged pipe projected vertically 2000-mm above the unexposed face of the concrete slab and approximately 500-mm below into the furnace chamber. The lagged pipe was supported at nominally 500-mm and 1500-mm above the unexposed face of the concrete slab. The pipe was left open on the unexposed end and plugged with ceramic fibre (Superwool) on the exposed end.

Specimen 4 – A SNAP MS70R Multi Service Retrofit fire collar protecting a DN25 copper pipe with 19-mm thick E-Flex fire-rated lagging and a 2.5-mm² 3-core TPS power cable penetrating a 67-mm diameter aperture

The SNAP MS70R Multi Service Retrofit fire collar comprised a 0.75-mm thick steel casing with a 69-mm inner diameter and a 0.95-mm thick steel base flange with a 162-mm outer 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 MS70R fire collar was centrally located over a 67-mm core hole on the underside (exposed face) of the concrete slab and fixed through the 3 mounting brackets using 5-mm x 35-mm long steel mushroom head spikes.

The penetrating service comprised a lagged copper pipe and a Prysmian 3-core 2.5-mm² TPS power cable. The Brasshards copper type B pipe had a 25.4-mm (1-inch) outside diameter, a wall thickness of 1.22-mm and was lagged with 19-mm thick E-Flex ST nitrile foam insulation. The lagged pipe and cable were fitted through the sleeve of the MS70R fire collar and penetrated the concrete slab through a 67-mm diameter cut-out hole as shown in drawing titled 'Specimen #4 1inch Copper Tube with 19mm Fire-rated Lagging (E-flex), 2.5mm² 3C TPS Cable & MS70R', dated 7 July 2021, by Snap Fire Systems Pty Ltd.

The lagged pipe and cable projected vertically approximately 550-mm above the concrete slab and 500 mm below into the furnace chamber. The lagged pipe and cable were supported at nominally 500-mm above the unexposed face of the concrete slab. The copper pipe was left open on the unexposed face and crimped closed on the exposed end.

Specimen 5 – A SNAP MS70R Multi Service Retrofit fire collar protecting a DN25 copper pipe with 19-mm thick Armaflex fire-rated lagging and a 2.5-mm² 3-core TPS power cable penetrating a 67-mm diameter aperture

The SNAP MS70R Multi Service Retrofit fire collar comprised a 0.75-mm thick steel casing with a 69-mm inner diameter and a 0.95-mm thick steel base flange with a 162-mm outer 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 MS70R fire collar was centrally located over a 67-mm core hole on the underside (exposed face) of the concrete slab and fixed through the 3 mounting brackets using 5-mm x 35-mm mushroom head spikes.

The penetrating service comprised a lagged copper pipe and a Prysmian 3-core 2.5-mm² TPS power cable. The Brasshards copper type B pipe had a 25.4-mm (1-inch) outside diameter, a wall thickness of 1.22-mm and was lagged with 19-mm thick Armaflex FRV nitrile rubber. The lagged pipe and cable were fitted through the sleeve of the MS70R fire collar and penetrated the concrete slab through a 67-mm diameter cut-out hole as shown in drawing titled 'Specimen #5 1inch Copper Tube with 19mm Fire-rated Lagging (Armaflex), 2.5mm² 3C TPS Cable & MS70R', dated 7 July 2021, by Snap Fire Systems Pty Ltd.

The lagged pipe and cable projected vertically approximately 550-mm above the concrete slab and 500 mm below into the furnace chamber. The lagged pipe and cable were supported at nominally 500-mm above the unexposed face of the concrete slab. The copper pipe was left open on the unexposed face and crimped closed on the exposed end.

Specimen 6 - A SNAP MS70R Multi Service Retrofit fire collar protecting a bundle of 60 Category 7 network cables penetrating a 67-mm diameter aperture

The SNAP MS70R Multi Service Retrofit fire collar comprised a 0.75-mm thick steel casing with a 69-mm inner diameter and a 0.95-mm thick steel base flange with a 162-mm outer 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 MS70R fire collar was centrally located over a 67-mm core hole on the underside (exposed face) of the concrete slab and fixed through the 3 mounting brackets using 6-mm x 40-mm long steel wedge anchors.

The penetrating service comprised a bundle of sixty 7-mm diameter Belden Category 7 network cables. The cables were fitted through the sleeve of the fire collar and penetrated the concrete slab through a 67-mm diameter cut-out hole as shown in drawing titled 'Specimen #6 100% Full of Cat7 Cables & MS70R', dated 7 July 2021, provided by Snap Fire Systems Pty Ltd.

The cables projected vertically 520-mm above the concrete and approximately 500 mm below into the furnace chamber. The cables were supported at nominally 500-mm above the unexposed face of the concrete slab.

Specimen 7 - A SNAP MS70C Multi Service cast-in fire collar protecting a bundle of 16 Category 7 network cables

The SNAP MS70C Multi Services cast-in fire collar comprised a 1.6-mm thick polypropylene casing with a 79 mm inner diameter and a 168-mm outer diameter base flange. The 250-mm high collar casing incorporated a 280-mm x 65-mm x 5-mm thick Intumesh intumescent material and a rubber ring seal. The closing mechanism comprised three stainless-steel springs bound with nylon fuse links and a 322-mm x 63-mm 316-stainless steel mesh as shown in drawing titled 'SNAP 70 Multi Service Cast-In', dated 20 May 2021, by Snap Fire Systems Pty Ltd.

The MS70C collar was cast into a 150-mm thick concrete slab with the collar's casing projecting 100-mm vertically above the unexposed face.

The penetrating service comprised a bundle of sixteen 7-mm diameter Belden Category 7 network cables. The cables were fitted through the collar's sleeve penetrated the concrete slab as shown in drawing titled 'Specimen #7 20% Full of Cat7 Cables & MS70C', dated 7 July 2021 by Snap Fire Systems Pty Ltd. On the unexposed face the annular gap between the top of the collar casing and the Category 7 network cables incorporated a PE backing rod and was backfilled with a 10-mm deep bead of H.B Fullers Firesound sealant.

The cables projected vertically approximately 520-mm above the concrete and approximately 500-mm below into the furnace chamber. The cables were supported at nominally 500-mm above the unexposed face of the concrete slab.

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 21 July 2021 and stored under standard laboratory atmospheric conditions until the test date.

2.5 Selection, construction and installation of specimen and 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-21-D Layout', dated 20 April 2021, by Snap Fire Systems Pty Ltd.

Drawing titled 'Specimen #1 1inch Copper Tube with 19mm Fire-rated Lagging (Armaflex), 2.5mm² 3C TPS Cable & MS70C', dated 7 July 2021, by Snap Fire Systems Pty Ltd.

Drawing titled 'Specimen #2 32 PN12 PVC Pipe with 19mm Fire-Rated Lagging (Armaflex) & MS70R', dated 7 July 2021, by Snap Fire Systems Pty Ltd.

Drawing titled 'Specimen #3 32 PN12 PVC Pipe with 19mm Fire-Rated Lagging (Armaflex) & MS70C', dated 7 July 2021, by Snap Fire Systems Pty Ltd.

Drawing titled 'Specimen #4 1inch Copper Tube with 19mm Fire-rated Lagging (E-flex), 2.5mm² 3C TPS Cable & MS70R', dated 7 July 2021 by Snap Fire Systems Pty Ltd.

Drawing titled Specimen #5 1inch Copper Tube with 19mm Fire-rated Lagging (Armaflex), 2.5mm² 3C TPS Cable & MS70R', dated 7 July 2021 by Snap Fire Systems Pty Ltd.

Drawing titled 'Specimen #6 100% Full of Cat7 Cables & MS70R', dated 7 July 2021 by Snap Fire Systems Pty Ltd.

Drawing titled 'Specimen #7 20% Full of Cat7 Cables & MS70C', dated 7 July 2021 by Snap Fire Systems Pty Ltd.

Drawing titled 'SNAP 70 Multi Service Cast-In', dated 20 May 2021 by Snap Fire Systems Pty Ltd.

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

No confidential information about the test specimen has been submitted to CSIRO Infrastructure Technologies.

4 Equipment

4.1 Furnace

The furnace had a nominal opening of 1000-mm x 1000-mm for attachment of vertical or horizontal specimens.

The furnace was lined with refractory bricks and materials with the thermal properties as specified in AS 1530.4-2014 and was heated by combustion of a mixture of natural gas and air.

4.2 Temperature

The temperature in the furnace chamber was measured by four type K, 3-mm diameter, and 310 stainless steel Mineral Insulated Metal Sheathed (MIMS) thermocouples. Each thermocouple was housed in high-nickel steel tubes opened at the exposed end.

The temperatures of the specimen were measured by glass-fibre insulated and sheathed K-type thermocouples with a wire diameter of 0.5-mm.

Location of the thermocouples on the unexposed face of the specimen are described in Appendix A.

4.3 Measurement system

The primary measurement system comprised a multiple-channel data logger, scanning at one-minute intervals during the test.

5 Ambient temperature

The temperature of the test area was 17°C at the commencement of the test.

6 Departure from standard

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

7 Termination of test

The test was terminated at 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
1 minute -	Smoke is being emitted at the base of Specimens 1, 6 and 7.
4 minutes -	The level of smoke being emitted at the base of Specimens 1, 6 and 7 has reduced.
7 minutes -	Smoke has ceased being emitted at the base of Specimen 1 and only light smoke is venting through the cable bundles of Specimens 6 and 7.
16 minutes -	A small amount of smoke is being emitted at the base Specimen 5 and from the cables and mastics of Specimen 7.
28 minutes -	Smoke and steam have begun venting at the base of specimen 5.
31 minutes -	Smoke and steam continue venting at the base of specimen 4. Moisture has begun forming on the concrete slab around the base of all the specimens.
46 minutes -	Smoke is fluing from end of the pipe of Specimen 2. Smoke and steam are being emitted from the base of Specimens 5 and 6.
49 minutes -	The level of smoke fluing from the pipe of Specimen 2 has increased with the specimen stack pipe starting to bow.
90 minutes -	Moisture around the base of all penetrations has now dried up.
94 minutes -	Smoke has resumed being emitted between the collar and the pipe at the base of Specimen 1, with this specimen's lagging swelling. The lagging at the base of Specimen 5 has begun to discolour, adjacent to the power cable.
103 minutes -	The discolouration of the lagging at the base of Specimen 5 continues.
106 minutes -	The level of smoke emitted from the base of Specimen 5 has increased.
116 minutes -	The level of smoke fluing from the base of Specimen 5 has further increased and the lagging has now swollen and deformed.
118 minutes -	<u>Insulation failure of Specimen 5</u> - maximum temperature rise of 180K is exceeded on the power cable, 25-mm above the concrete slab.
121 minutes -	The lagging has begun to shrink and shrivel at the base of Specimen 1, both thermocouples #5 and #6 remain in contact with the lagging at this time.
122 minutes -	<u>Insulation failure of Specimen 1</u> - maximum temperature rise of 180K is exceeded on the Armaflex lagging of Specimen 1, 25-mm above the collar's sleeve.
123 minutes -	The collar's sleeve of Specimen 1 above the unexposed face of the concrete slab has begun to deform.
134 minutes -	The lagging at the base of Specimen 5 below thermocouple #26 has shrivelled.
141 minutes -	<u>Insulation failure of Specimen 4</u> - maximum temperature rise of 180K is exceeded on the E-flex lagging at the base of Specimen 1, 25-mm above the concrete slab.
144 minutes -	The lagging continues to swell at the base of Specimen 2.
160 minutes -	<u>Insulation failure of Specimen 6</u> - maximum temperature rise of 180K is exceeded on the Cat7 cable, 25-mm above the concrete slab (north side).
172 minutes -	The lagging around the base of the Specimen 2 has spilt.
219 minutes -	The fire collar sleeve above the concrete slab of Specimen 1 has begun to melt.
235 minutes -	A red glow of the copper pipe can be seen at the base of Specimen 5, no fluing of furnace gasses noted at this time.

- 239 minutes - A red glow of the copper pipe can be seen at the base of Specimen 4, no fluing of furnace gasses noted at this time.
- 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 5.

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

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

8.5 Performance

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

Specimen 1 - A SNAP MS70C Multi Service cast-in fire collar protecting a DN25 copper pipe with 19 mm thick Armaflex fire-rated lagging and a 2.5-mm² 3-core TPS power cable

Structural adequacy	-	not applicable
Integrity	-	no failure at 241 minutes
Insulation	-	122 minutes

Specimen 2 - A SNAP MS70R Multi Service Retrofit fire collar protecting a nominal 32 (42.3-mm OD) PN12 uPVC pipe with 19-mm thick Armaflex fire-rated lagging penetrating a 67-mm diameter aperture

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

Specimen 3 - A SNAP MS70C Multi Service cast-in fire collar protecting a nominal 32 (42.3-mm OD) PN12 uPVC pipe with 19-mm thick Armaflex fire-rated lagging

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

Specimen 4 - A SNAP MS70R Multi Service Retrofit fire collar protecting a DN25 copper pipe with 19-mm thick E-Flex fire-rated lagging and a 2.5-mm² 3-core TPS power cable penetrating a 67-mm diameter aperture

Structural adequacy	-	not applicable
Integrity	-	no failure at 241 minutes
Insulation	-	141 minutes

Specimen 5 - A SNAP MS70R Multi Service Retrofit fire collar protecting a DN25 copper pipe with 19-mm thick Armaflex fire-rated lagging and a 2.5-mm² 3-core TPS power cable penetrating a 67 mm diameter aperture

Structural adequacy	-	not applicable
Integrity	-	no failure at 241 minutes
Insulation	-	118 minutes

Specimen 6 - A SNAP MS70R Multi Service Retrofit fire collar protecting a bundle of 60 Category 7 network cables penetrating a 67-mm diameter aperture

Structural adequacy	-	not applicable
Integrity	-	no failure at 241 minutes
Insulation	-	160 minutes

Specimen 7 - A SNAP MS70C Multi Service cast-in fire collar protecting a bundle of 16 Category 7 network cables.

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	-	-/240/120
Specimen 2	-	-/240/180*
Specimen 3	-	-/240/180*
Specimen 4	-	-/240/120
Specimen 5	-	-/240/90
Specimen 6	-	-/240/120
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.

* Specimens were tested 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

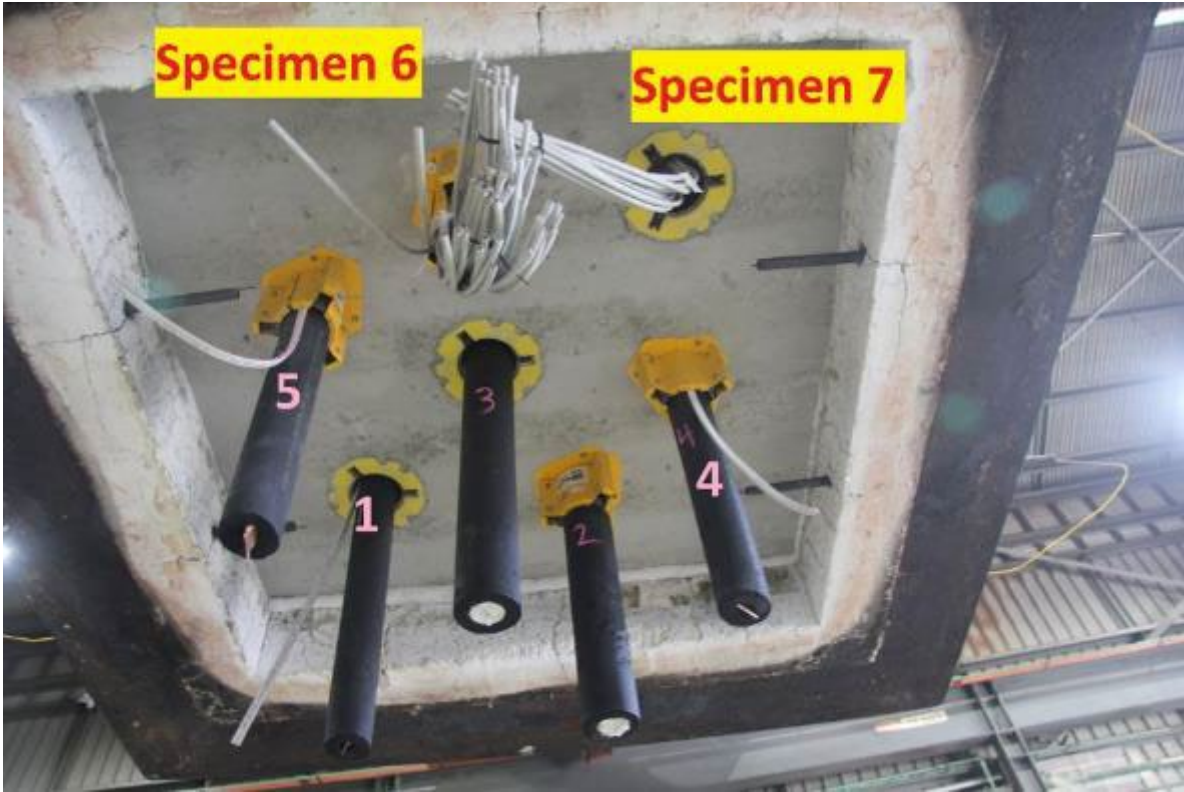
Appendices

Appendix A – Measurement location

Specimen	T/C Position	T/C designation
Specimen 1 - A SNAP MS70C Multi Service cast-in fire collar protecting a DN25 copper pipe with 19 mm thick Armaflex fire-rated lagging and a 2.5-mm ² 3-core TPS power cable.	On the slab, 25-mm from collar (North)	S1
	On the slab, 25-mm from collar (South)	S2
	On the collar, 25-mm above slab (North)	S3
	On the collar, 25-mm above slab (South)	S4
	On the lagging, 25-mm above the collar (North)	S5
	On the lagging, 25-mm above the collar (South)	S6
Specimen 2 - A SNAP MS70R Multi Service Retrofit fire collar protecting a nominal 32 (42.3-mm OD) PN12 uPVC pipe with 19-mm thick Armaflex fire-rated lagging penetrating a 67-mm diameter aperture.	On the slab, 25-mm from lagging (North)	S8
	On the slab, 25-mm from lagging (South)	S9
	On the lagging, 25-mm above slab (North)	S10
	On the lagging, 25-mm above slab (South)	S11
Specimen 3 - A SNAP MS70C Multi Service cast-in fire collar protecting a nominal 32 (42.3-mm OD) PN12 uPVC pipe with 19-mm thick Armaflex fire-rated lagging.	On the slab, 25-mm from collar (West)	S12
	On the slab, 25-mm from collar (East)	S13
	On the collar, 25-mm above slab (West)	S14
	On the collar, 25-mm above slab (East)	S15
	On the lagging, 25-mm above the collar (West)	S16
	On the lagging, 25-mm above the collar (East)	S17
Specimen 4 - A SNAP MS70R Multi Service Retrofit fire collar protecting a DN25 copper pipe with 19-mm thick E-Flex fire-rated lagging and a 2.5-mm ² 3-core TPS power cable penetrating a 67-mm diameter aperture.	On the slab, 25-mm from lagging (N/W)	S18
	On the slab, 25-mm from lagging (S/E)	S19
	On the lagging, 25-mm above slab (West)	S20
	On the lagging, 25-mm above slab (East)	S21
	On the cable, 25-mm above the slab (South)	S22

Specimen	T/C Position	T/C designation
Specimen 5 - A SNAP MS70R Multi Service Retrofit fire collar protecting a DN25 copper pipe with 19-mm thick Armaflex fire-rated lagging and a 2.5-mm ² 3-core TPS power cable penetrating a 67 mm diameter aperture.	On the slab, 25-mm from lagging (N/E)	S23
	On the slab, 25-mm from lagging (S/W)	S24
	On the lagging, 25-mm above slab (West)	S25
	On the lagging, 25-mm above slab (East)	S26
	On the cable, 25-mm above the slab	S27
Specimen 6 - A SNAP MS70R Multi Service Retrofit fire collar protecting a bundle of 60 Category 7 network cables penetrating a 67-mm diameter aperture.	On the slab, 25-mm from cables (West)	S28
	On the slab, 25-mm from cables (East)	S29
	On the cables, 25-mm above slab (North)	S30
	On the cables, 25-mm above slab (South)	S31
Specimen 7 - A SNAP MS70C Multi Service cast-in fire collar protecting a bundle of 16 Category 7 network cables.	On the slab, 25-mm from collar (North)	S32
	On the slab, 25-mm from collar (South)	S33
	On the collar, 25-mm above slab (North)	S34
	On the collar, 25-mm above slab (South)	S35
	On the sealant (North)	S36
	On the sealant (South)	S37
	On the cables, 25-mm above the sealant (West)	S38
	On the cables, 25-mm above the sealant (East)	S39
Rover		S40
Ambient		S41

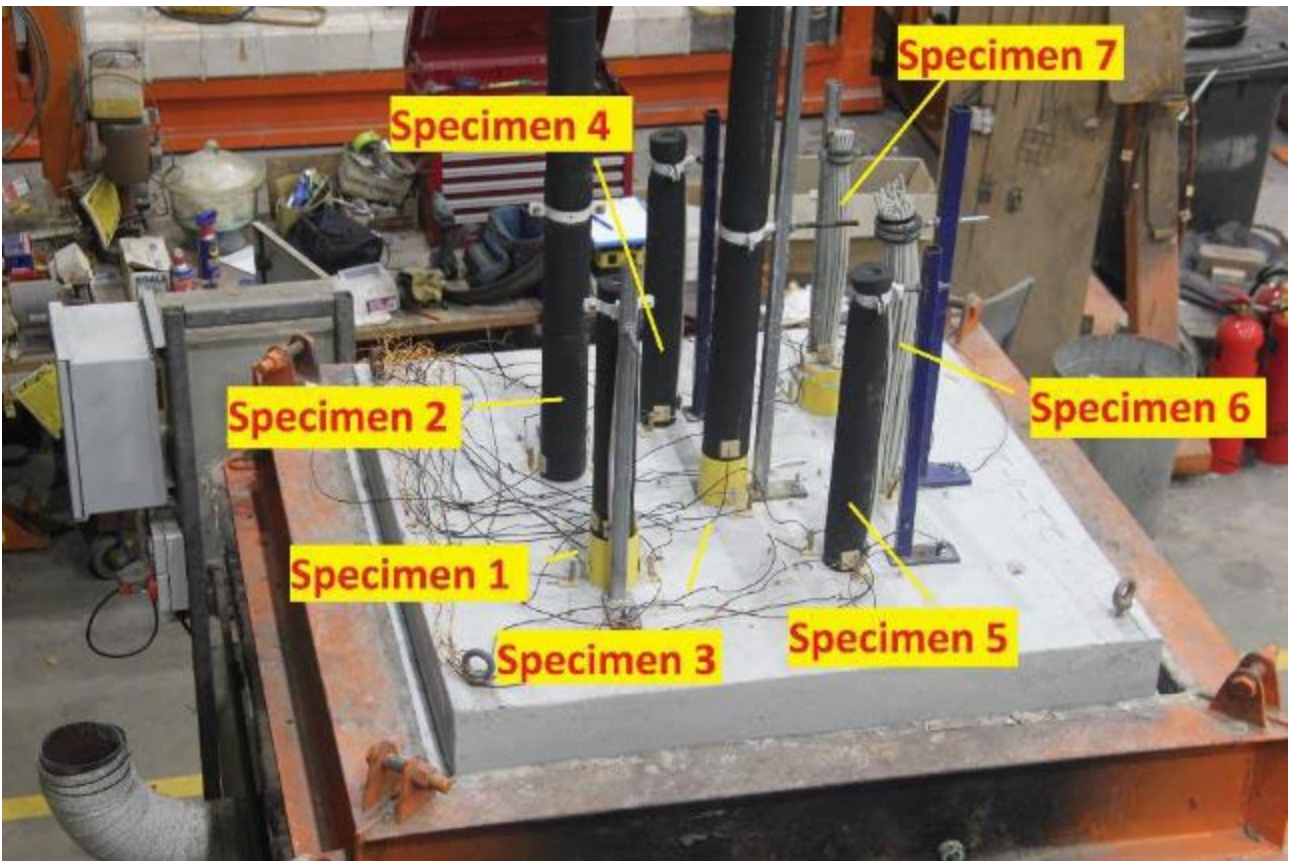
Appendix B – Photographs



PHOTOGRAPH 1 – EXPOSED FACE OF SPECIMENS PRIOR TO TESTING



PHOTOGRAPH 2 – UNEXPOSED FACE OF SPECIMENS PRIOR TO TESTING



PHOTOGRAPH 3 – UNEXPOSED FACE OF SPECIMENS PRIOR TO TESTING



PHOTOGRAPH 4 – SPECIMENS AT 7 MINUTES INTO THE TEST



PHOTOGRAPH 5 – SPECIMENS AT 30 MINUTES INTO THE TEST



PHOTOGRAPH 6 –SPECIMENS AT 33 MINUTES INTO THE TEST



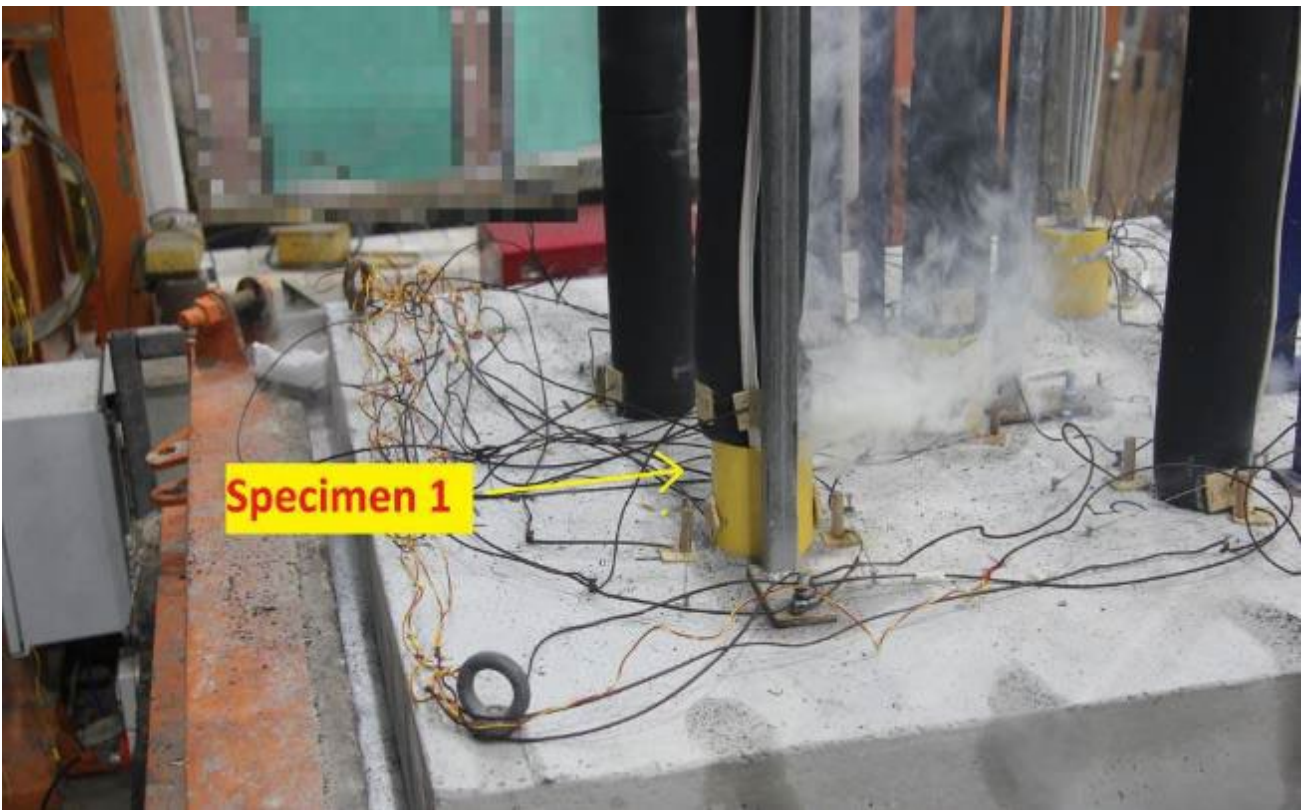
PHOTOGRAPH 7 – SPECIMENS AT 49 MINUTES INTO THE TEST



PHOTOGRAPH 8 – SPECIMENS AT 60 MINUTES INTO THE TEST



PHOTOGRAPH 9 – SPECIMENS AT 90 MINUTES INTO THE TEST



PHOTOGRAPH 10 – SPECIMENS AT 94 MINUTES INTO THE TEST



PHOTOGRAPH 11 – SPECIMENS AT 94 MINUTES INTO THE TEST



PHOTOGRAPH 12 – SPECIMEN 5 AT 116 MINUTES INTO THE TEST



PHOTOGRAPH 13 – SPECIMENS AT 120 MINUTES INTO THE TEST.



PHOTOGRAPH 14 – SPECIMENS AT 123 MINUTES INTO THE TEST.



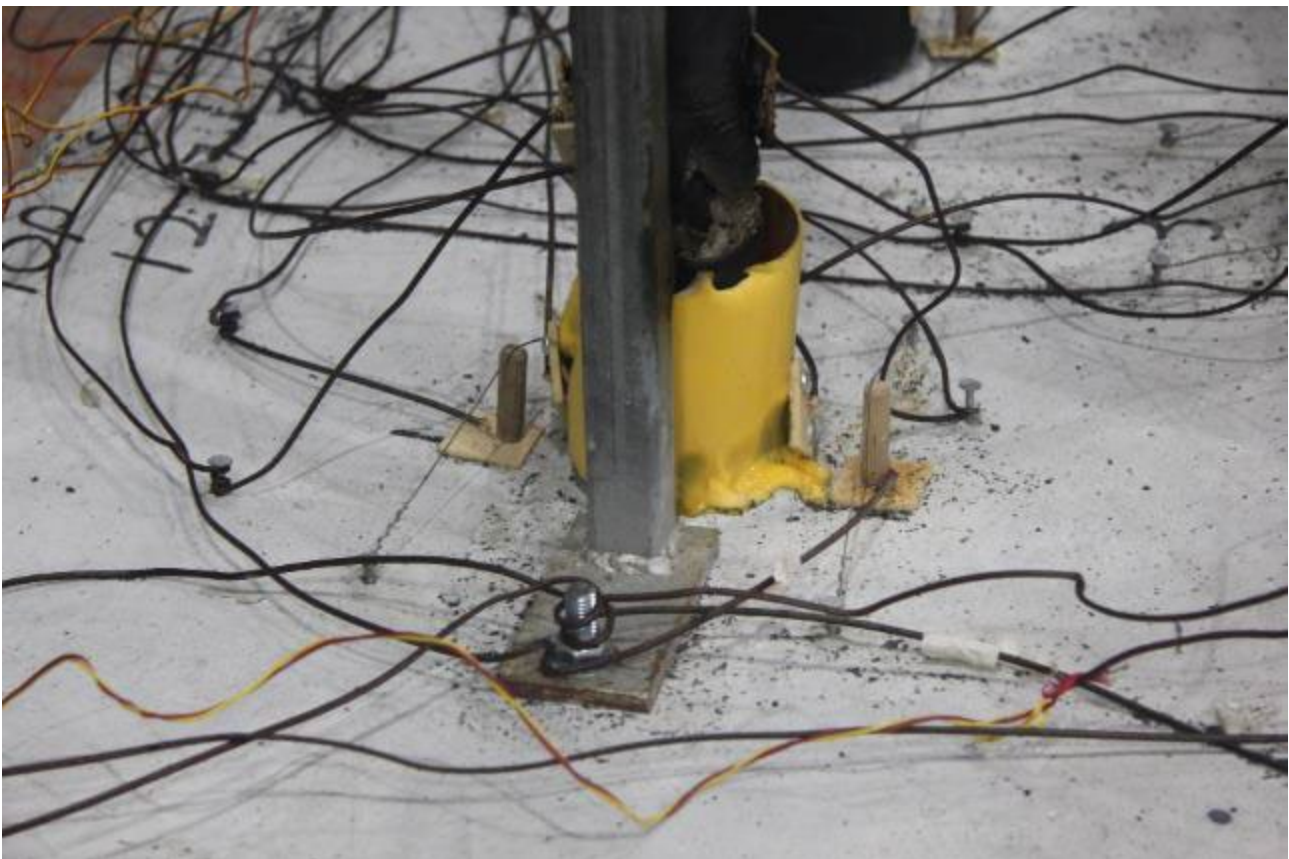
PHOTOGRAPH 15 – SPECIMEN 1 AT 160 MINUTES INTO THE TEST



PHOTOGRAPH 16 – SPECIMEN 2 AT 172 MINUTES INTO THE TEST



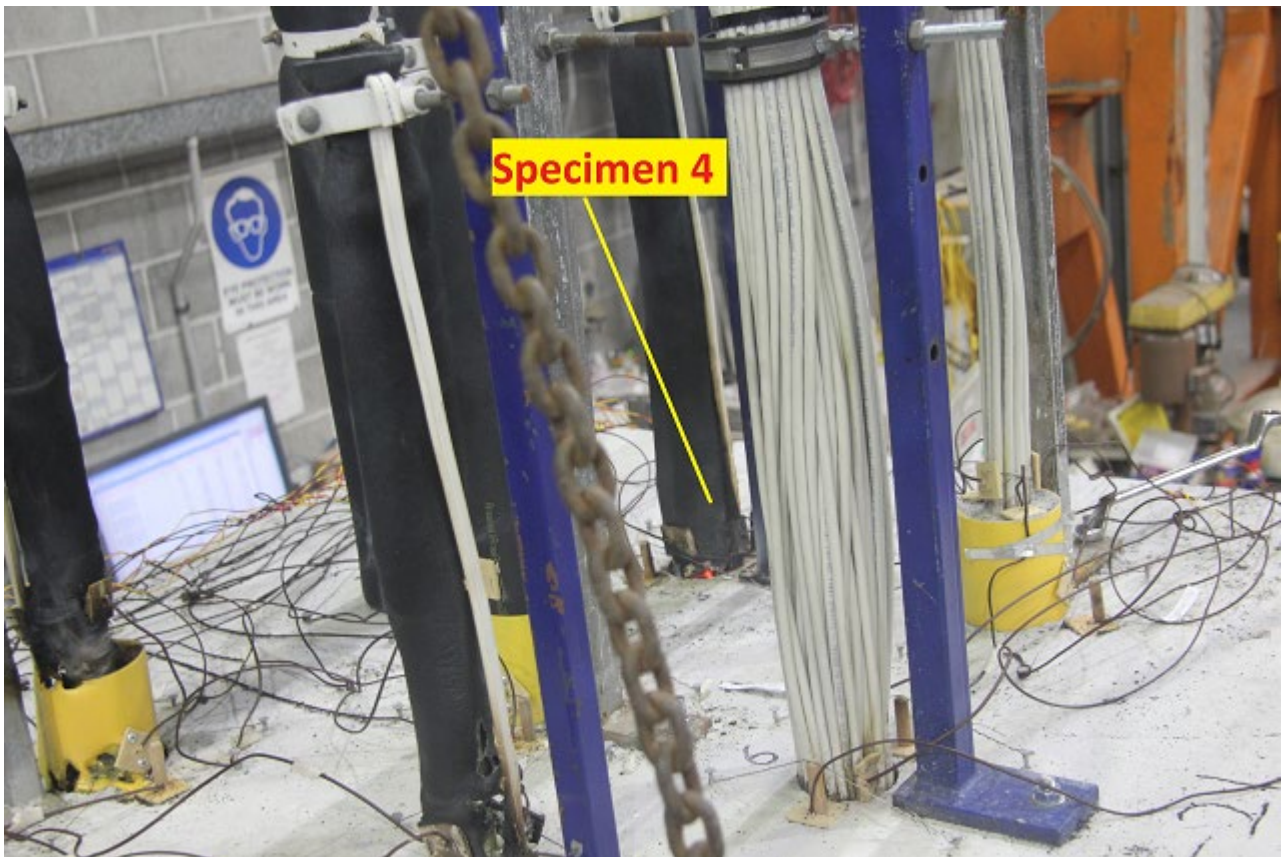
PHOTOGRAPH 17 – SPECIMENS AT 187 MINUTES INTO THE TEST



PHOTOGRAPH 18 – SPECIMEN 1 AT 199 MINUTES INTO THE TEST



PHOTOGRAPH 19 – SPECIMEN 5 AT 235 MINUTES INTO THE TEST



PHOTOGRAPH 20 – SPECIMEN 4 AT 239 MINUTES INTO THE TEST



PHOTOGRAPH 21 – SPECIMENS AT 240 MINUTES INTO THE TEST



PHOTOGRAPH 22 – SPECIMENS AT THE CONCLUSION OF TESTING



PHOTOGRAPH 23 – EXPOSED FACE OF SPECIMENS AT THE CONCLUSION OF TESTING

Appendix C – Test Data charts

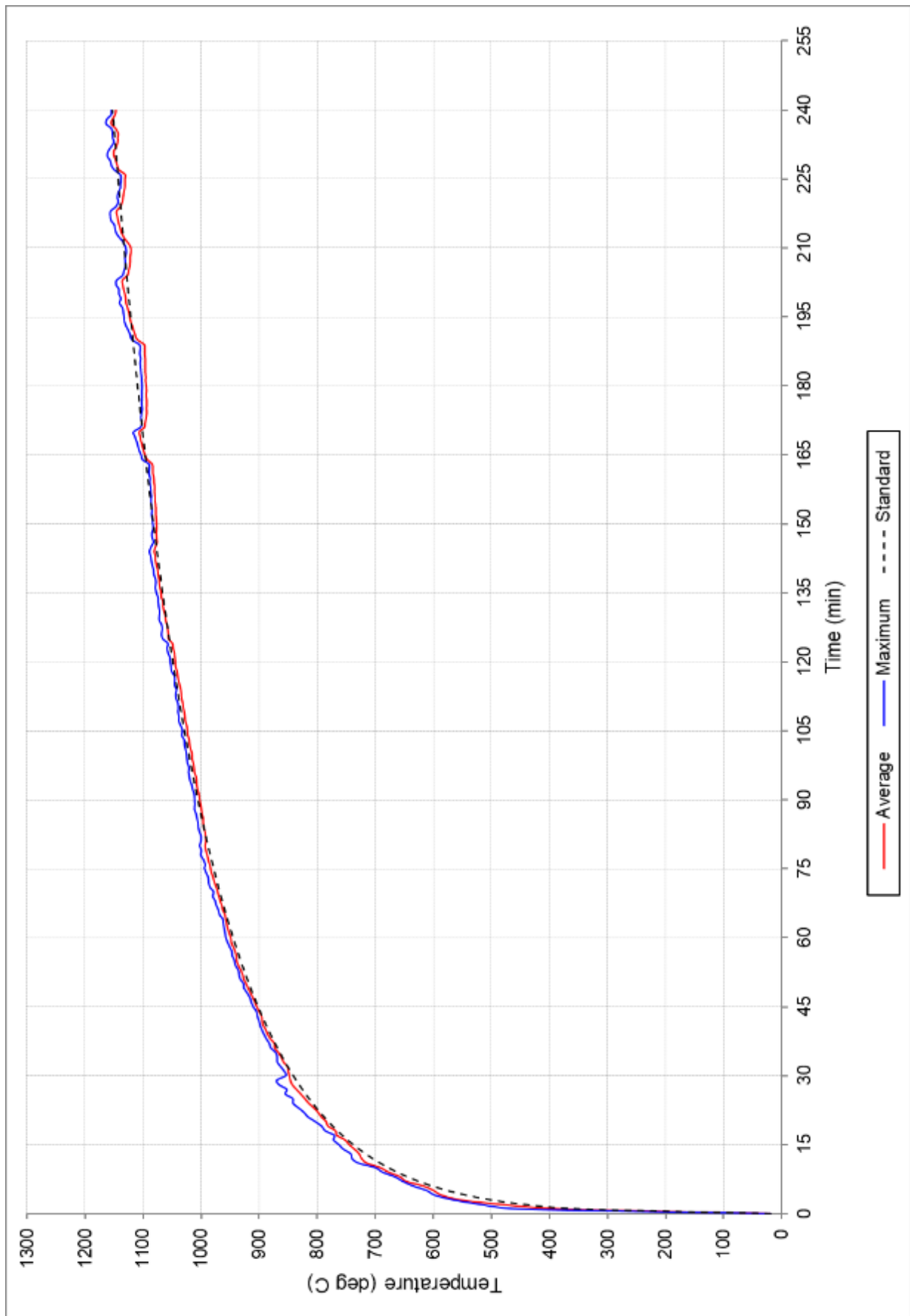


FIGURE 1 – FURNACE TEMPERATURE

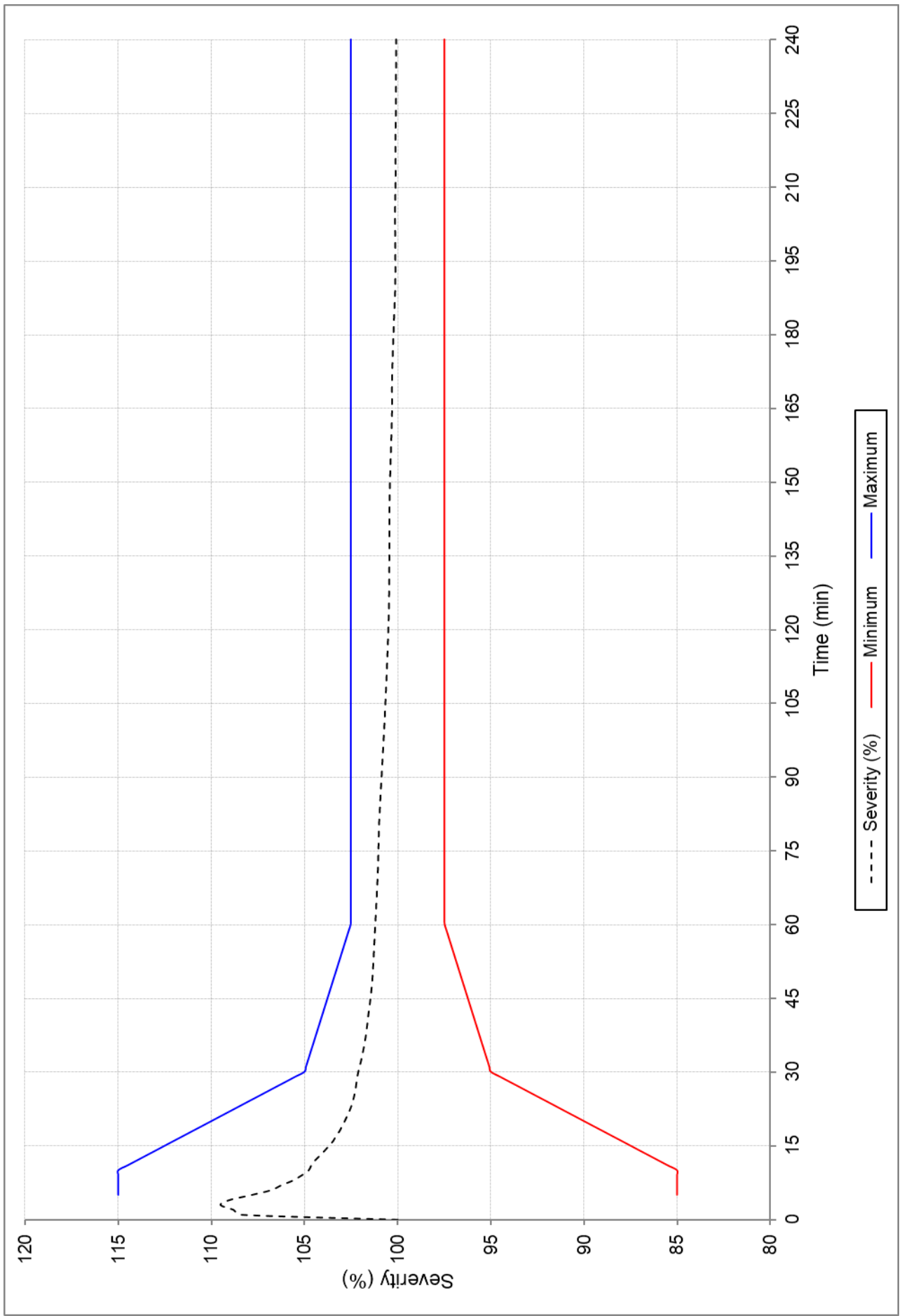


FIGURE 2 – FURNACE SEVERITY

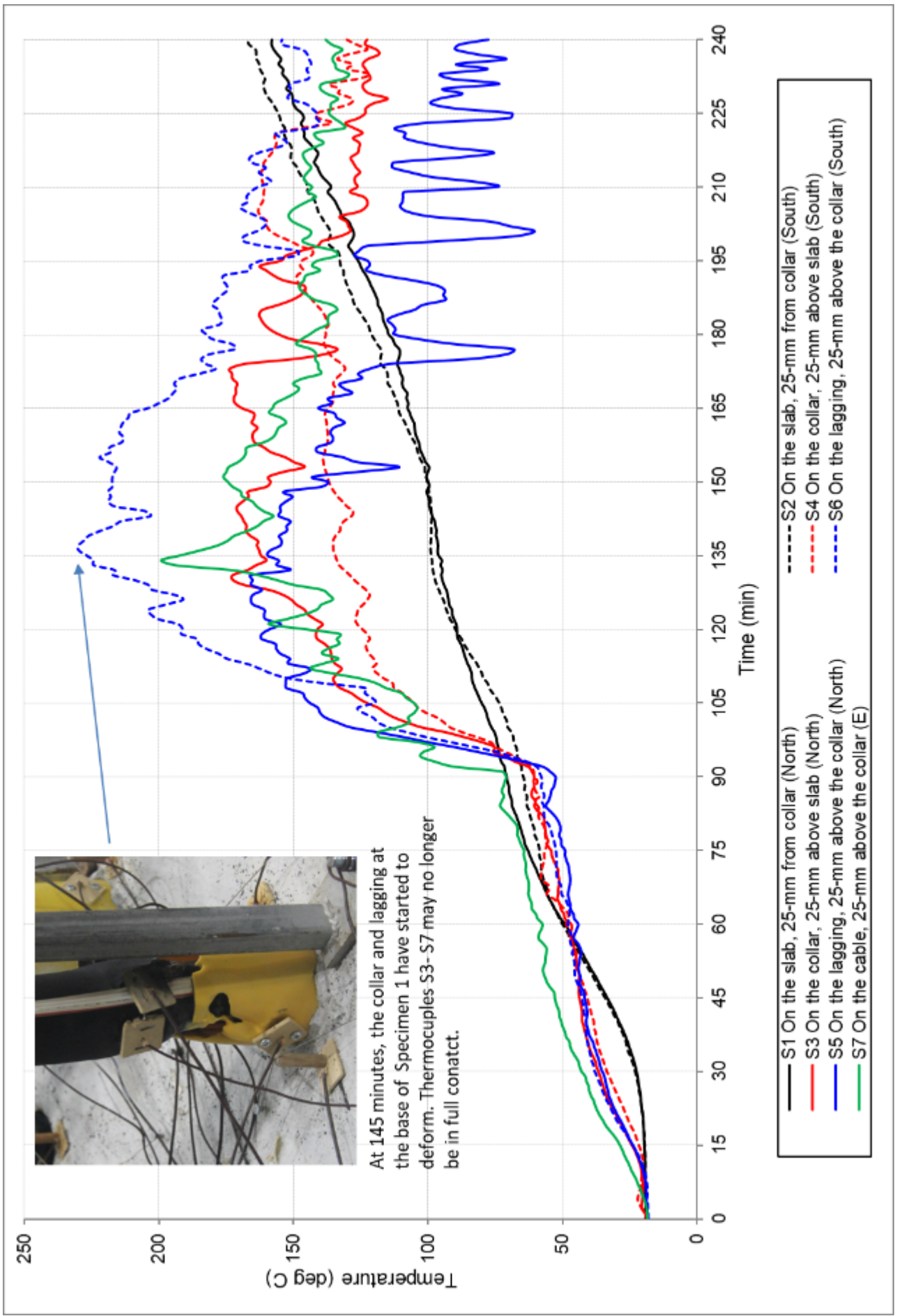


FIGURE 3 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 1

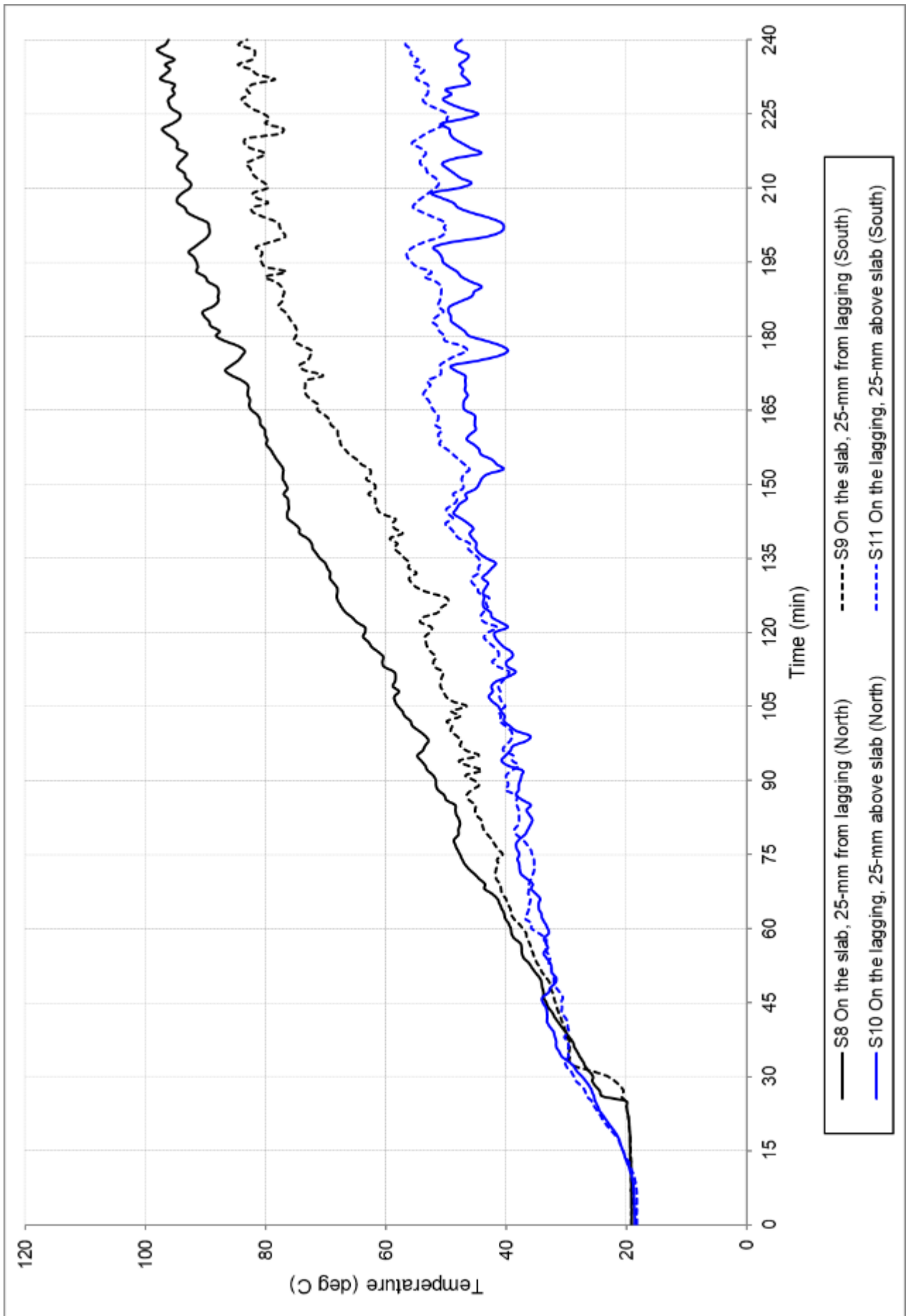


FIGURE 4 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 2

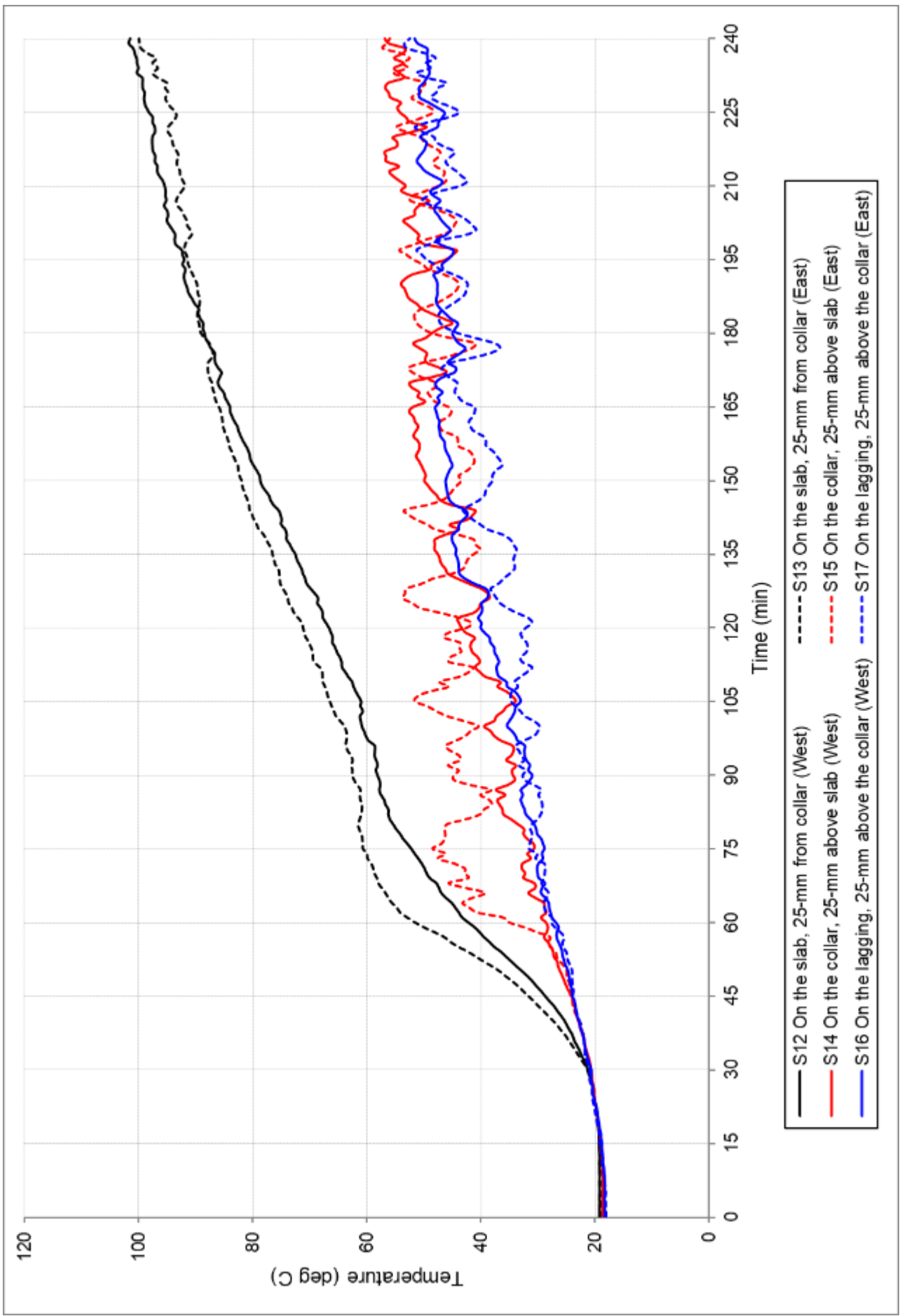


FIGURE 5 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 3

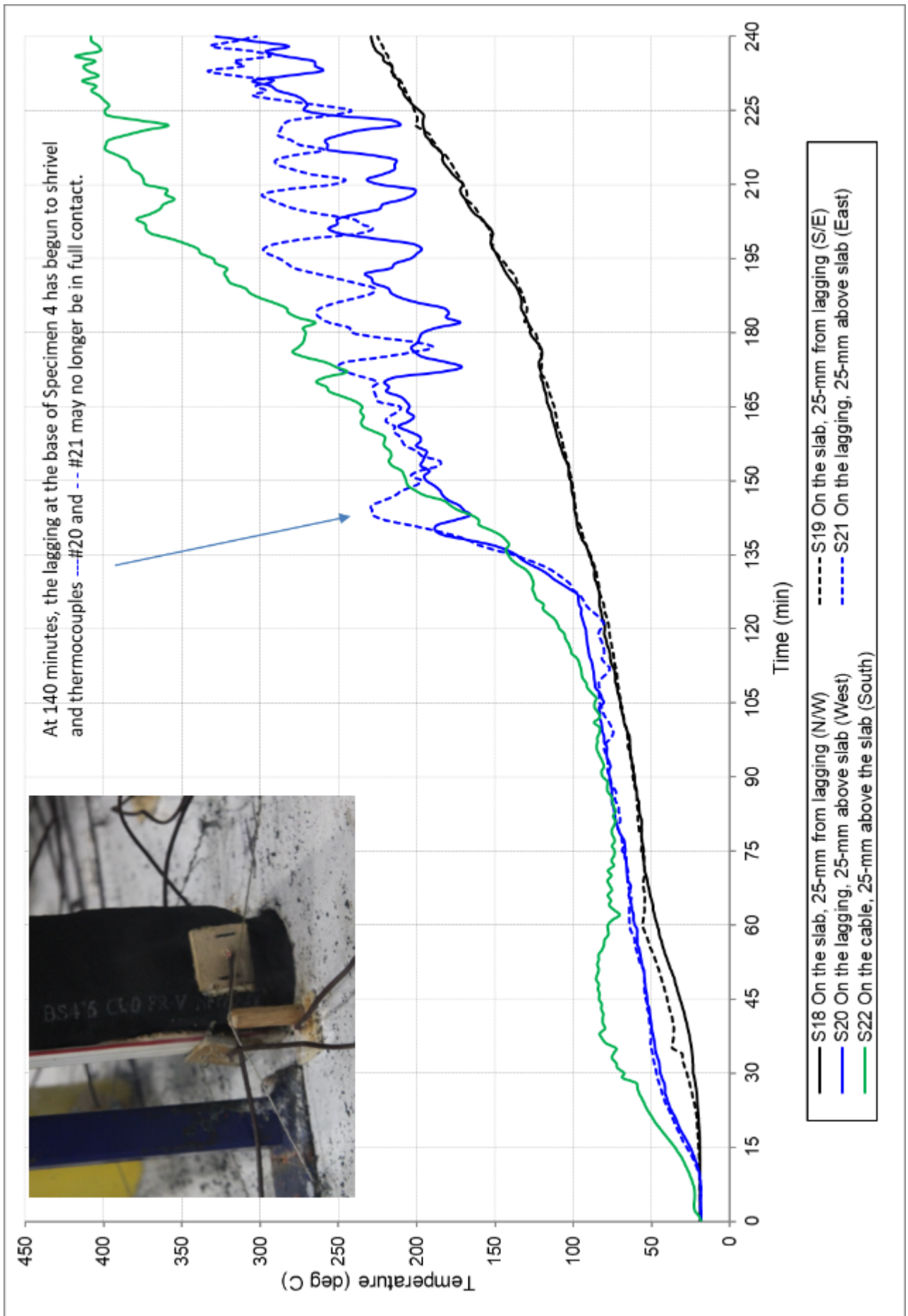


FIGURE 6 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 4

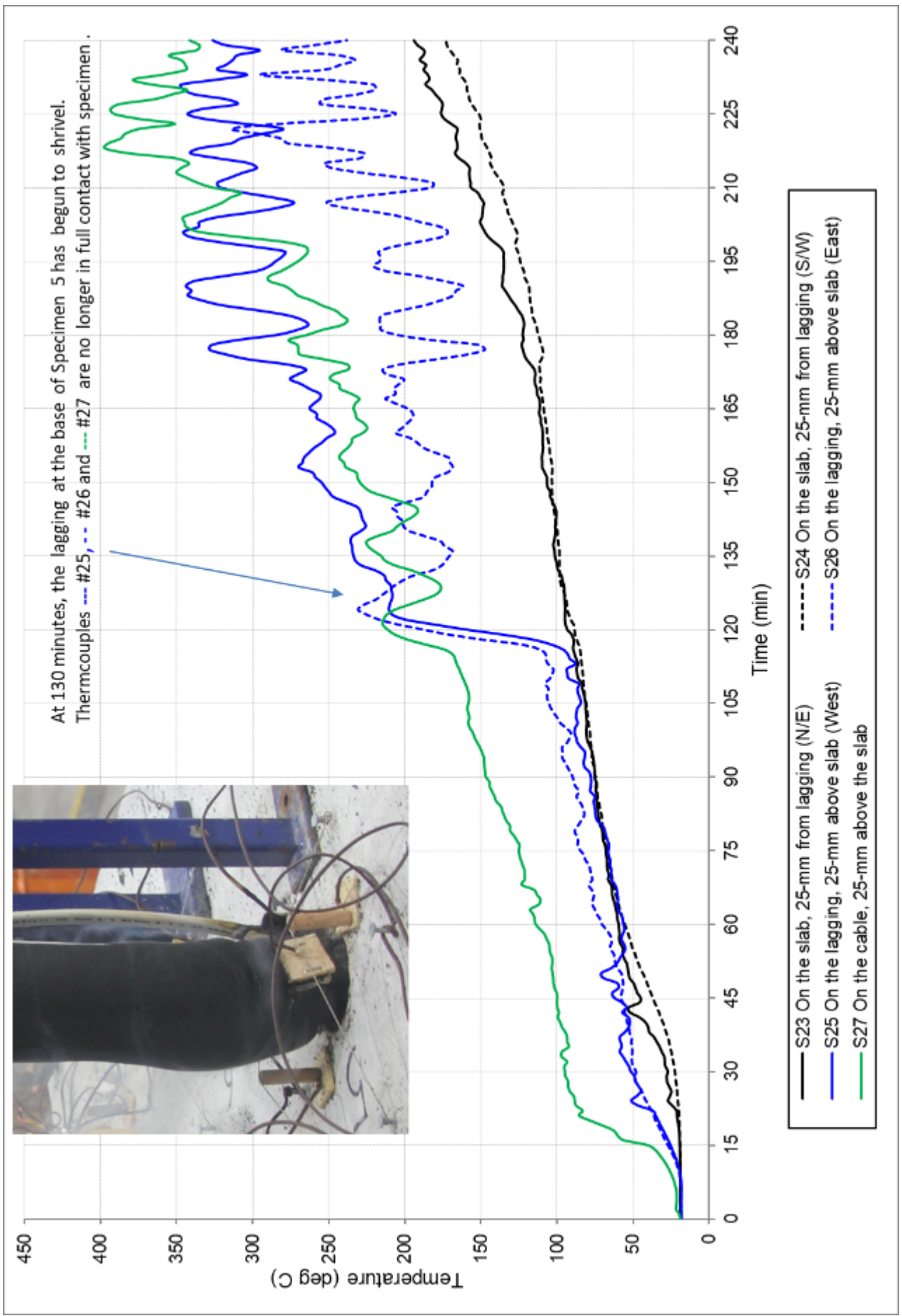


FIGURE 7 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 5

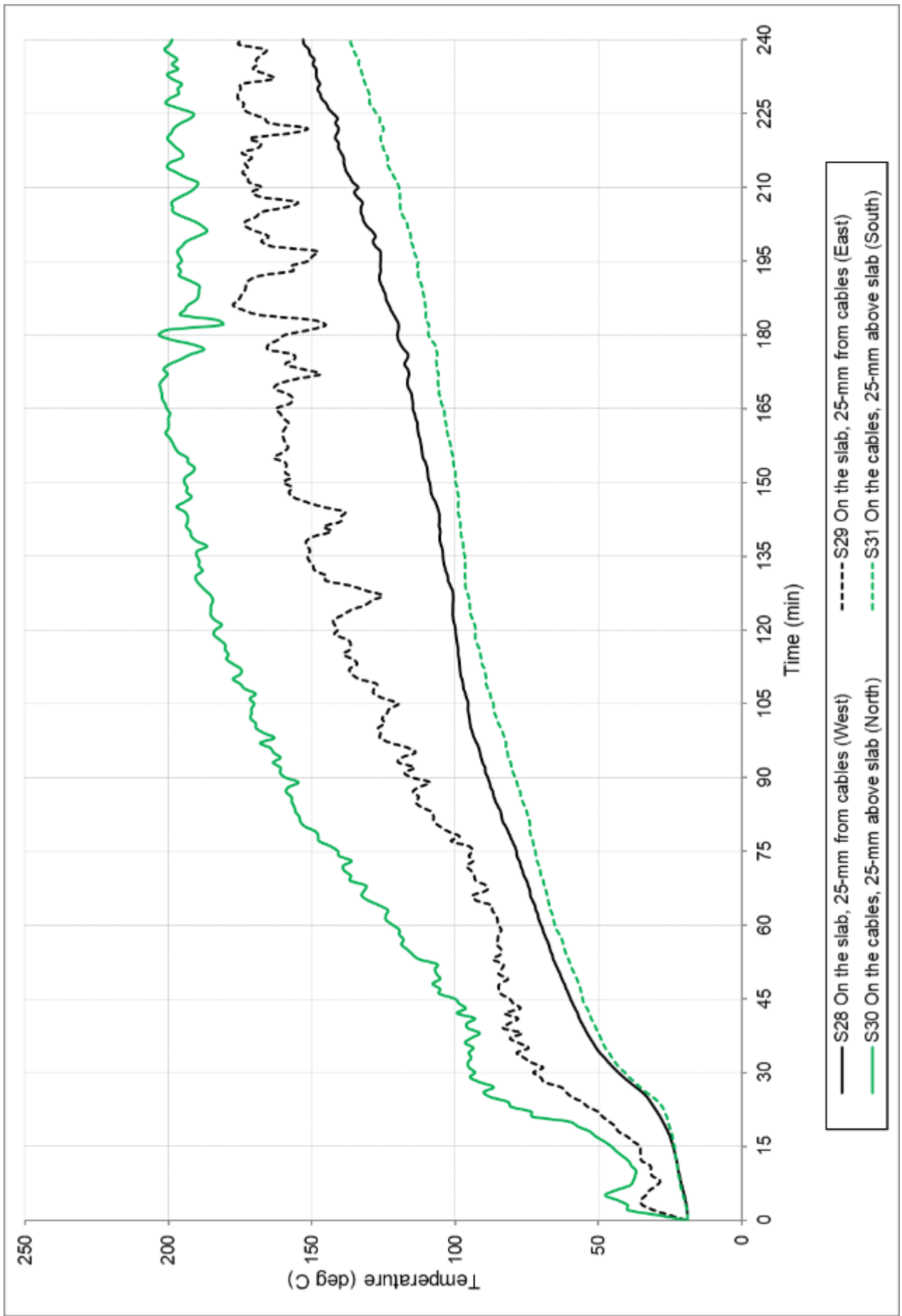


FIGURE 8 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 6

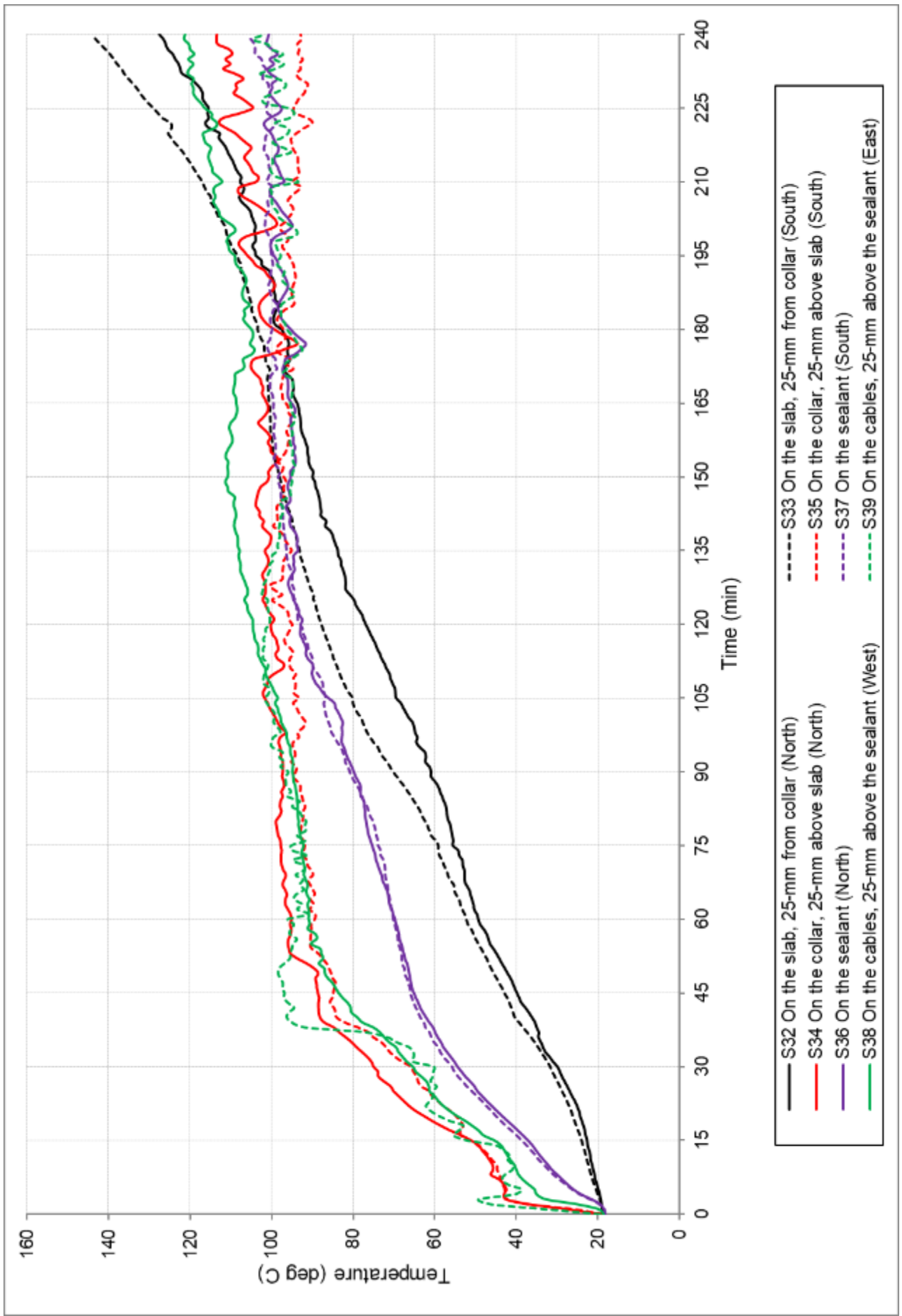
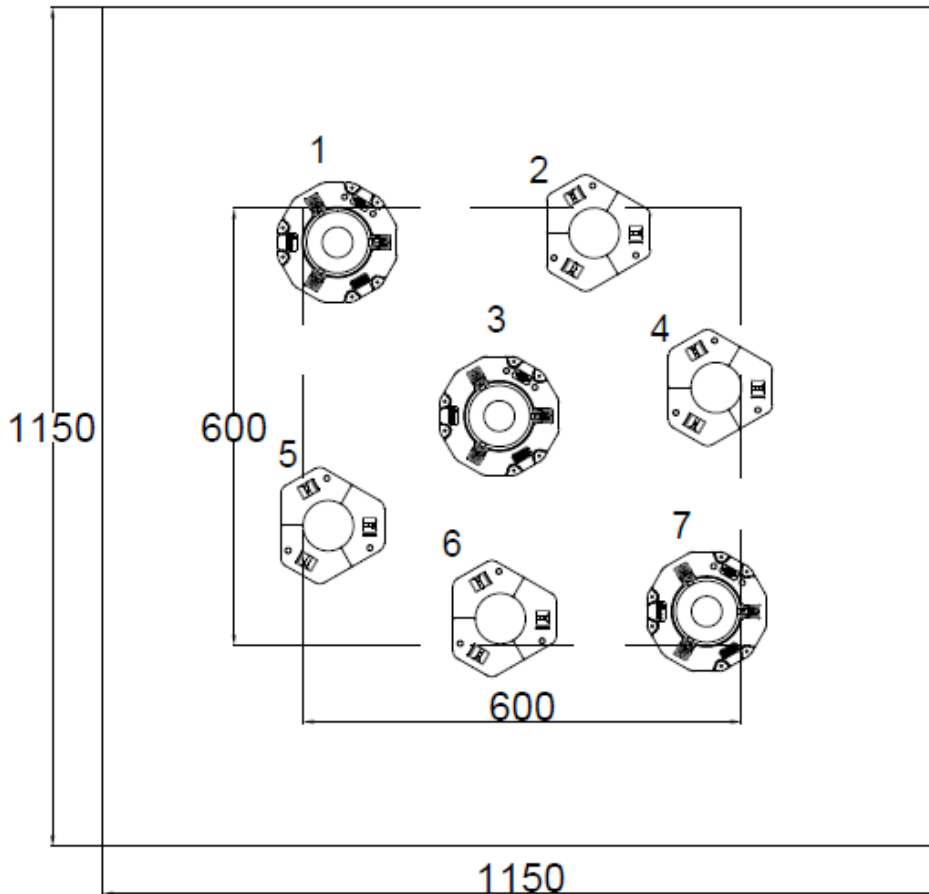


FIGURE 9 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 7

Appendix D – Installation drawings

Snap Fire Systems Pty Ltd
 Test Slab S-21-D Layout
 Date: 20 APR 2021



Penetration	Collar Code	Pipe Type	Pipe Diameter
1	MS70C	Copper Tube w/ F/R Lagging and TPS Cable	1in(19mm Lagging) & 2.5mm ² 3C
2	MS70R	PN12 PVC w/ F/R Lagging	32mm(19mm Lagging)
3	MS70C	PN12 PVC w/ F/R Lagging	32mm(19mm Lagging)
4	MS70R	Copper Tube w/ F/R Lagging and TPS Cable	1in(19mm Lagging) & 2.5mm ² 3C
5	MS70R	Copper Tube w/ F/R Lagging and TPS Cable	1in(19mm Lagging) & 2.5mm ² 3C
6	MS70R	Cat7 Cables	60x7mm
7	MS70C	Cat7 Cables	16x7mm

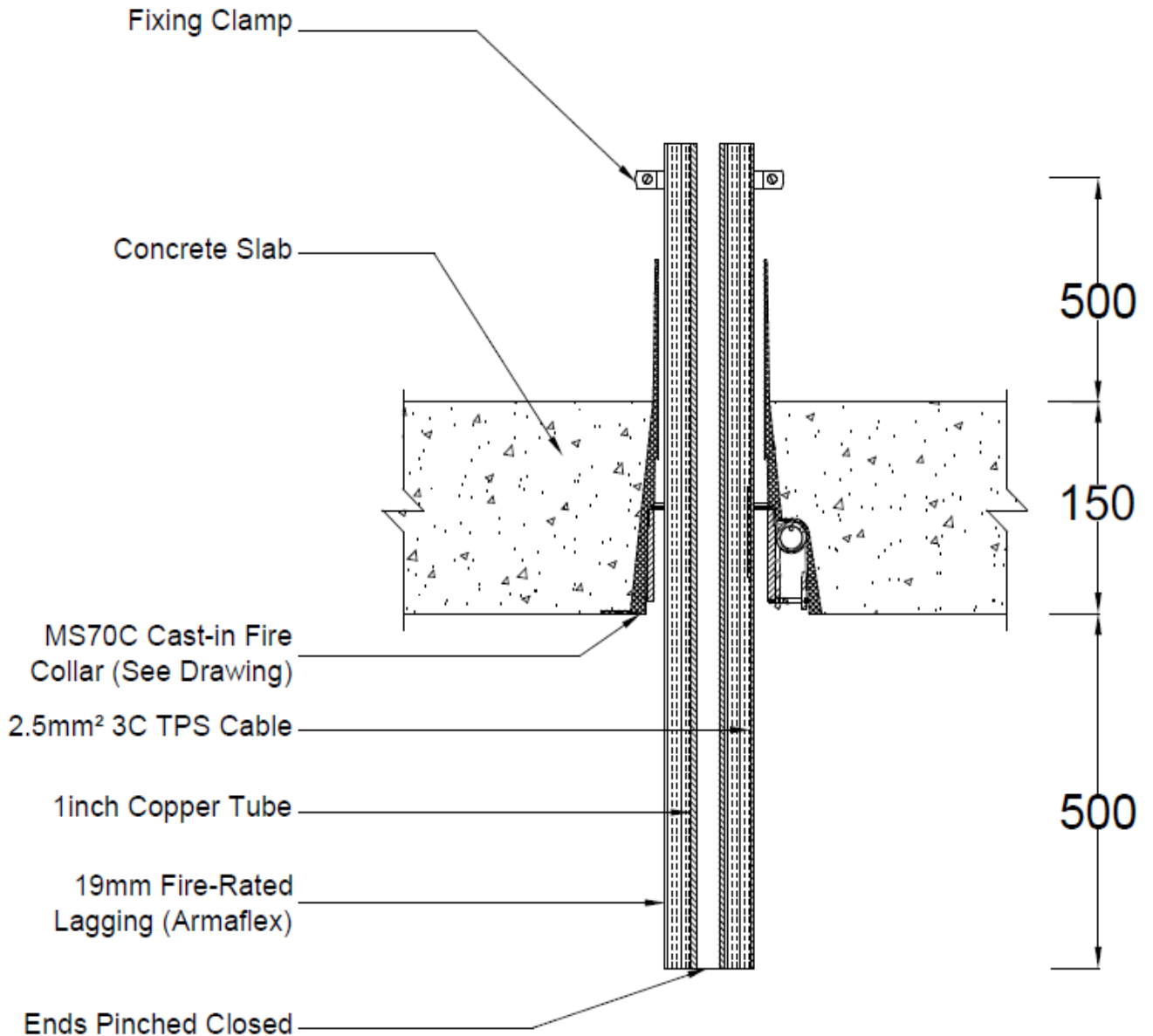
DRAWING TITLED “TEST SLAB S-20-D LAYOUT”, DATED 20 APRIL 2021, BY SNAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd

Specimen #1

1inch Copper Tube with 19mm Fire-Rated Lagging
(Armaflex), 2.5mm² 3C TPS Cable & MS70C

Date: 07 JUL 2021



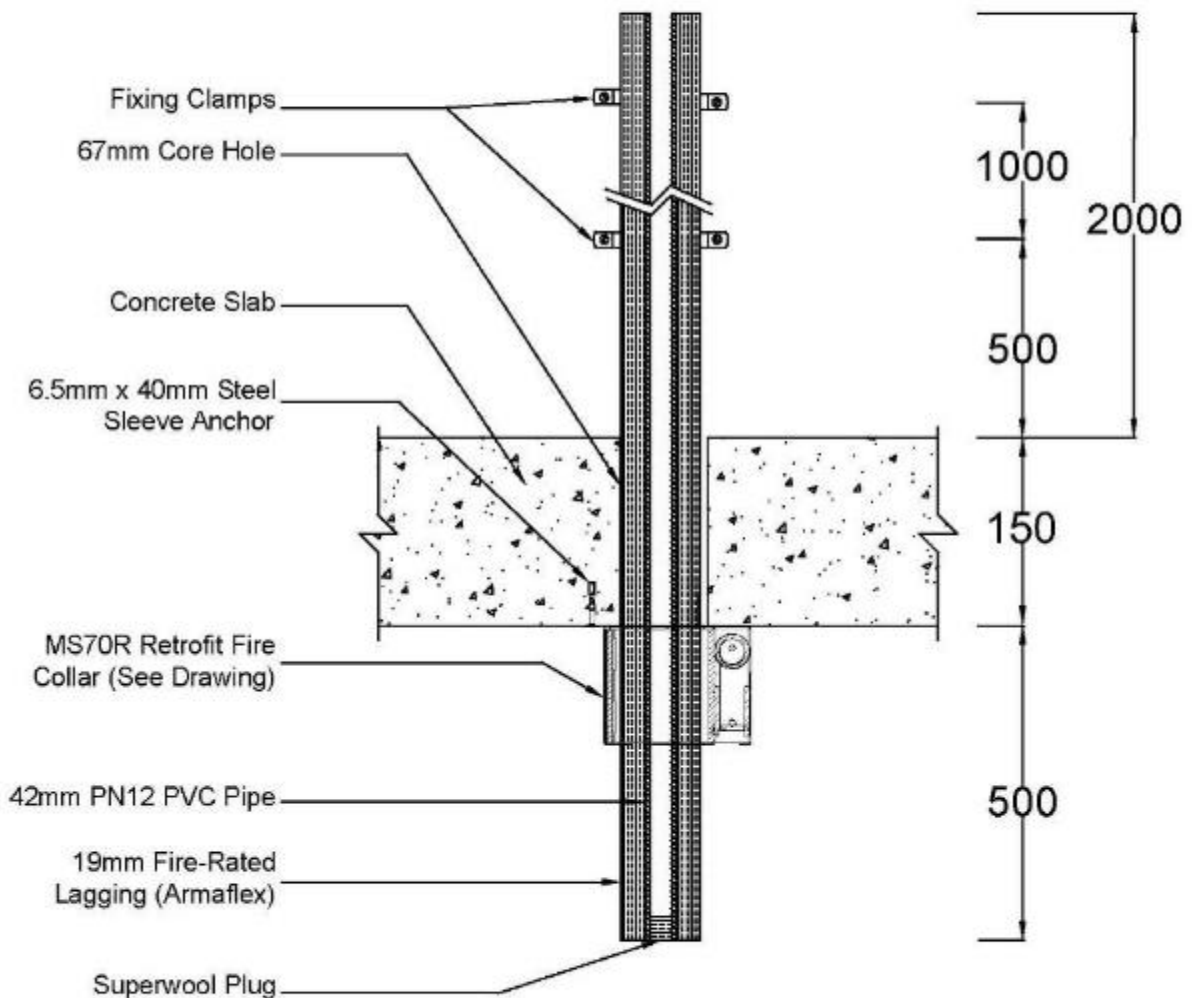
DRAWING TITLED 'SPECIMEN #1, 1INCH COPPER TUBE WITH 19MM FIRE-RATED LAGGING (ARMAFLEX), 2.5MM² 3C TPS CABLE & MS70C', DATED 7 JULY 2021 BY SNAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd

Specimen #2

32 PN12 PVC Pipe with 19mm Fire-Rated Lagging
(Armaflex) & MS70R

Date: 07 JUL 2021



DRAWING TITLED 'SPECIMEN #2, 32 PN12 PVC PIPE WITH 19MM FIRE-RATED LAGGING (ARMAFLEX) & MS70R', DATED 7 JULY 2021 BY SNAP FIRE SYSTEMS PTY LTD

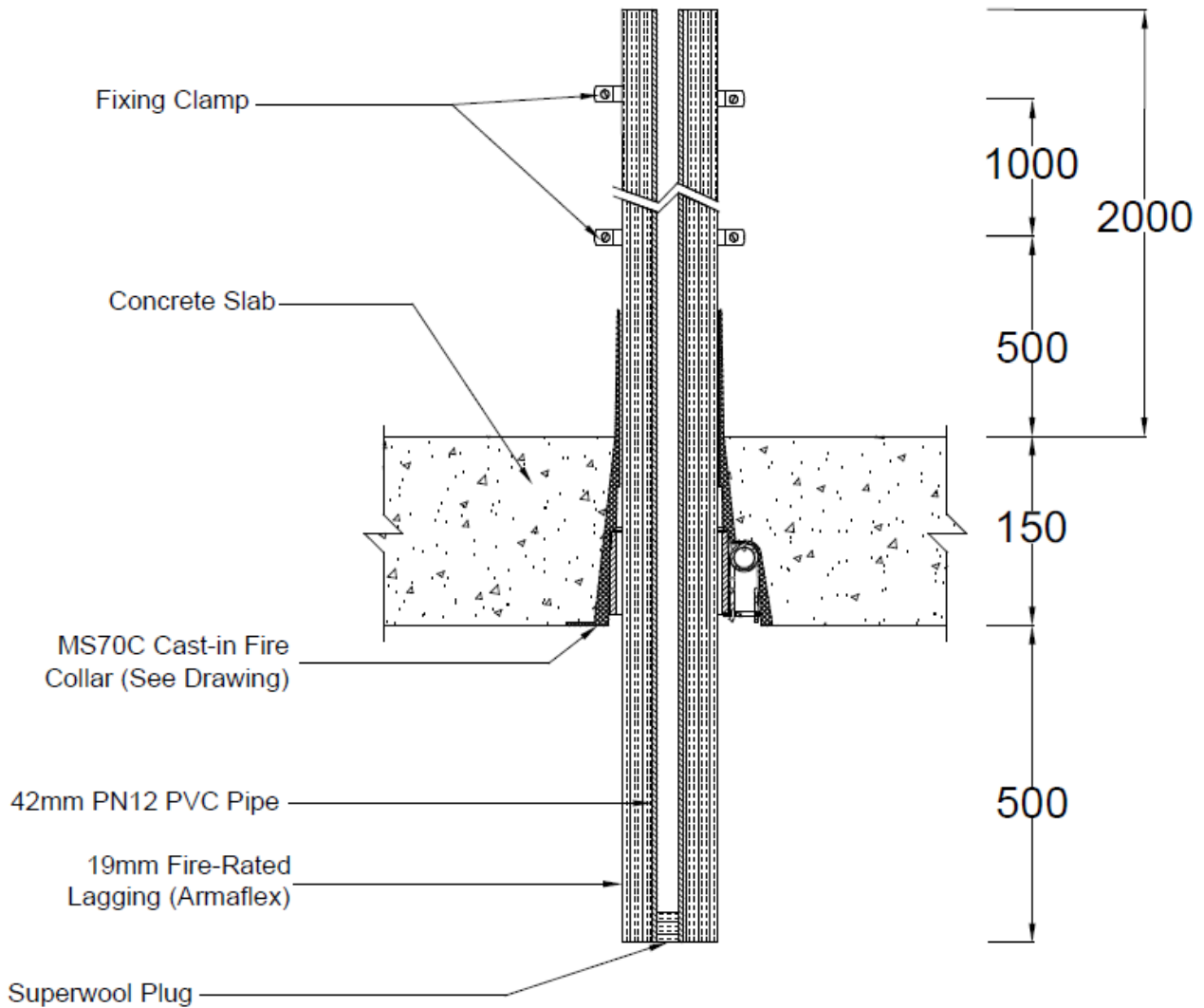
Snap Fire Systems Pty Ltd

Specimen #3

32 PN12 PVC with 19mm Fire-Rated Lagging

(Armaflex) & MS70C

Date: 07 JUL 2021



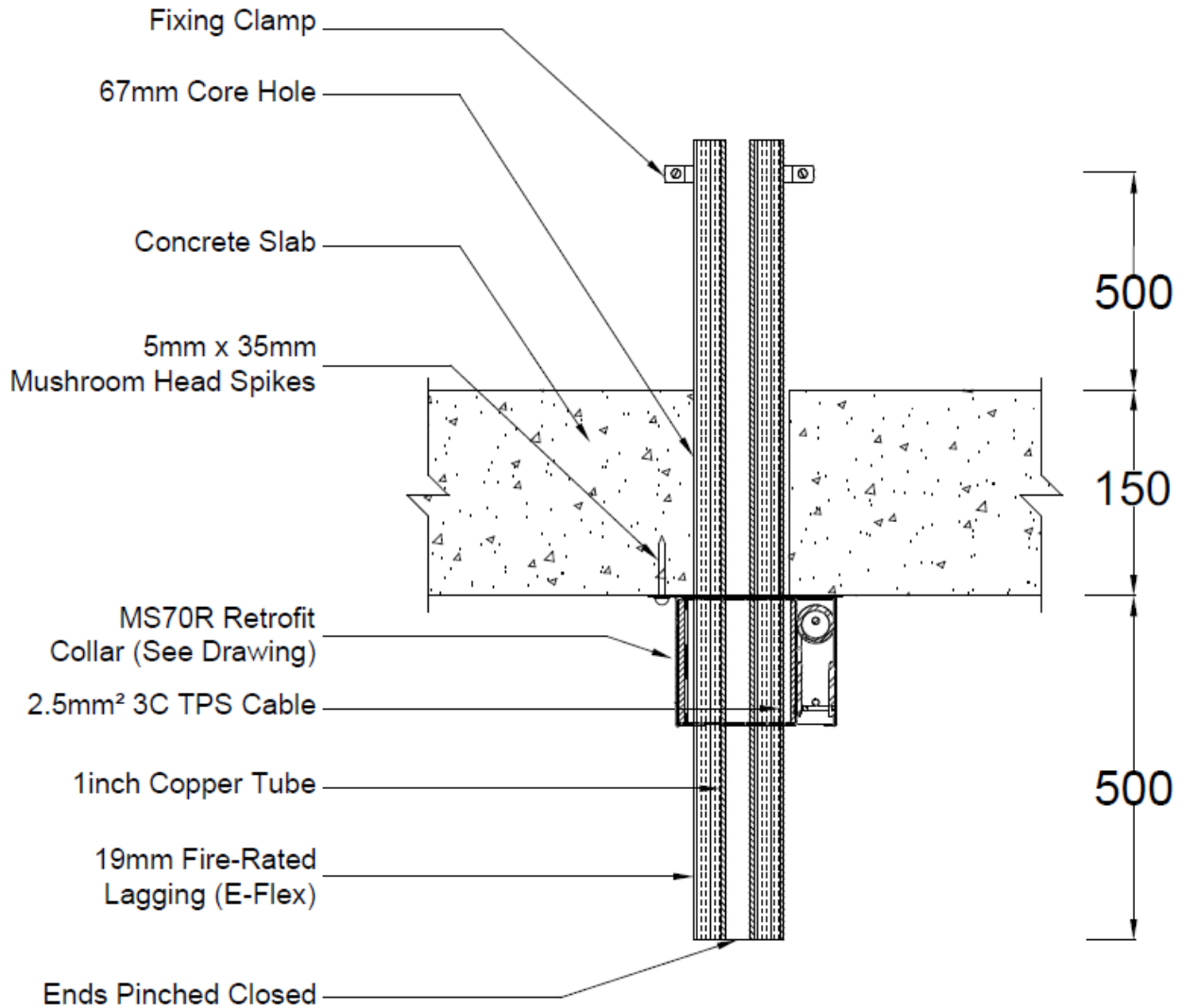
**DRAWING TITLED 'SPECIMEN #3, 32 PN12 PVC WITH 19MM FIRE-RATED LAGGING (ARMAFLEX) & MS70C',
DATED 7 JULY 2021 BY SNAP FIRE SYSTEMS PTY LTD**

Snap Fire Systems Pty Ltd

Specimen #4

1inch Copper Tube with 19mm Fire-Rated Lagging
(E-Flex), 2.5mm² 3C TPS Cable & MS70R

Date: 07 JUL 2021



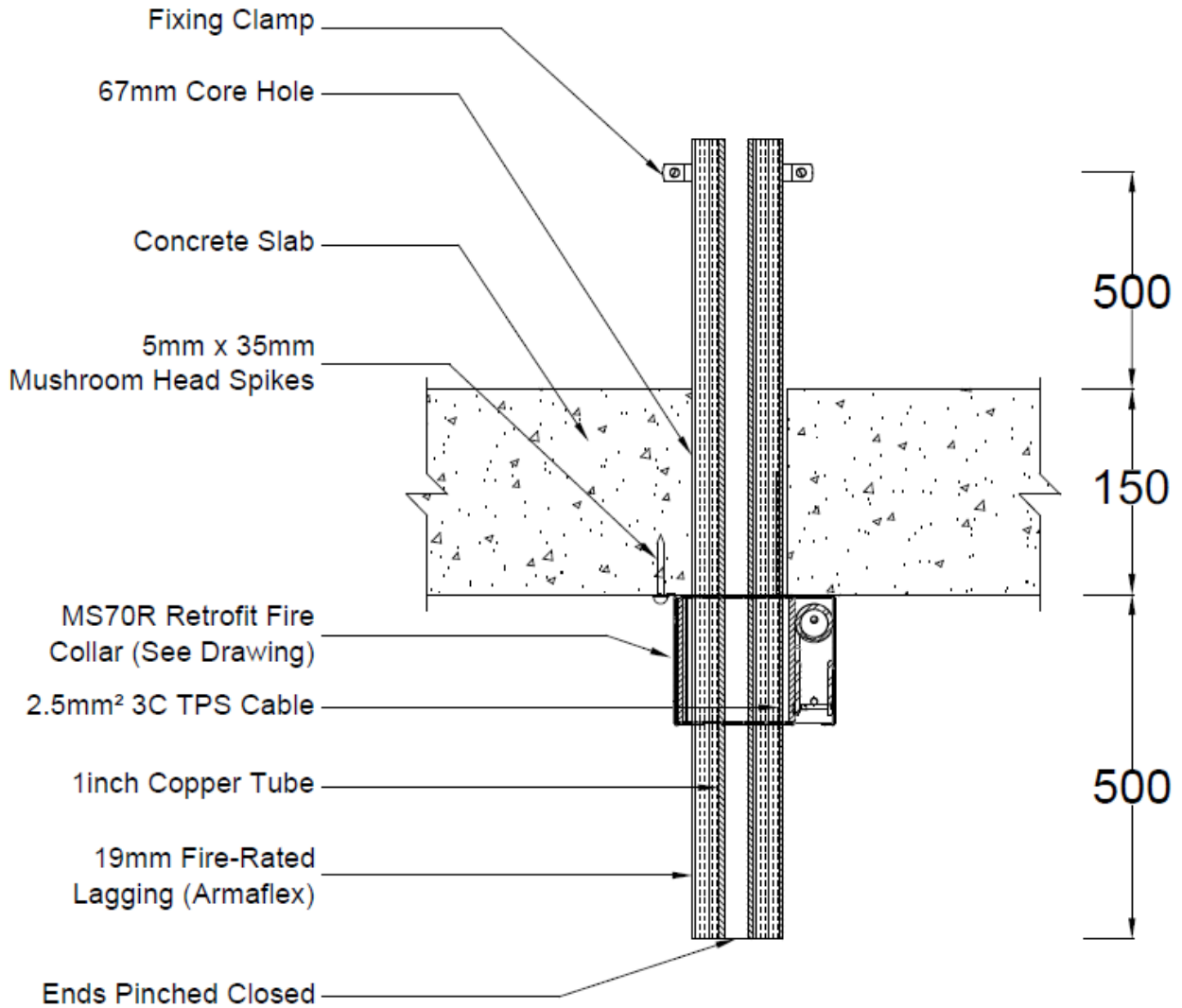
DRAWING TITLED 'SPECIMEN #4 1INCH COPPER TUBE WITH 19MM FIRE-RATED LAGGING (E-FLEX), 2.5MM² 3C TPS CABLE & MS70R', DATED 7 JULY 2021 BY SNAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd

Specimen #5

1inch Copper Tube with 19mm Fire-Rated Lagging
(Armaflex), 2.5mm² 3C TPS Cable & MS70R

Date: 07 JUL 2021



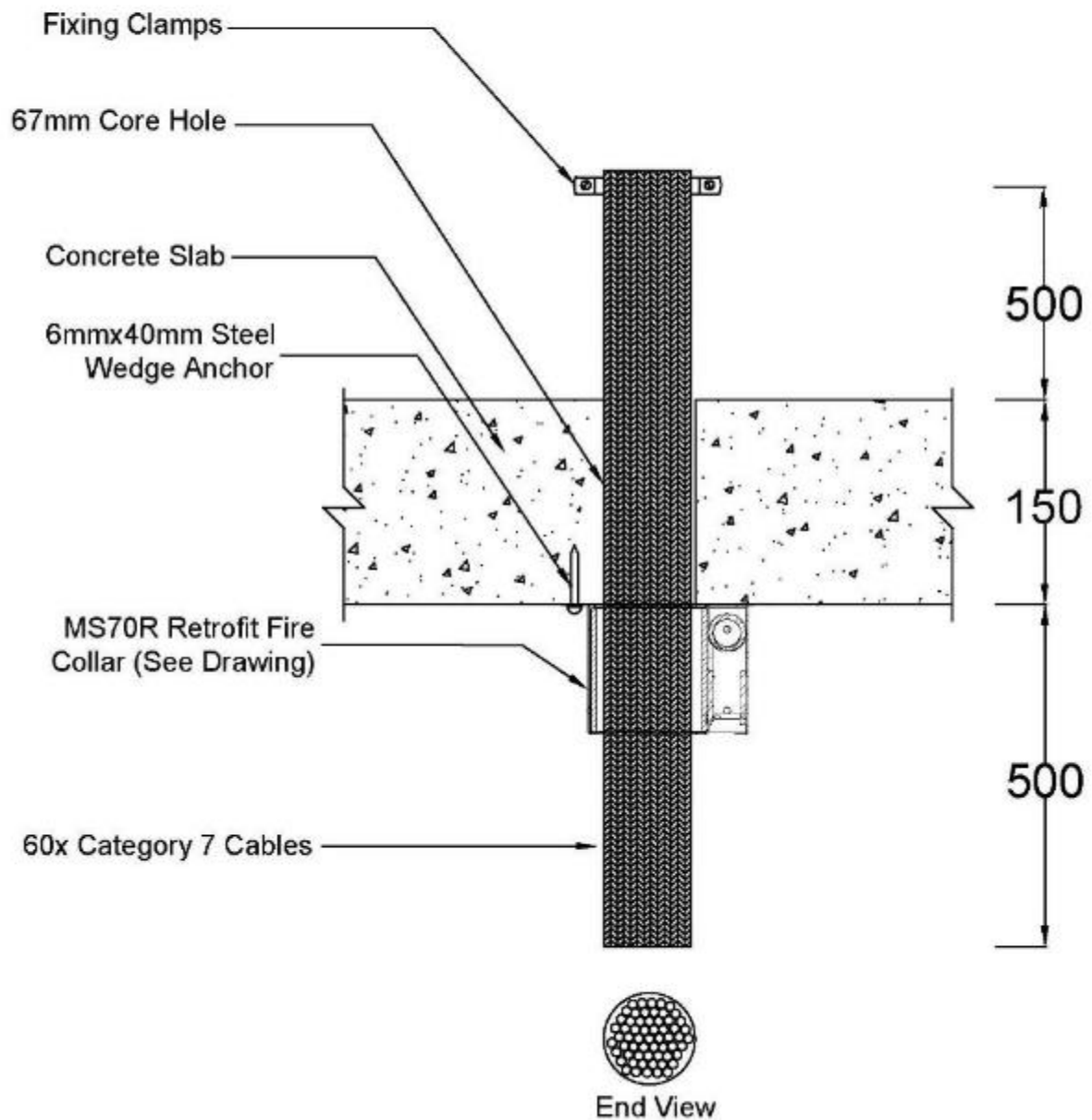
**DRAWING TITLED 'SPECIMEN #5, 1INCH COPPER TUBE WITH 19MM FIRE-RATED LAGGING (ARMAFLEX),
2.5MM² 3C TPS CABLE & MS70R', DATED 7 JULY 2021 BY SNAP FIRE SYSTEMS PTY LTD**

Snap Fire Systems Pty Ltd

Specimen #6

100% Full of Cat7 Cables & MS70R

Date: 07 JUL 2021



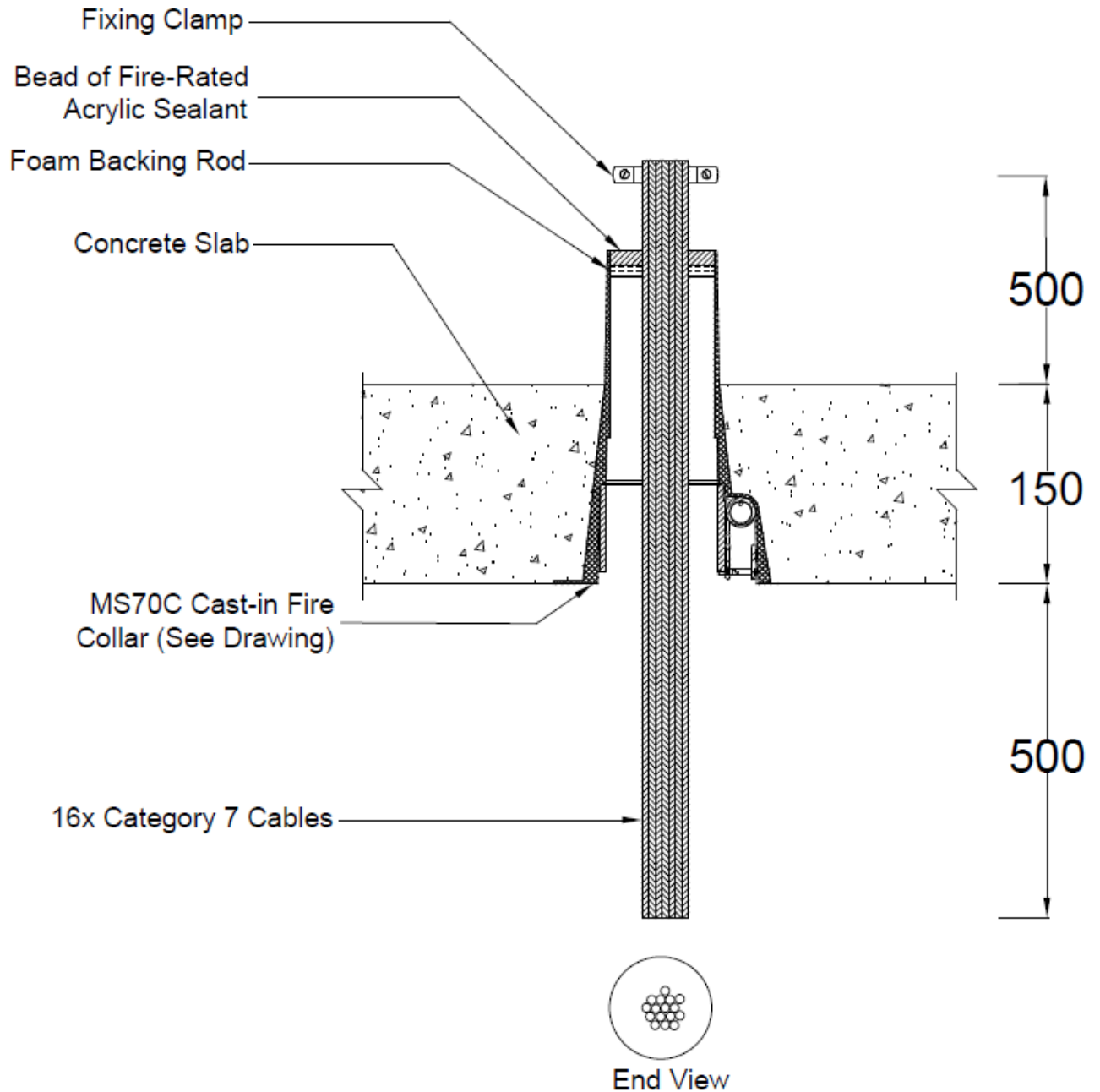
DRAWING TITLED 'SPECIMEN #6, 100% FULL OF CAT7 CABLES & MS70R', DATED 7 JULY 2021 BY SNAP FIRE SYSTEMS PTY LTD

Snap Fire Systems Pty Ltd

Specimen #7

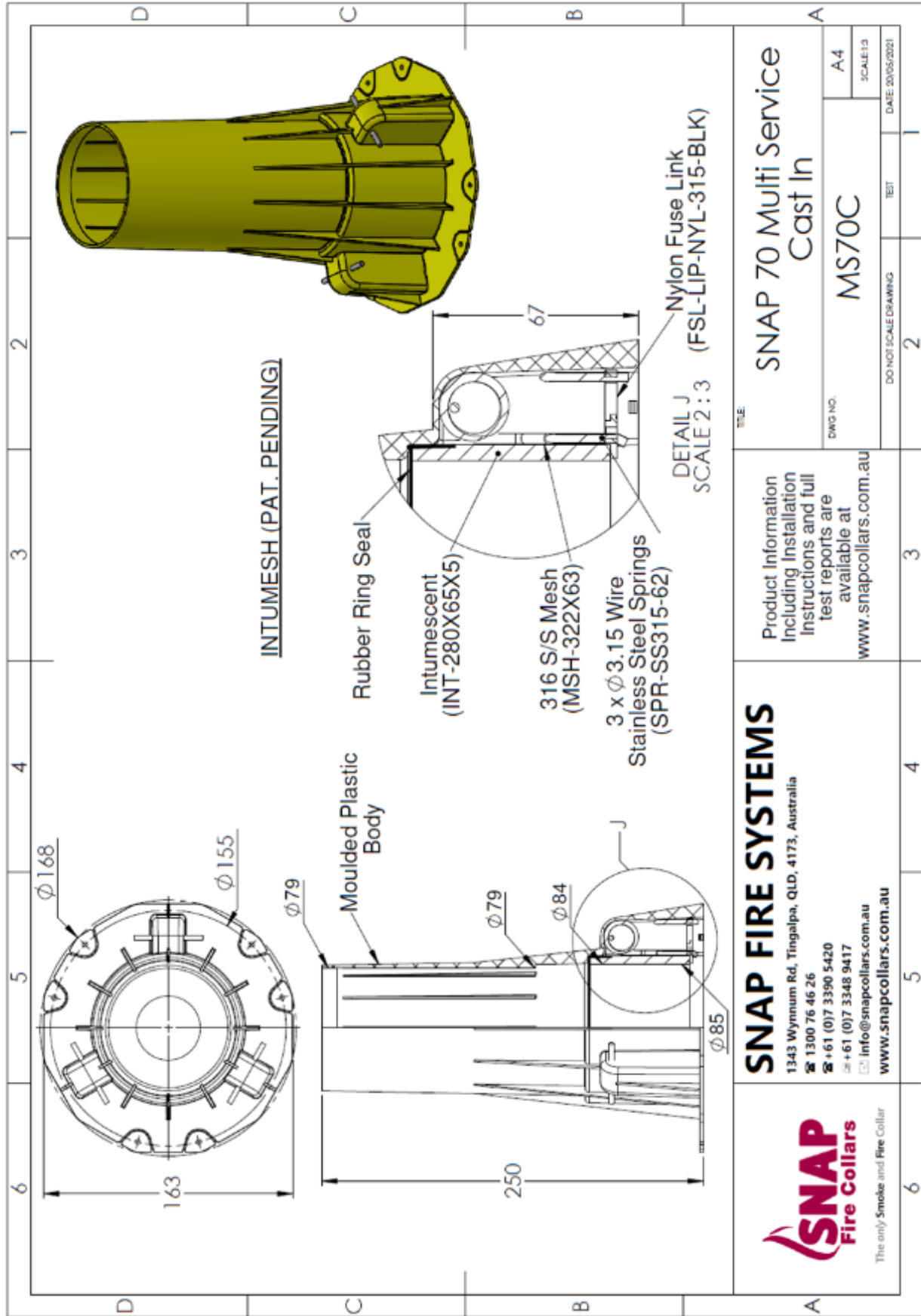
20% Full of Cat7 Cables & MS70C

Date: 07 JUL 2021

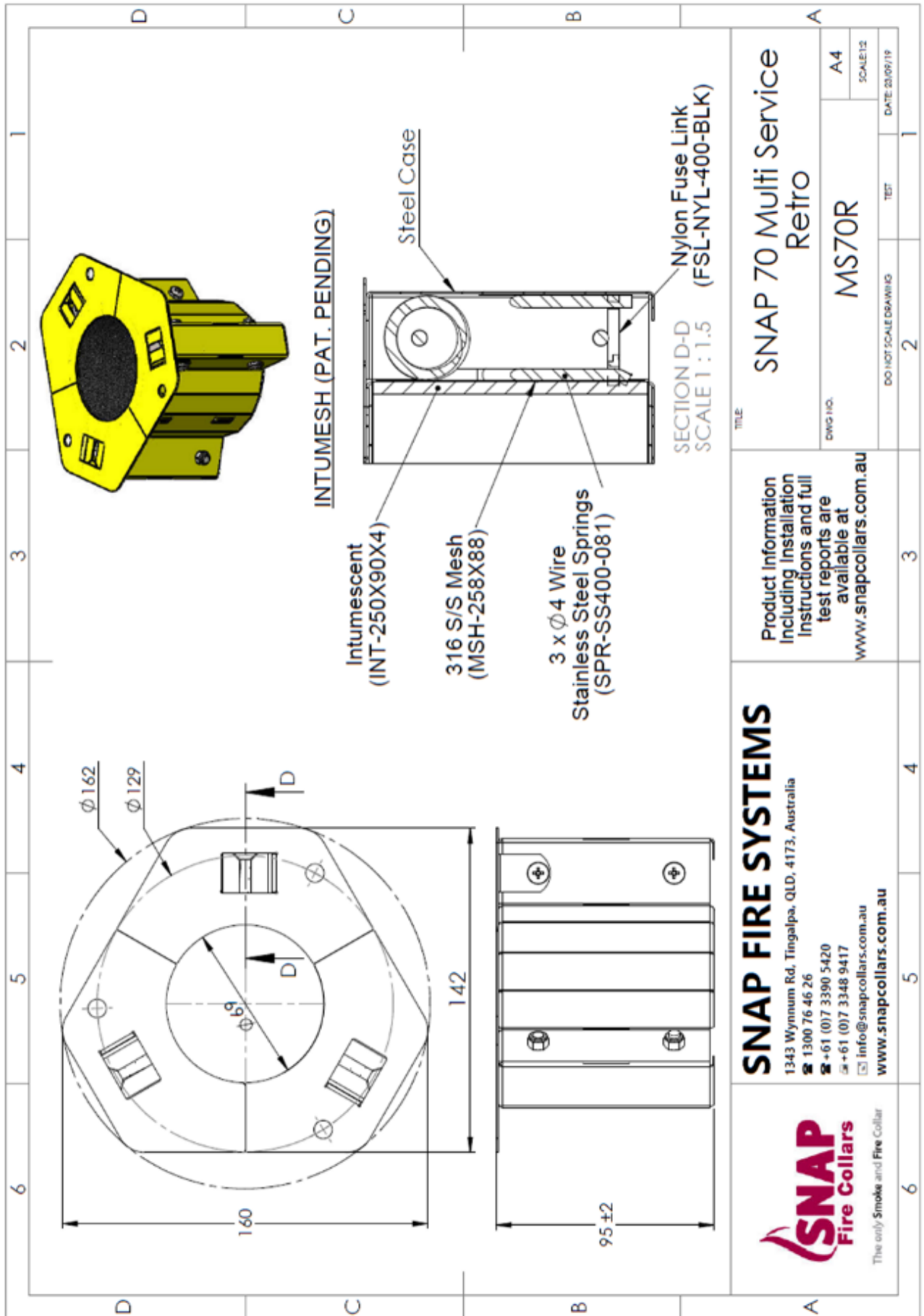


DRAWING TITLED 'SPECIMEN #7, 20% FULL OF CAT7 CABLES & MS70C', DATED 7 JULY 2021 BY SNAP FIRE SYSTEMS PTY LTD

Appendix E – Specimen Drawings






DRAWING TITLED 'SNAP 70 MULTI SERVICE CAST IN', DATED 20 MAY 2021, BY SNAP FIRE SYSTEMS PTY LTD



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

Appendix F – Certificate(s) of Test

INFRASTRUCTURE TECHNOLOGIES www.csiro.au		
14 Julius Avenue, North Ryde NSW 2113 PO Box 52, North Ryde NSW 1670, Australia T (02) 9490 5444 • ABN 41 687 119 230		
<h2>Certificate of Test</h2>		No. 3638
This is to certify that the element of construction described below was tested by CSIRO Infrastructure Technologies in accordance with Australian Standard 1530, Methods for fire tests on building materials, components and structures, Part 4 Fire-resistance tests of elements of construction, 2014, Section 10: Service penetrations and control joints, on behalf of:		
IG6 Pty Ltd as trustee for the IG6 IP Trust 1343 Wynnum Road Tingalpa QLD		
A full description of the test specimen and the complete test results are detailed in the Division's report numbered FSP 2225.		
Product Name:	SNAP MS70C Multi Service cast-in fire collar protecting a DN25 copper pipe with 19 mm thick Armaflex fire-rated lagging and a 2.5-mm ² 3-core TPS power cable (Specimen 1)	
Description:	The specimen comprised an 1150-mm x 1150-mm x 150-mm thick concrete slab penetrated by multiple services protected by three cast-in collars and four retrofit fire collars. The 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. Specimen 1 is the subject of this Certificate. The SNAP MS70C Multi Service cast-in fire collar comprised a 1.6-mm thick polypropylene casing with a 79 mm inner diameter and a 168-mm outer diameter base flange. The 250-mm high collar casing incorporated a 280-mm x 65-mm x 5-mm thick Intumescent Intumescent material and a rubber ring seal. The closing mechanism comprised three stainless-steel springs bound with nylon fuse links and a 322-mm x 63-mm 316 stainless steel mesh. The MS70C fire collar was cast into a 150-mm thick concrete slab with the collar's casing projecting 100 mm vertically above unexposed face. The penetrating service comprised a lagged copper pipe and a Prysmian 3-core 2.5-mm ² TPS power cable. The Brasshards copper type B pipe had a 25.4-mm (1-inch) outside diameter, a wall thickness of 1.22 mm and was lagged with 19-mm thick Armaflex FRV nitrile rubber insulation. The lagged pipe and cable were fitted through the sleeve of the MS70C collar and penetrated the concrete slab. The lagged pipe and cable projected vertically 550-mm above concrete slab and approximately 500 mm below into furnace chamber. The lagged pipe and cable were supported at 500-mm above unexposed face of concrete slab. The copper pipe was left open on unexposed face and crimped closed on the exposed end. The Sponsor provided documents 'Test Slab S-21-D Layout', dated 20 April 2021, 'Specimen #1 1Inch Copper Tube with 19mm Fire-rated Lagging (Armaflex), 2.5mm ² 3C TPS Cable & MS70C', dated 7 July 2021 and 'SNAP 70 Multi Service Cast-In', dated 20 May 2021 as a complete description of the specimen and should be read in conjunction with this Certificate.	
Performance observed in respect of the following AS 1530.4-2014 criteria		
Structural Adequacy	-	not applicable
Integrity	-	no failure at 241 minutes
Insulation	-	122 minutes
and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/240/120.		
The fire-resistance level of the specimen is applicable when the system is exposed to fire from the same direction as tested. Specimens were tested 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: 12 August 2021
Issued on the 18 th day of October 2021 without alterations or additions.		
 Brett Roddy Manager, Fire Testing and Assessments		
© Copyright CSIRO 2021 © Copying or alteration of this report without written authorisation from CSIRO is forbidden		
	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. 3638



Certificate of Test

No. 3639

This is to certify that the element of construction described below was tested by CSIRO Infrastructure Technologies in accordance with Australian Standard 1530, Methods for fire tests on building materials, components and structures, Part 4 Fire-resistance tests of elements of construction, 2014, Section 10: Service penetrations and control joints, on behalf of:

IG6 Pty Ltd as trustee for the IG6 IP Trust
1343 Wynnum Road
Tingalpa QLD

A full description of the test specimen and the complete test results are detailed in the Division's report numbered FSP 2225.

Product Name: SNAP MS70R Multi Service Retrofit fire collar protecting a nominal 32 (42.3-mm OD) PN12 uPVC pipe with 19-mm thick Armaflex fire-rated lagging penetrating a 67-mm diameter aperture (Specimen 2)

Description: The specimen comprised an 1150-mm x 1150-mm x 150-mm thick concrete slab penetrated by multiple services protected by three cast-in collars and four retrofit fire collars. The 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. Specimen 2 is the subject of this Certificate. The SNAP MS70R Multi Service Retrofit fire collar comprised a 0.75-mm thick steel casing with a 69-mm inner dia. and a 0.95-mm thick steel base flange with a 162-mm outer dia. The 95-mm high collar casing incorporated a 4-mm thick x 90-mm wide x 250-mm long soft Intumesh Intumescent wrap which lined 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. The MS70R fire collar was centrally located over a 67-mm core hole on underside (exposed face) of concrete slab and fixed through 3 mounting brackets using 6.5-mm x 40-mm long steel sleeved masonry anchors. The penetrating service comprised a 1plex PN12 uPVC 42.3-mm outside dia. pressure pipe, with a wall thickness of 2.6-mm, lagged with 19-mm thick Armaflex FRV nitrile rubber insulation. The lagged pipe was fitted through the sleeve of the fire collar and penetrated the concrete slab through a 67-mm diameter cut out hole. The lagged pipe projected vertically 2000-mm above the unexposed face of concrete slab and approximately 500 mm below into the furnace chamber. The lagged pipe was supported at nominally 500-mm and 1500-mm above unexposed face of the concrete slab. The pipe was left open on unexposed end and plugged with ceramic fibre (Superwool) on exposed end. The Sponsor provided documents 'Test Slab S-21-D Layout', dated 20 April 2021, 'Specimen #2 32 PN12 PVC Pipe with 19mm Fire-Rated Lagging (Armaflex) & MS70R', dated 7 July 2021 and 'SNAP 70 Multi Service Retro', dated 23 September 2019 as a complete description of the specimen and should be read in conjunction with this Certificate.

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 of the specimen is applicable when the system is exposed to fire from the same direction as tested. Specimens were tested 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: 12 August 2021

Issued on the 18th day of October 2021 without alterations or additions.

Brett Roddy | Manager, Fire Testing and Assessments

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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. 3639



Certificate of Test

No. 3640

This is to certify that the element of construction described below was tested by CSIRO Infrastructure Technologies in accordance with Australian Standard 1530, Methods for fire tests on building materials, components and structures, Part 4 Fire-resistance tests of elements of construction, 2014, Section 10: Service penetrations and control joints, on behalf of:

IG6 Pty Ltd as trustee for the IG6 IP Trust
1343 Wynnum Road
Tingalpa QLD

A full description of the test specimen and the complete test results are detailed in the Division's report numbered FSP 2225.

Product Name: SNAP MS70C Multi Service cast-in fire collar protecting a nominal 32 (42.3-mm OD) PN12 uPVC pipe with 19-mm thick Armaflex fire-rated lagging (Specimen 3)

Description: The specimen comprised an 1150-mm x 1150-mm x 150-mm thick concrete slab penetrated by multiple services protected by three cast-in collars and four retrofit fire collars. The 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. Specimen 3 is the subject of this Certificate. The SNAP MS70C Multi Services cast-in fire collar comprised a 1.6-mm thick polypropylene casing with a 79 mm inner diameter and a 168-mm outer diameter base flange. The 250-mm high collar casing incorporated a 280-mm x 65-mm x 5-mm thick Intumescent material and a rubber ring seal. The closing mechanism comprised three stainless-steel springs bound with nylon fuse links and a 322-mm x 63-mm 316 stainless steel mesh. The MS70C fire collar was cast into a 150-mm thick concrete slab with the collar's casing projecting 100 mm vertically above the unexposed face. The penetrating service comprised a Iplex PN12 uPVC 42.3-mm outside diameter pressure pipe with a wall thickness of 2.6-mm lagged with 19-mm thick Armaflex FRV nitrile rubber insulation. The lagged pipe was fitted through the sleeve of the fire collar and penetrated the concrete slab. The lagged pipe projected vertically 2000-mm above the unexposed face of the concrete slab and approximately 500 mm below into the furnace chamber. The lagged pipe was supported at nominally 500-mm and 1500-mm above the unexposed face of the concrete slab. The pipe was left open on the unexposed end and plugged with ceramic fibre (Superwool) on the exposed end. The Sponsor provided documents 'Test Slab S-21-D Layout', dated 20 April 2021, 'Specimen #3 32mm PN12 PVC Pipe with 19mm Fire-Rated Lagging (Armaflex) & MS70C', dated 7 July 2021 and 'SNAP 70 Multi Service Cast-In', dated 20 May 2021 as a complete description of the specimen and should be read in conjunction with this Certificate.

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 of the specimen is applicable when the system is exposed to fire from the same direction as tested. Specimens were tested 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: 12 August 2021

Issued on the 18th day of October 2021 without alterations or additions.


Brett Roddy | Manager, Fire Testing and Assessments

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Accreditation No. 165 - Corporate Site No. 3625
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Certificate of Test

No. 3641

This is to certify that the element of construction described below was tested by CSIRO Infrastructure Technologies in accordance with Australian Standard 1530, Methods for fire tests on building materials, components and structures, Part 4 Fire-resistance tests of elements of construction, 2014, Section 10: Service penetrations and control joints, on behalf of:

IG6 Pty Ltd as trustee for the IG6 IP Trust
 1343 Wynnum Road
 Tingalpa QLD

A full description of the test specimen and the complete test results are detailed in the Division's report numbered FSP 2225.

Product Name: SNAP MS70R Multi Service Retrofit fire collar protecting a DN25 copper pipe with 19-mm thick E-Flex fire-rated lagging and a 2.5-mm² 3-core TPS power cable penetrating a 67-mm diameter aperture (Specimen 4)

Description: The specimen comprised an 1150-mm x 1150-mm x 150-mm thick concrete slab penetrated by multiple services protected by three cast-in collars and four retrofit fire collars. The 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. Specimen 4 is the subject of this Certificate. The SNAP MS70R Multi Service Retrofit fire collar comprised a 0.75-mm thick steel casing with a 69-mm inner dia. and a 0.95-mm thick steel base flange with a 162-mm outer dia. 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 intumescent strip. MS70R fire collar was centrally located over a 67-mm core hole on underside (exposed face) of slab and fixed through 3 mounting brackets using 5-mm x 35-mm long steel mushroom head spikes. Penetrating service comprised a lagged copper pipe and Prysmian 3-core 2.5-mm² TPS power cable. Brasshards copper type B pipe had a 25.4-mm (1-inch) outside dia., a wall thickness of 1.22 mm and was lagged with 19-mm thick E-Flex ST nitrile foam insulation. Lagged pipe and cable were fitted through sleeve of MS70R fire collar and penetrated concrete slab through a 67-mm dia. cut-out hole. Lagged pipe and cable projected vertically approx. 550-mm above concrete slab and 500 mm below into furnace chamber. Lagged pipe and cable were supported at nom. 500-mm above unexposed face of concrete slab. Copper pipe was left open on unexposed face and crimped closed on exposed end. Sponsor provided documents 'Test Slab S-21-D Layout', dated 20 April 2021, 'Specimen #4 1inch Copper Tube with 19mm Fire-rated Lagging (E-flex), 2.5mm² 3C TPS Cable & MS70R', dated 7 July 2021 and 'SNAP 70 Multi Service Retro', dated 23 September 2019 as a complete description of specimen and should be read in conjunction with this Certificate.

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

Structural Adequacy	-	not applicable
Integrity	-	no failure at 241 minutes
Insulation	-	141 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/240/120.

The fire-resistance level of the specimen is applicable when the system is exposed to fire from the same direction as tested. Specimens were tested 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:** 12 August 2021

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COPY OF CERTIFICATE OF TEST – NO. 3641



Certificate of Test

No. 3642

This is to certify that the element of construction described below was tested by CSIRO Infrastructure Technologies in accordance with Australian Standard 1530, Methods for fire tests on building materials, components and structures, Part 4 Fire-resistance tests of elements of construction, 2014, Section 10: Service penetrations and control joints, on behalf of:

IG6 Pty Ltd as trustee for the IG6 IP Trust
1343 Wynnum Road
Tingalpa QLD

A full description of the test specimen and the complete test results are detailed in the Division's report numbered FSP 2225.

Product Name: SNAP MS70R Multi Service Retrofit fire collar protecting a DN25 copper pipe with 19-mm thick Armaflex fire-rated lagging and a 2.5-mm² 3-core TPS power cable penetrating a 67 mm diameter aperture (Specimen 5)

Description: The specimen comprised an 1150-mm x 1150-mm x 150-mm thick concrete slab penetrated by multiple services protected by three cast-in collars and four retrofit fire collars. The 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. Specimen 5 is the subject of this Certificate. The SNAP MS70R Multi Service Retrofit fire collar comprised a 0.75-mm thick steel casing with a 69-mm inner dia. and a 0.95-mm thick steel base flange with a 162-mm outer dia. The 95 mm high collar casing incorporated a 4-mm thick x 90-mm wide x 250-mm long soft Intumescent wrap lined within internal circumference of 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 intumescent strip. MS70R fire collar was centrally located over a 67-mm core hole on underside (exposed face) of concrete slab and fixed through 3 mounting brackets using 5-mm x 35-mm mushroom head spikes. The penetrating service comprised a lagged copper pipe and a Prysmian 3-core 2.5-mm² TPS power cable. Brasshards copper type B pipe had a 25.4-mm (1-inch) outside dia., a wall thickness of 1.22 mm and was lagged with 19-mm thick Armaflex FRV nitrile rubber. Lagged pipe and cable were fitted through sleeve of MS70R fire collar and penetrated concrete slab through a 67-mm dia. cut-out hole. Lagged pipe and cable projected vertically approx. 550-mm above concrete slab and 500 mm below into furnace chamber. The lagged pipe and cable were supported at nom. 500-mm above unexposed face of concrete slab. The copper pipe was left open on unexposed side and crimped closed on exposed end. Sponsor provided documents 'Test Slab S-21-D Layout', dated 20 April 2021, 'Specimen #5 1inch Copper Tube with 19mm Fire-rated Lagging (Armaflex), 2.5mm² 3C TPS Cable & MS70R', dated 7 July 2021 and 'SNAP 70 Multi Service Retro', dated 23 September 2019 as a complete description of specimen and should be read in conjunction with this Certificate.

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

Structural Adequacy	-	not applicable
Integrity	-	no failure at 241 minutes
Insulation	-	118 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/240/90.

The fire-resistance level of the specimen is applicable when the system is exposed to fire from the same direction as tested. Specimens were tested 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: 12 August 2021

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Brett Roddy | Manager, Fire Testing and Assessments

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COPY OF CERTIFICATE OF TEST – NO. 3642



Certificate of Test

No. 3643

This is to certify that the element of construction described below was tested by CSIRO Infrastructure Technologies in accordance with Australian Standard 1530, Methods for fire tests on building materials, components and structures, Part 4 Fire-resistance tests of elements of construction, 2014, Section 10: Service penetrations and control joints, on behalf of:

IG6 Pty Ltd as trustee for the IG6 IP Trust
1343 Wynnum Road
Tingalpa QLD

A full description of the test specimen and the complete test results are detailed in the Division's report numbered FSP 2225.

Product Name: SNAP MS70R Multi Service Retrofit fire collar protecting a bundle of 60 Category 7 network cables penetrating a 67-mm diameter aperture (Specimen 6)

Description: The specimen comprised an 1150-mm x 1150-mm x 150-mm thick concrete slab penetrated by multiple services protected by three cast-in collars and four retrofit fire collars. The 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. Specimen 6 is the subject of this Certificate. The SNAP MS70R Multi Service Retrofit fire collar comprised a 0.75-mm thick steel casing with a 69-mm inner diameter and a 0.95-mm thick steel base flange with a 162-mm outer 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. The MS70R fire collar was centrally located over a 67-mm core hole on the underside (exposed face) of the concrete slab and fixed through the 3 mounting brackets using 6-mm x 40-mm long steel wedge anchors. The penetrating service comprised a bundle of sixty 7-mm diameter Belden Category 7 network cables. The cables were fitted through the sleeve of the fire collar and penetrated the concrete slab through a 67-mm diameter cut-out hole. The cables projected vertically 520-mm above the concrete and approximately 500 mm below into the furnace chamber. The cables were supported at nominally 500-mm above the unexposed face of the concrete slab. The Sponsor provided documents 'Test Slab S-21-D Layout', dated 20 April 2021, 'Specimen #6 100% Full of Cat7 Cables & MS70R', dated 7 July 2021 and 'SNAP 70 Multi Service Retro', dated 23 September 2019 as a complete description of specimen and should be read in conjunction with this Certificate.

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

Structural Adequacy	-	not applicable
Integrity	-	no failure at 241 minutes
Insulation	-	160 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/240/120.

The fire-resistance level of the specimen is applicable when the system is exposed to fire from the same direction as tested. Specimens were tested 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: 12 August 2021

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Brett Roddy | Manager, Fire Testing and Assessments

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Certificate of Test

No. 3644

This is to certify that the element of construction described below was tested by CSIRO Infrastructure Technologies in accordance with Australian Standard 1530, Methods for fire tests on building materials, components and structures, Part 4 Fire-resistance tests of elements of construction, 2014, Section 10: Service penetrations and control joints, on behalf of:

IG6 Pty Ltd as trustee for the IG6 IP Trust
 1343 Wynnum Road
 Tingalpa QLD

A full description of the test specimen and the complete test results are detailed in the Division's report numbered FSP 2225.

Product Name: SNAP MS70C Multi Service cast-in fire collar protecting a bundle of 16 Category 7 network cables (Specimen 7)

Description: The specimen comprised an 1150-mm x 1150-mm x 150-mm thick concrete slab penetrated by multiple services protected by three cast-in collars and four retrofit fire collars. The 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. Specimen 7 is the subject of this Certificate. The SNAP MS70C Multi Services cast-in fire collar comprised a 1.6-mm thick polypropylene casing with a 79 mm inner diameter and a 168-mm outer diameter base flange. The 250-mm high collar casing incorporated a 280-mm x 65-mm x 5-mm thick Intumesh intumescent material and a rubber ring seal. The closing mechanism comprised three stainless-steel springs bound with nylon fuse links and a 322-mm x 63-mm 316-stainless steel mesh. The MS70C collar was cast into a 150-mm thick concrete slab with the collar's casing projecting 100 mm vertically above the unexposed face. The penetrating service comprised a bundle of sixteen 7-mm diameter Belden Category 7 network cables. The cables were fitted through the collar's sleeve penetrated the concrete slab. On the unexposed face the annular gap between the top of the collar casing and the Category 7 network cables incorporated a PE backing rod and was backfilled with a 10-mm deep bead of H.B Fullers Firesound sealant. The cables projected vertically approximately 520-mm above the concrete and approximately 500 mm below into the furnace chamber. The cables were supported at nominally 500-mm above the unexposed face of the concrete slab. The Sponsor provided documents 'Test Slab S-21-D Layout', dated 20 April 2021, 'Specimen #7 20% Full of Cat7 Cables & MS70C', dated 7 July 2021 and 'SNAP 70 Multi Service Cast-in', dated 20 May 2021 as a complete description of specimen and should be read in conjunction with this Certificate.

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 of the specimen is applicable when the system is exposed to fire from the same direction as tested. Specimens were tested 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: 12 August 2021

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B. Roddy

Brett Roddy | Manager, Fire Testing and Assessments

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References

The following informative documents are referred to in this Report:

- | | |
|----------------|--|
| AS 1530.4-2014 | Methods for fire tests on building materials, components and structures Part 4: Fire-resistance tests for elements of building construction. |
| AS 4072.1-2005 | Components for the protection of openings in fire-resistant separating elements. Part 1: Service penetrations and control joints. |
| AS 3600-2018 | Concrete structures. |

*** end of report ***

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FOR FURTHER INFORMATION

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