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

Test Report

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Client: Snap Fire Systems Pty Ltd

Commercial-in-confidence

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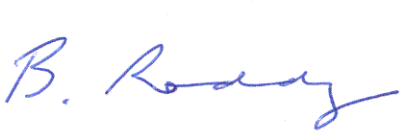
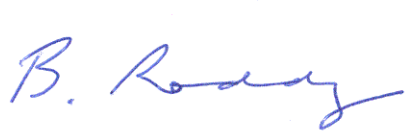
Report Authorization:

AUTHOR	REVIEWED BY	AUTHORISED BY
Chris Wojcik	Brett Roddy	Brett Roddy
		
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Contents

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

Sponsored Investigation No. FSP 1741

1 Introduction

1.1 Identification of specimen

The sponsor identified the specimen as Snap Cast-in Fire Collars protecting a 150-mm thick concrete slab penetrated by five (5) stack pipes.

1.2 Sponsor

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

1.3 Manufacturer

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

1.4 Test standard

Australian Standard 1530, Methods for fire tests on building materials, components and structures, Part 4-2005, Fire-resistance tests of elements of construction.

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 Purpose of test

The test was conducted with the collar flanges in close proximity. Clearances between fire collars is shown on drawing 'Test Slab S-15-L Penetration # 1 Collar Cluster – Top view', undated.

1.7 Test number

CSIRO Reference test number: FS 4544/3836

1.8 Test date

The fire-resistance test was conducted on 23 December 2015.

2 Description of specimen

2.1 General

The specimen comprised an 1150-mm x 1150-mm x 150-mm thick reinforced concrete slab penetrated by five (5) stack pipes protected by Cast-in Snap Fire Systems fire collars.

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

- AS/NZS 1260 - PVC-U pipes and fittings for drain, waste and vent application
- AS/NZS 5065:2005 'Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications'
- AS/NZS 7671:2010 'Plastics piping systems for soil and waste discharge (low and high temperature) inside buildings - Polypropylene (PP)(ISO 7671:2003), MOD';

For the purpose of the test, the specimens were referenced as Penetrations 1a, 1b, 1c, 1d (Specimen 1) and Penetration 2 (Specimen 2). Documents containing a complete description of each specimen were supplied by the sponsor and are retained on file. Penetrations 1a, 1b, 1c, 1d formed one specimen whereby four (4) stack pipes were fitted in close proximity to each other.

<u>Penetration 1a – H150S-RR cast-in fire collar protecting a 150-mm diameter Polyvinyl Chloride (PVC-SC) Stack Pipe</u>

The SNAP Cast-in H150S-RR fire collar comprised a 2.0-mm thick polypropylene casing with a 179-mm inner diameter and a 287-mm diameter base flange. The 250-mm high collar casing incorporated a 588-mm x 110-mm x 6-mm thick Intumesh intumescent material and a rubber ring seal. The closing mechanism comprised four galvanised steel springs bound with nylon fuse links and a 640-mm x 109-mm stainless steel mesh as shown in drawing numbered H150S-RR-T dated 21 March 2016, by Snap Fire Systems Pty Ltd.

The penetrating service comprised a 150-mm PVC-SC stack pipe, with a wall thickness of 4.4-mm fitted through the collar's sleeve. The pipe projected vertically 2000-mm above the concrete and 500-mm into the furnace chamber. The pipe was supported at 500-mm and 1000-mm from the unexposed face of the concrete slab as shown in drawing titled "Test Slab S-15-L Penetration # 1a – 150mm (162mm) PVC-SC Stack Pipe & H150S -RR" dated 16 April 2016, by Snap Fire Systems Pty Ltd. On the exposed end, the pipe was capped with a PVC End Cap. On the unexposed face, the annular gap between the pipe and slab was sealed with non-shrink grout backfill.

Penetration 1b – H100S-RR cast-in fire collar protecting a 110-mm diameter High-density polyethylene (HDPE) pipe Stack Pipe

The SNAP Cast-in H100S-RR fire collar comprised a 1.6-mm thick polypropylene casing with a 126.5-mm inner diameter and a 213-mm diameter base flange. The 250-mm high collar casing incorporated a 412-mm x 85-mm x 4-mm thick Intumesh intumescent material and a rubber ring seal. The closing mechanism comprised three galvanised steel springs bound with nylon fuse links and a 460-mm x 85-mm stainless steel mesh as shown in drawing numbered H100 S-RR-T dated 29 September 2015, by SNAP Fire Systems Pty Ltd.

The penetrating service comprised a 110-mm HDPE stack pipe, with a wall thickness of 4.8-mm fitted through the collar's sleeve. The pipe projected vertically 2000-mm above the concrete and 500-mm into the furnace chamber.

The pipe was supported at 500-mm and 1000-mm from the unexposed face of the concrete slab as shown in drawing titled "Test Slab S-15-L Penetration # 1b – 110mm (108mm) HDPE Stack Pipe & H100S -RR" dated 16 April 2016, by Snap Fire Systems Pty Ltd. On the exposed end, the pipe was plugged with Superwool. On the unexposed face, the annular gap between the pipe and slab was sealed with non-shrink grout backfill.

Penetration 1c – H100S-RR cast-in fire collar protecting a 100-mm diameter Polyvinyl Chloride (PVC-SC) Stack Pipe

The SNAP Cast-in H100S-RR fire collar comprised a 1.6-mm thick polypropylene casing with a 126.5-mm inner diameter and a 213-mm diameter base flange. The 250-mm high collar casing incorporated a 412-mm x 85-mm x 4-mm thick Intumesh intumescent material and a rubber ring seal. The closing mechanism comprised three galvanised steel springs bound with nylon fuse links and a 460-mm x 85-mm stainless steel mesh as shown in drawing numbered H100 S-RR-T dated 29 September 2015, by SNAP Fire Systems Pty Ltd.

The penetrating service comprised a 100-mm PVC-SC stack pipe, with a wall thickness of 3.4-mm fitted through the collar's sleeve. The pipe projected vertically 2000-mm above the concrete and 500-mm into the furnace chamber. The pipe was supported at 500-mm and 1000-mm from the unexposed face of the concrete slab as shown in drawing titled "Test Slab S-15-L Penetration # 1c – 100mm (111mm OD) PVC-SC Stack Pipe & H100S -RR" dated 16 April 2016, by Snap Fire Systems Pty Ltd. On the exposed end, the pipe was capped with a 100mm PVC Pipe Cap.

On the unexposed face, the annular gap between the pipe and slab was sealed with non-shrink grout backfill.

Penetration 1d – H50S-RR cast-in fire collar protecting a 50-mm diameter Rehau Raupiano Stack Pipe

The SNAP Cast-in H50S-RR fire collar comprised a 1.6-mm thick polypropylene casing with a 67-mm inner diameter and a 150-mm diameter base flange. The 250-mm high collar casing incorporated a 230-mm x 55-mm x 5-mm thick Intumesh intumescent material and a rubber ring seal. The closing mechanism comprised three galvanised steel springs bound with nylon fuse links and a 268-mm x 55-mm stainless steel mesh as shown in drawing numbered H50 S-RR-T dated 29 September 2015, by SNAP Fire Systems Pty Ltd.

The penetrating service comprised a 50-mm Rehau Raupiano stack pipe, with a wall thickness of 2.3-mm fitted through the collar's sleeve. The pipe projected vertically 2000-mm above the concrete and 500-mm into the furnace chamber. The pipe was supported at 500-mm and 1000-mm from the unexposed face of the concrete slab as shown in drawing titled "Test Slab S-15-L Penetration # 1d – 50mm Rehau Raupiano Pipe Stack & H50S -RR" dated 16 April 2016, by Snap Fire Systems Pty Ltd. On the exposed end, the pipe was plugged with Superwool.

On the unexposed face, the annular gap between the pipe and slab was sealed with Fullers Firesound Sealant.

Penetration 2 – H100S-RR cast-in fire collar protecting a 110-mm diameter Rehau Raupiano Stack Pipe with a fitting inside the collar

The SNAP Cast-in H100S-RR fire collar comprised a 1.6-mm thick polypropylene casing with a 126.5-mm inner diameter and a 213-mm diameter base flange. The 250-mm high collar casing incorporated a 412-mm x 85-mm x 4-mm thick Intumesh intumescent material and a rubber ring seal. The closing mechanism comprised three galvanised steel springs bound with nylon fuse links and a 460-mm x 85-mm stainless steel mesh as shown in drawing numbered H100 S-RR-T dated 29 September 2015, by SNAP Fire Systems Pty Ltd.

The penetrating service comprised a 110-mm Rehau Raupiano stack pipe and a 110-mm Rahau Raupiano coupling, with a total wall thickness of 6.2-mm fitted through the collar's sleeve. The pipe projected vertically 2000-mm above the concrete and 500-mm into the furnace chamber. The pipe was supported at 500-mm and 1000-mm from the unexposed face of the concrete slab as shown in drawing titled "Test Slab S-15-L Penetration # 2 – 110mm Rehau Raupiano Pipe Stack & H100S -RR" dated 16 April 2016, by Snap Fire Systems Pty Ltd. On the exposed end, the pipe was plugged with Superwool.

On the unexposed face, the annular gap between the pipe and slab was sealed with Fullers Firesound Sealant.

2.2 Dimensions

The overall dimension of the concrete slab was 1150-mm wide x 1150-mm long x 150-mm thick, 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.

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-15-L Penetration # 1 Collar Cluster – Top view, undated.

Drawing titled "Test Slab S-15-L Penetration # 1a – 150mm (162mm) PVC-SC Stack Pipe & H150S -RR" dated 16 April 2016, by Snap Fire Systems Pty Ltd.

Drawing titled "Test Slab S-15-L Penetration # 1b – 110mm (108mm) HDPE Stack Pipe & H100S -RR" dated 16 April 2016, by Snap Fire Systems Pty Ltd. On the exposed end, the pipe was capped with Superwool.

Drawing titled "Test Slab S-15-L Penetration # 1c – 100mm (111mm OD) PVC-SC Stack Pipe & H100S -RR" dated 16 April 2016, by Snap Fire Systems Pty Ltd.

Drawing titled "Test Slab S-15-L Penetration # 1d – 50mm Rehau Raupiano Pipe Stack & H50S -RR" dated 16 April 2016, by Snap Fire Systems Pty Ltd.

Drawing titled “Test Slab S-15-L Penetration # 2 – 110mm Rehau Raupiano Pipe Stack & H100S -RR” dated 16 April 2016, by Snap Fire Systems Pty Ltd.

Drawing numbered H50S RR-T, dated 29 September 2015, by Snap Fire Systems Pty Ltd.

Drawing numbered H150S RR-T, dated 21 March 2016, by Snap Fire Systems Pty Ltd.

Drawing numbered H100S RR-T, dated 29 September 2015, 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 1530.4-2005 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 22°C at the commencement of the test.

6 Departure from standard

There were no departures from the requirements of AS 1530.4-2005.

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
60 seconds -	Smoke is being emitted from the furnace flues.
90 seconds -	Smoke is fluing from Penetrations 1a and 1c.
2 minutes -	Smoke is fluing from Penetration 2. Smoke from Penetration 1a and 1c has diminished.
5 minutes -	Penetration 2 is distorting at the base.
7 minutes -	Penetration 1b is fluing. A small amount of smoke is visible on Penetration 1a and 1c. Smoke from Penetration 2 has diminished. Smoke from Penetration 1b has diminished.
8 minutes -	Smoke is apparent at the base of Penetration 2. The thermocouple on north side of Penetration 2 is no longer in contact with the specimen.
12 minutes -	Noise from the furnace is audible and identified as 'spalling' of concrete.
15 minutes -	Penetration 1a and 1b are fluing slightly. More noises are audible from the furnace.
25 minutes -	Condensation is pooling on the slab surface.
60 minutes -	Steam is being emitted from the slab. No smoke is visible emitting from the pipes.
74 minutes -	A small amount of smoke is emitting from Penetration 1a.
120 minutes -	Little visible change.
140 minutes -	Insulation failure Penetration 1a.
180 minutes -	Smoke is being emitted from the base of Penetration 1a.
195 minutes -	Smoke is fluing from Penetration 1a.
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 maximum temperature versus time associated with Penetration 1a.

Figure 4 shows the curve of maximum temperature versus time associated with Penetration 1b.

Figure 5 shows the curve of maximum temperature versus time associated with Penetration 1c.

Figure 6 shows the curve of maximum temperature versus time associated with Penetration 1d.

Figure 7 shows the curve of maximum temperature versus time associated with Penetration 2.

8.5 Performance

Performance observed in respect of the following AS 1530.4-2005 criteria:

Penetration 1a – H150S-RR cast-in fire collar protecting a 150-mm diameter PVC-SC Stack Pipe

Structural adequacy	-	not applicable
Integrity	-	no failure at 241 minutes
Insulation	-	140 minutes

Penetration 1b – H100S-RR cast-in fire collar protecting a 110-mm diameter HDPE Stack Pipe

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

Penetration 1c – H100S-RR cast-in fire collar protecting a 100-mm diameter PVC-SC Stack Pipe

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

Penetration 1d – H50S-RR cast-in fire collar protecting a 50-mm diameter Rehau Raupiano Stack Pipe

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

Penetration 2 – H100S-RR cast-in fire collar protecting a 110-mm diameter Rehau Raupiano Stack Pipe with a fitting inside the collar

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 this standard. Any significant variation with respect to size, constructional details, loads, stresses, edge or end conditions, other than those allowed under the field of direct application in the relevant test method, is not covered by this report.

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

9 Fire-resistance level (FRL)

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

Penetration #	Specimen #	Fire-resistance level (FRL)
Penetration 1a Penetration 1b Penetration 1c Penetration 1d }	Specimen # 1	-/240/120 *
Penetration 2	Specimen # 2	-/240/240

* The FRL of the Specimen is representative of the Penetration with the least favourable results.

Penetrations 1a, 1b, 1c, 1d formed one specimen whereby four (4) stack pipes were fitted in close proximity to each other

For the purposes of AS 1530.4-2005 the results of these fire tests may be used to directly assess fire hazard, but it should be noted that a single test method will not provide a full assessment of fire hazard under all fire conditions.

10 Field of direct application of test results

The results of the fire test contained in this test report are directly applicable, without reference to the testing authority, to similar constructions where one or more changes listed in Clause 10.11 of AS 1530.4-2005, have been made provided no individual component is removed or reduced.

11 Tested by

For Mario Lara-Ledermann
Testing Officer

Appendices

Appendix A – Measurement location

Measurement Location		
Group location	**T/C Position**	**T/C desgination**
Penetration 1	On slab – 25-mm from pipe	S1
	On slab – 25-mm from pipe	S2
	On sealant	S3
	On sealant	S4
	On pipe -25-mm from sealant	S5
	On pipe -25-mm from sealant	S6
Penetration 2	On slab – 25-mm from pipe	S7
	On slab – 25-mm from pipe	S8
	On sealant	S9
	On sealant	S10
	On pipe -25-mm from sealant	S11
	On pipe -25-mm from sealant	S12
Penetration 3	On slab – 25-mm from pipe	S13
	On slab – 25-mm from pipe	S14
	On sealant	S15
	On sealant	S16
	On pipe -25-mm from sealant	S17
	On pipe -25-mm from sealant	S18
Penetration 4	On slab – 25-mm from pipe	S19
	On slab – 25-mm from pipe	S20
	On sealant	S21
	On sealant	S22
	On pipe -25-mm from sealant	S23
	On pipe -25-mm from sealant	S24
Penetration 5	On slab – 25-mm from pipe	S25
	On slab – 25-mm from pipe	S26
	On sealant	S27
	On sealant	S28
	On pipe -25-mm from sealant	S29
	On pipe -25-mm from sealant	S30

Appendix B – Photographs

PHOTOGRAPH 1 – EXPOSED FACE OF SPECIMENS PRIOR TO TESTING

PHOTOGRAPH 2 – UNEXPOSED FACE OF SPECIMENS PRIOR TO TESTING

PHOTOGRAPH 3 – SPECIMENS AFTER 60 MINUTES OF TESTING

PHOTOGRAPH 4 – SPECIMENS AFTER 120 MINUTES OF TESTING

PHOTOGRAPH 5 – SPECIMENS AFTER 180 MINUTES OF TESTING

PHOTOGRAPH 6 – UNEXPOSED FACED OF SPECIMEN AT CONCLUSION OF TESTING

PHOTOGRAPH 7 – EXPOSED FACE OF SPECIMENS AT CONCLUSION OF TESTING

Appendix C – Furnace Temperature

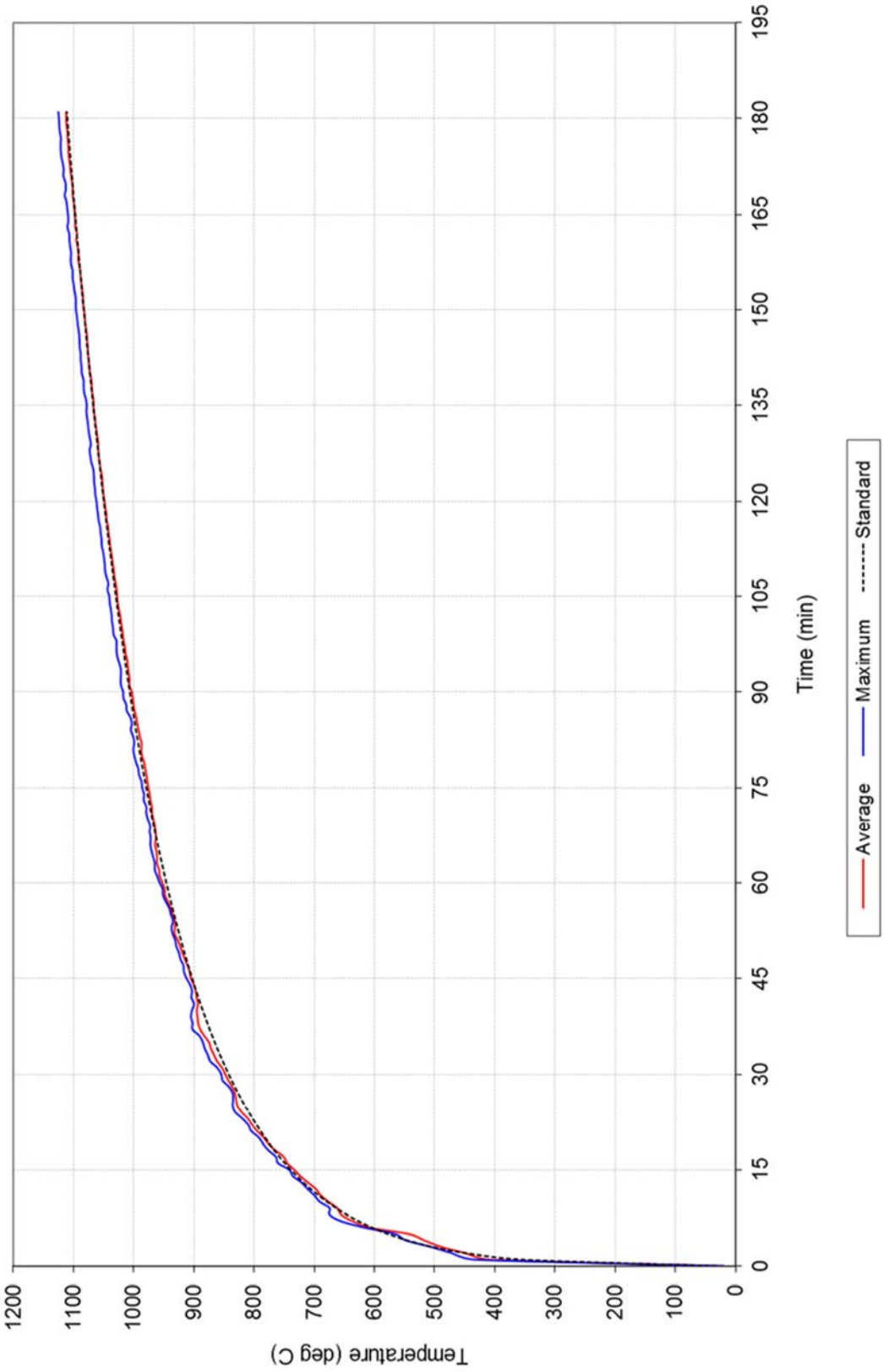


FIGURE 1 – FURNACE TEMPERATURE

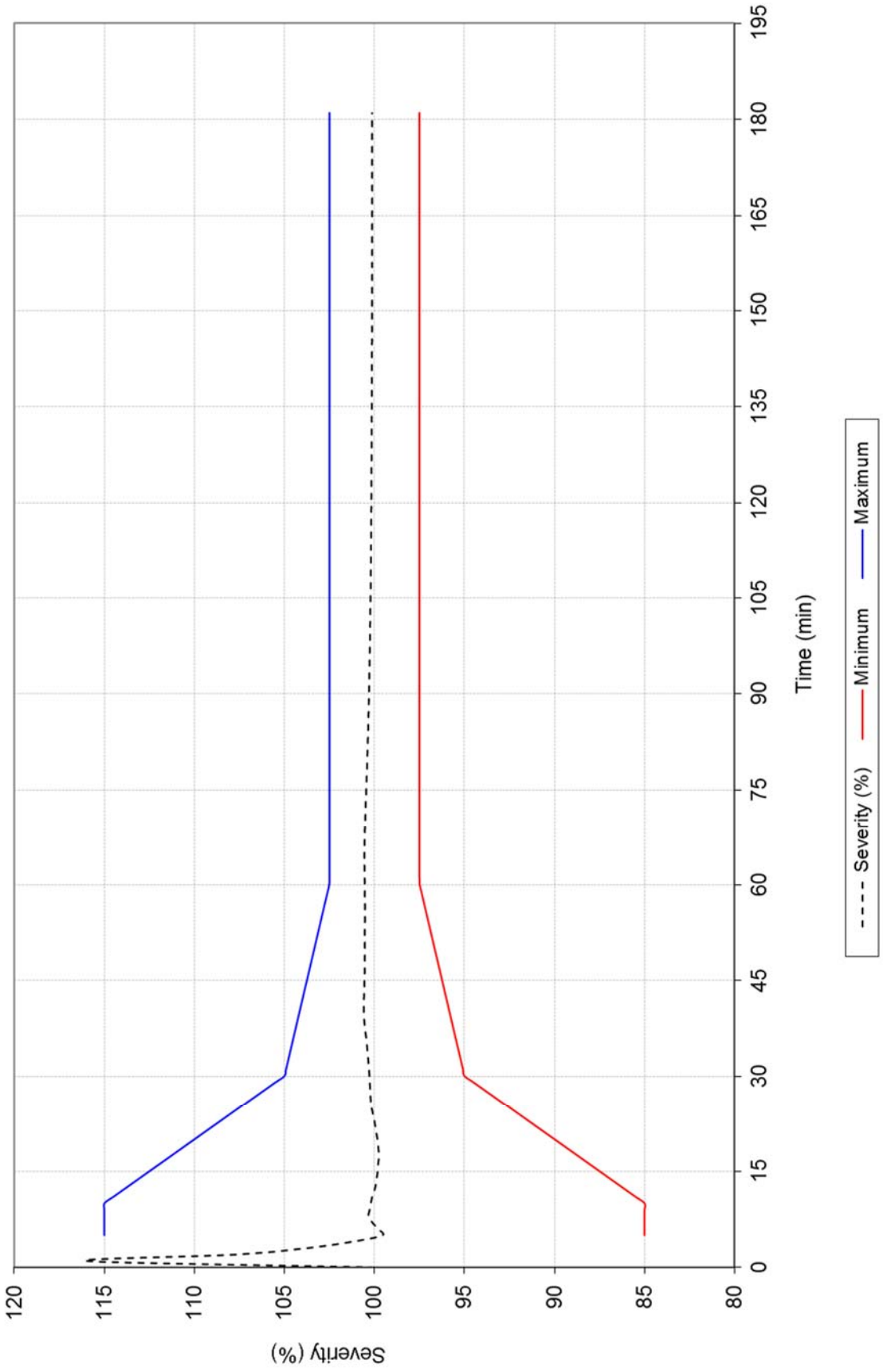


FIGURE 2 – FURNACE SEVERITY

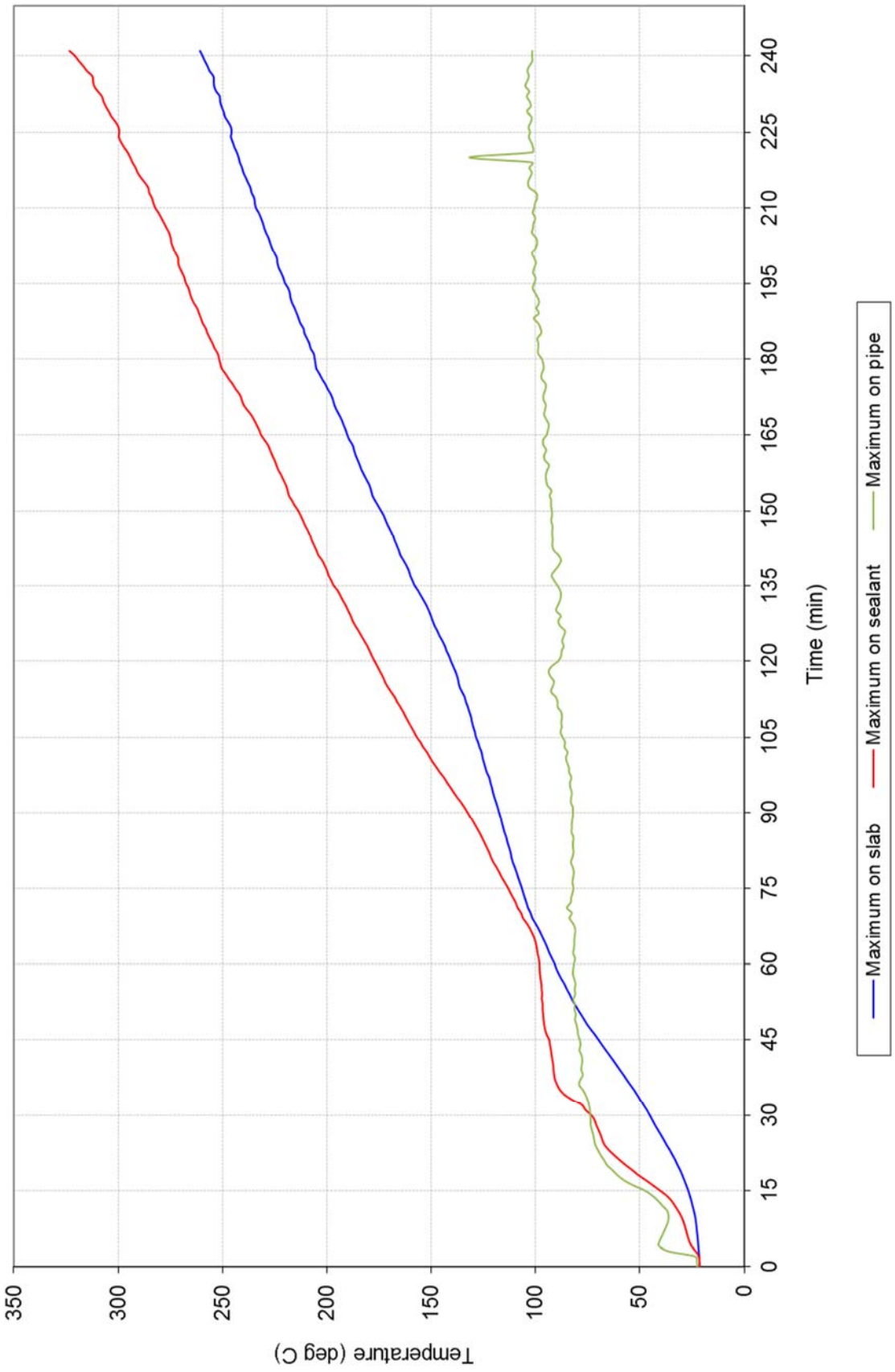


FIGURE 3 – SPECIMEN TEMPERATURE – ASSOCIATED WITH PENETRATION 1a

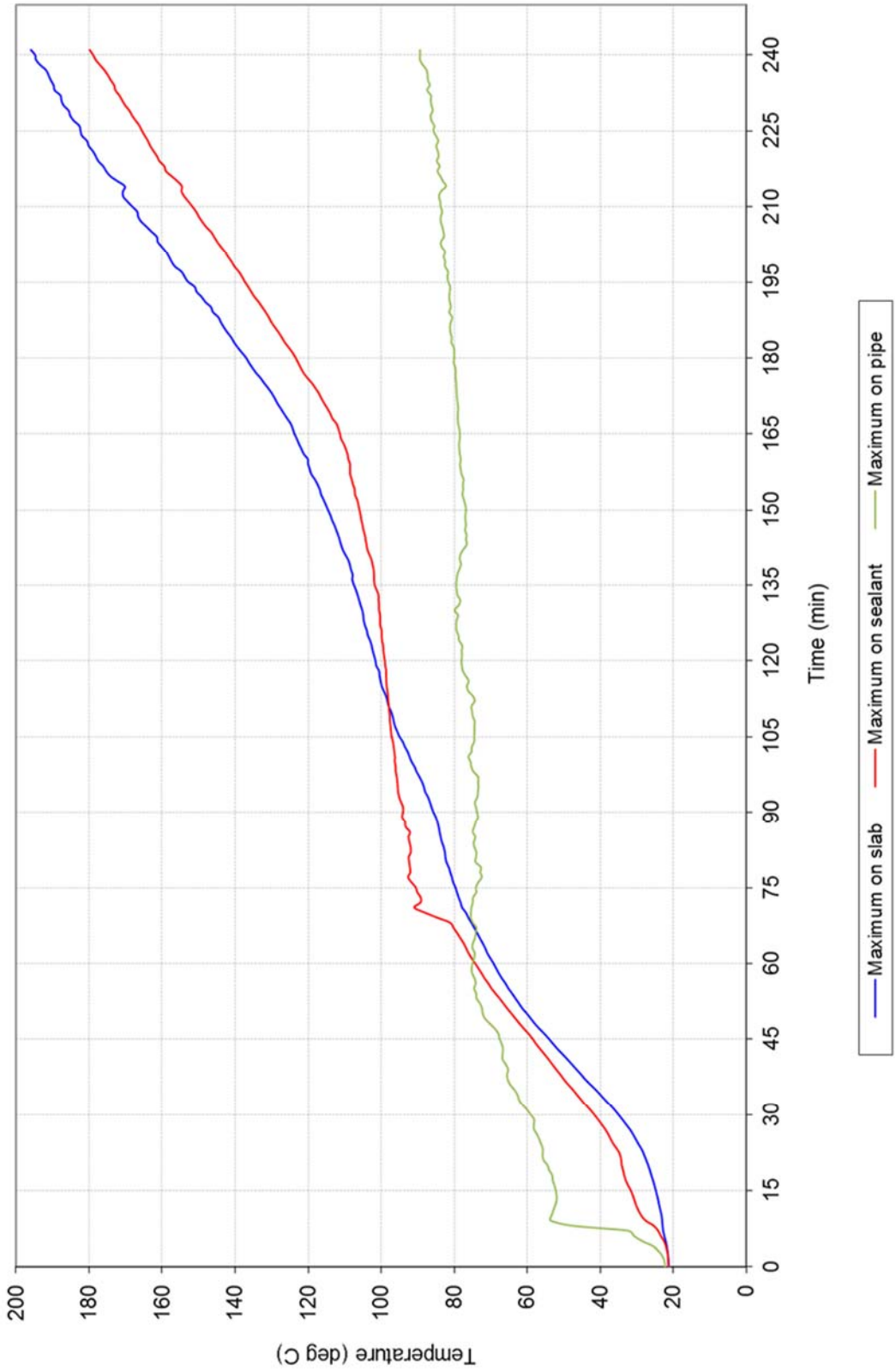


FIGURE 4 – SPECIMEN TEMPERATURE – ASSOCIATED WITH PENETRATION 1b

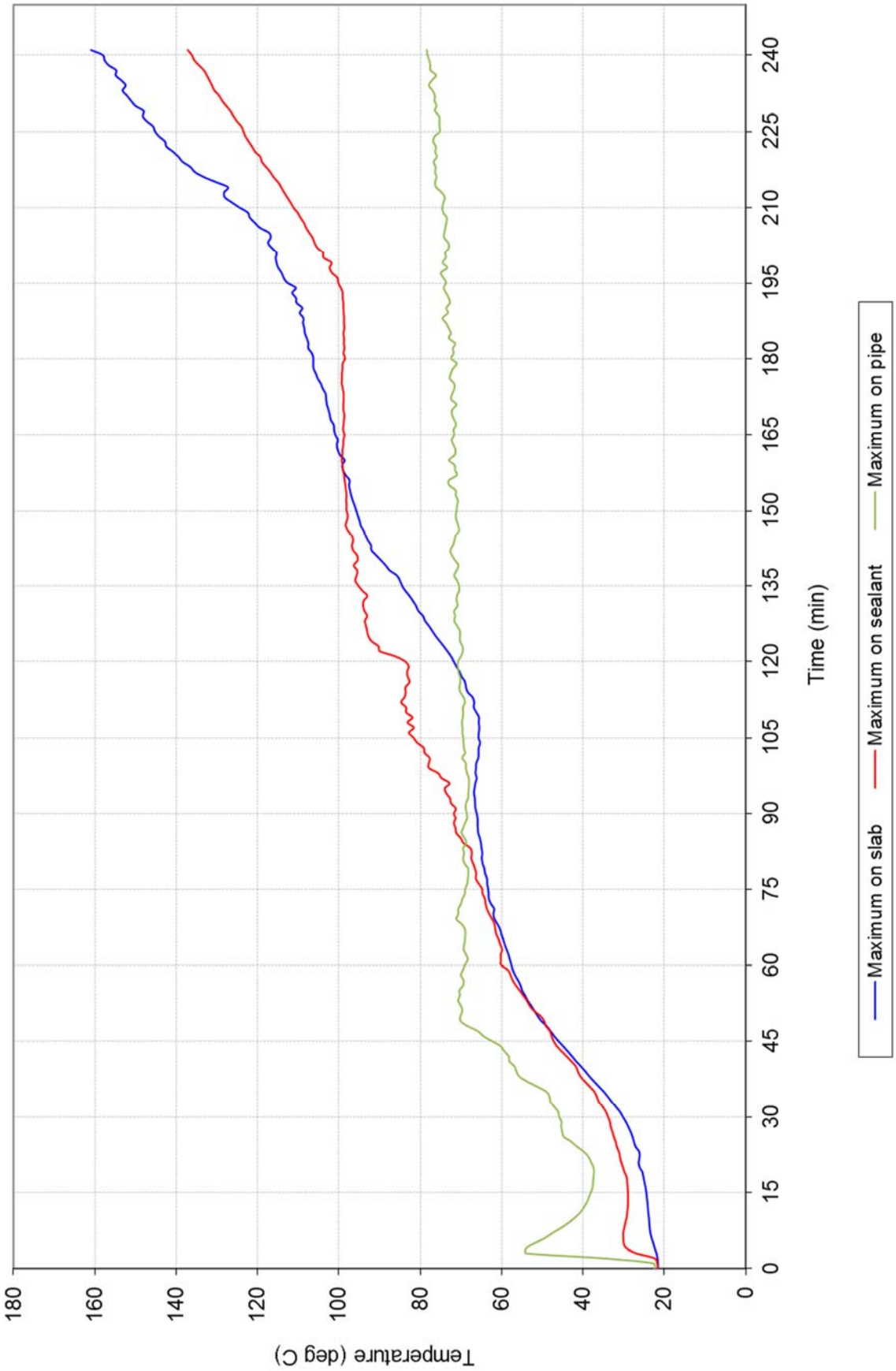


FIGURE 5 – SPECIMEN TEMPERATURE – ASSOCIATED WITH PENETRATION 1c

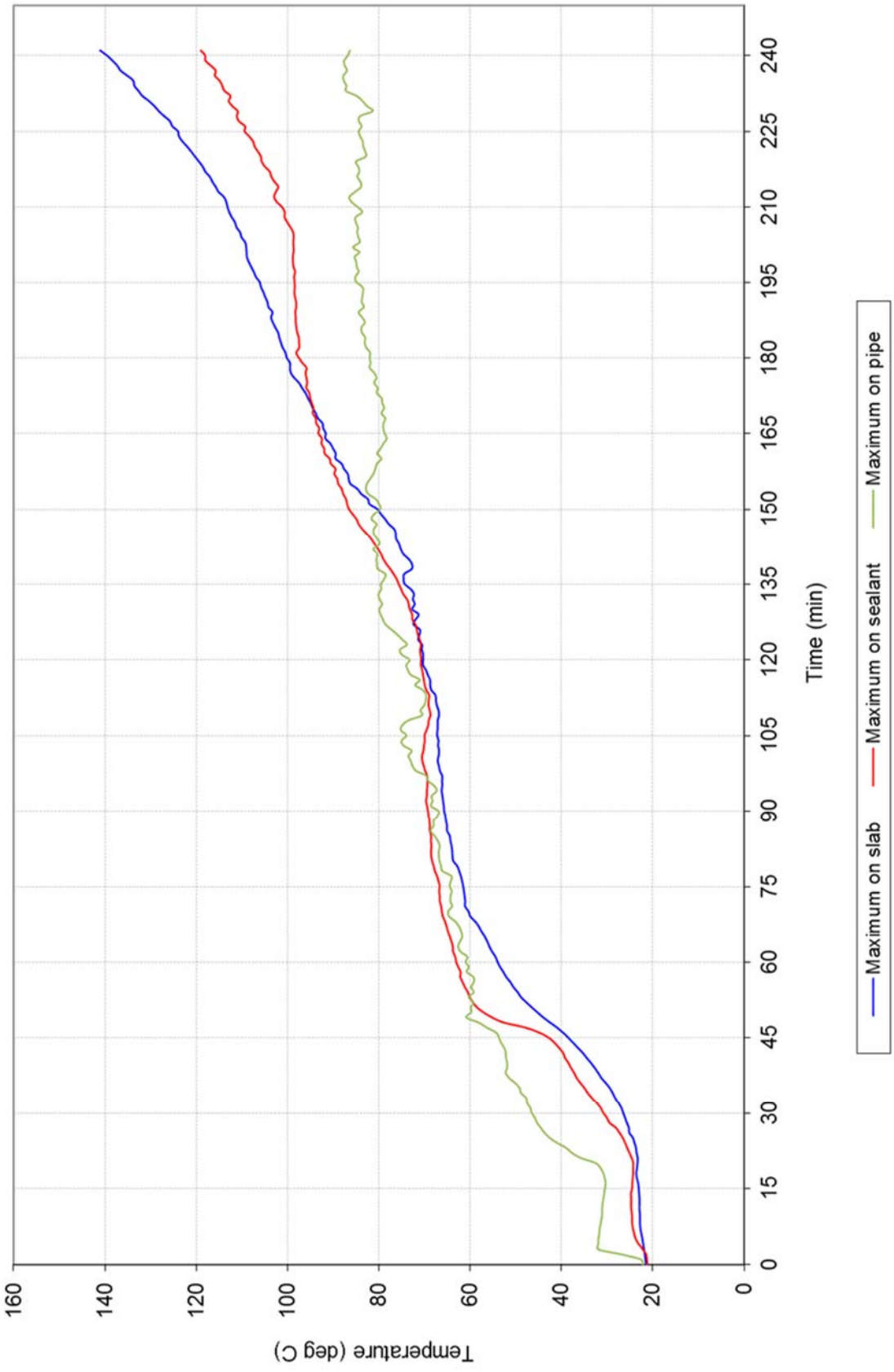


FIGURE 6 – SPECIMEN TEMPERATURE – ASSOCIATED WITH PENETRATION 1d

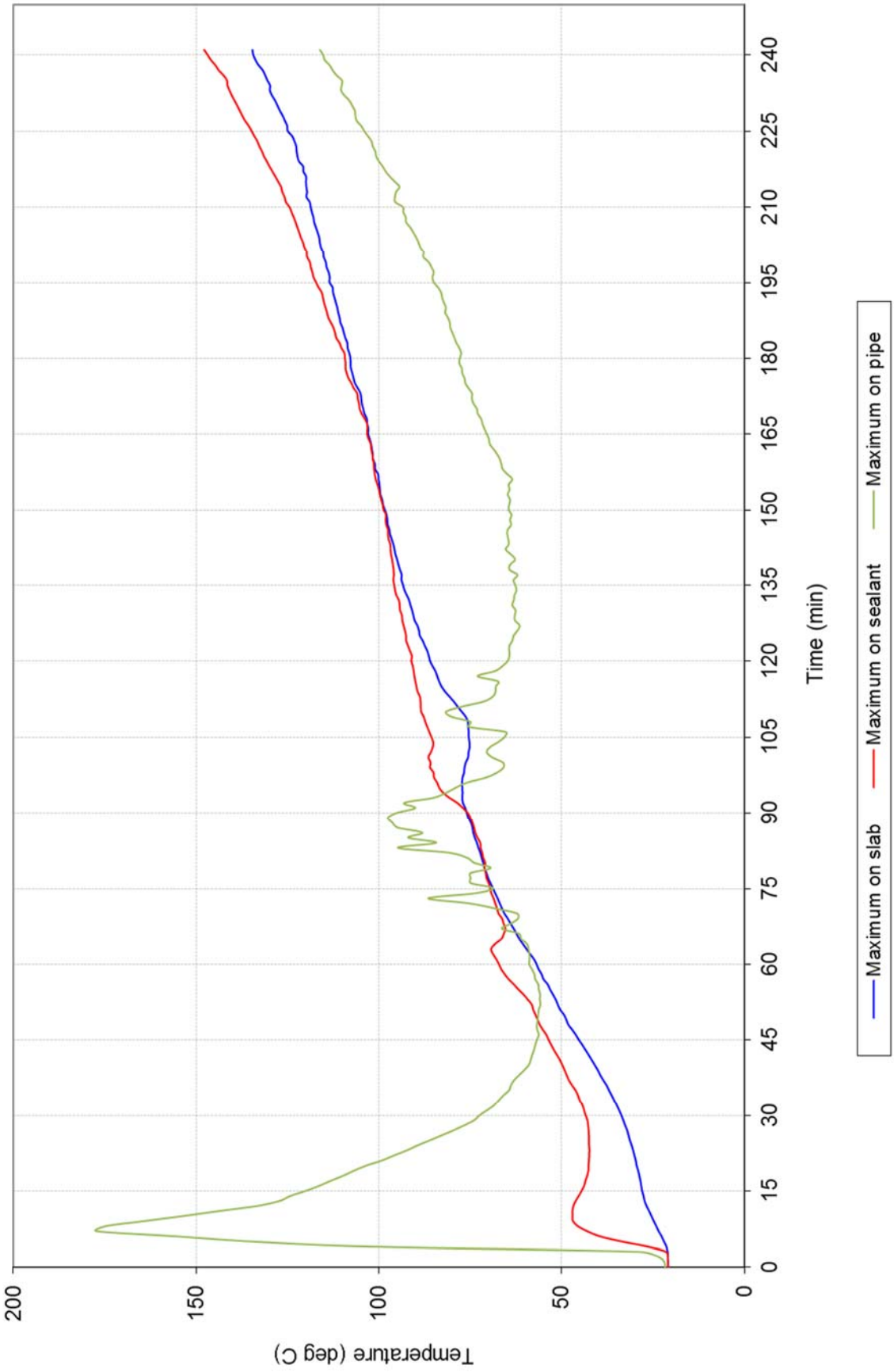
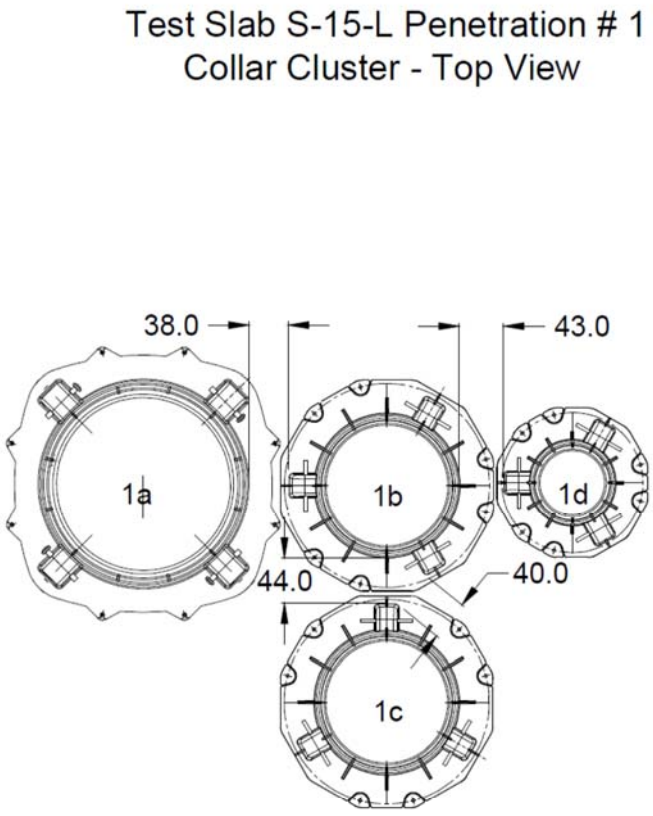
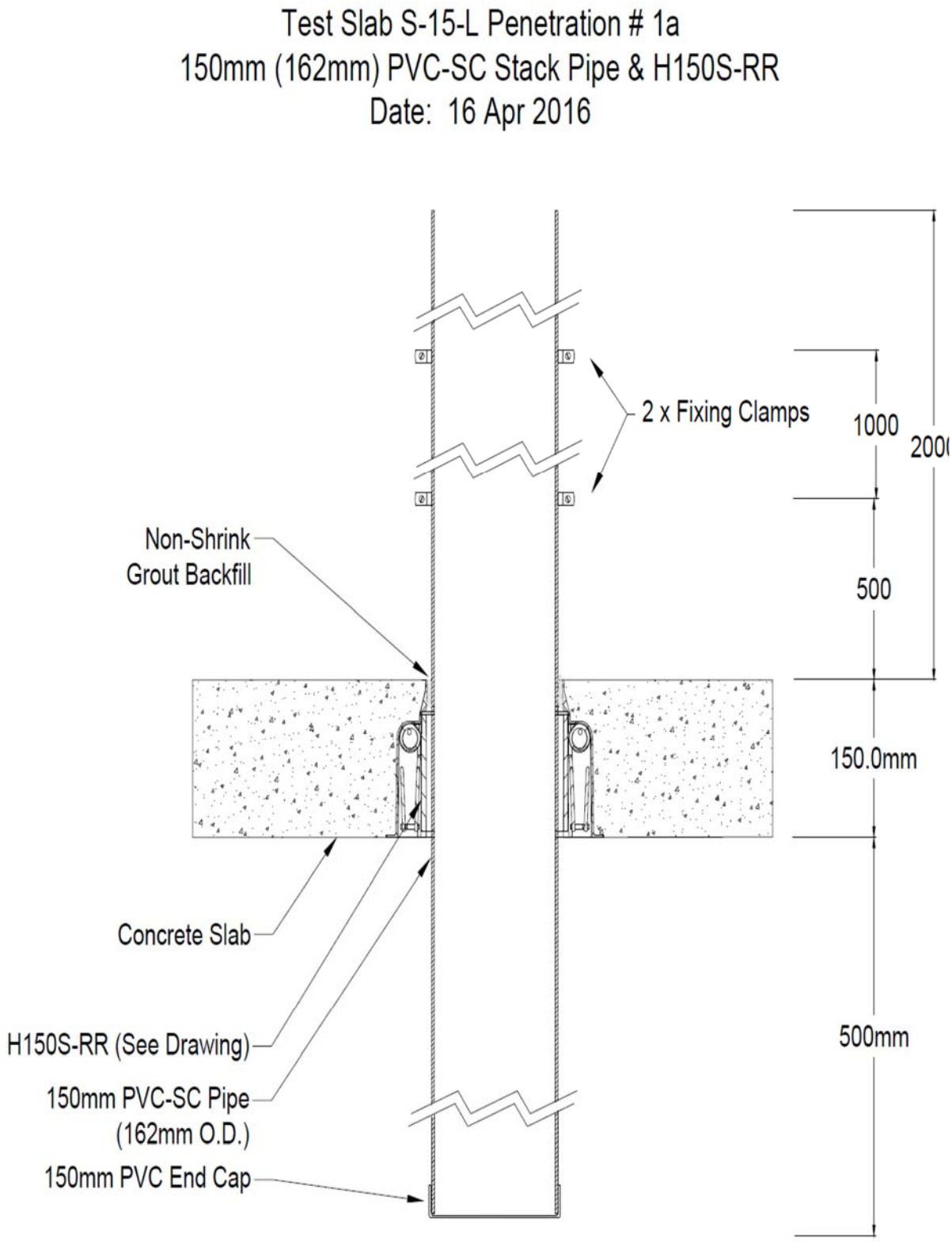


FIGURE 7 – SPECIMEN TEMPERATURE – ASSOCIATED WITH PENETRATION 2

Appendix D – Installation drawings

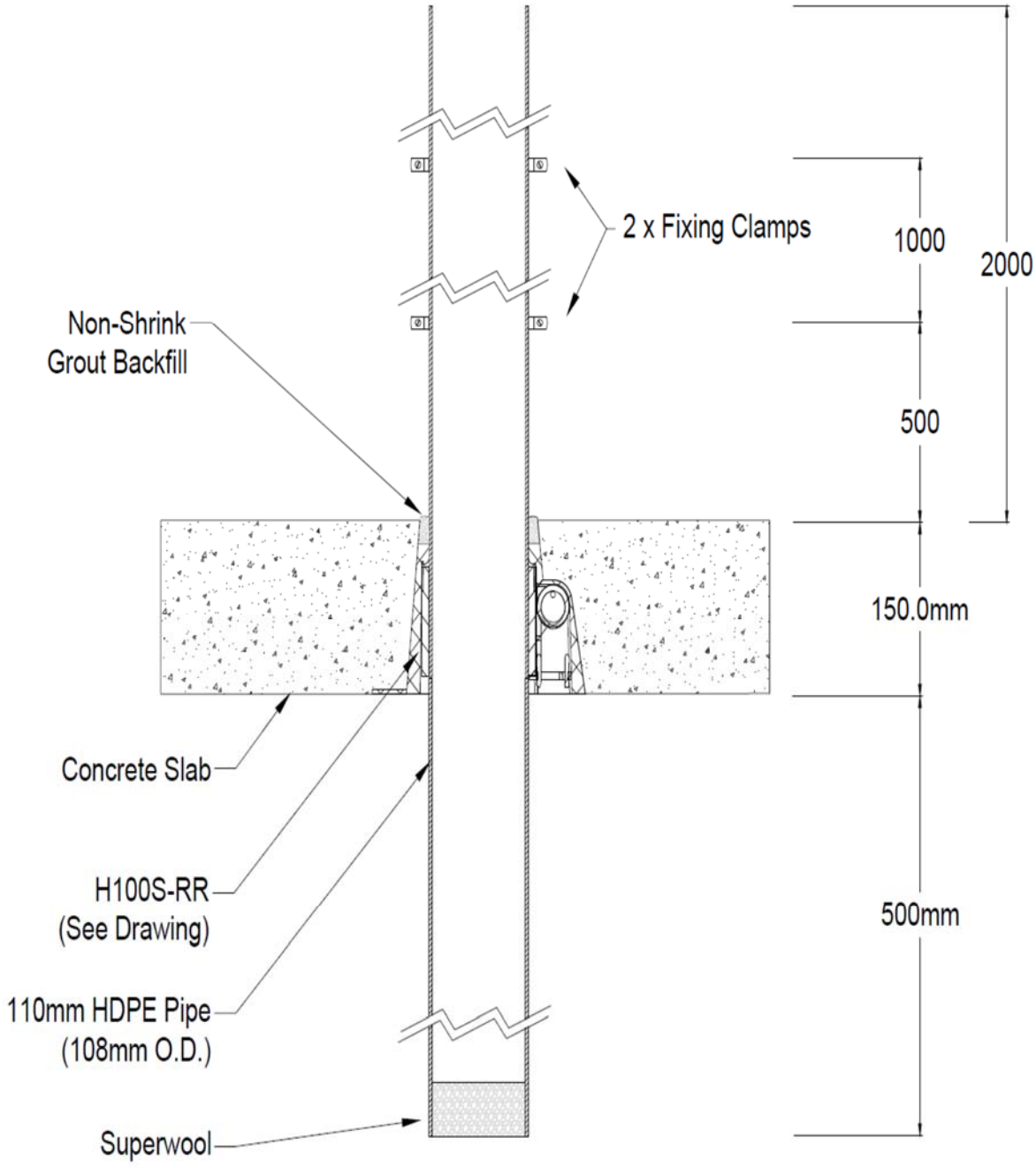


DRAWING TITLED "TEST SLAB S-15-L PENETRATION # 1 COLLAR CLUSTER – TOP VIEW

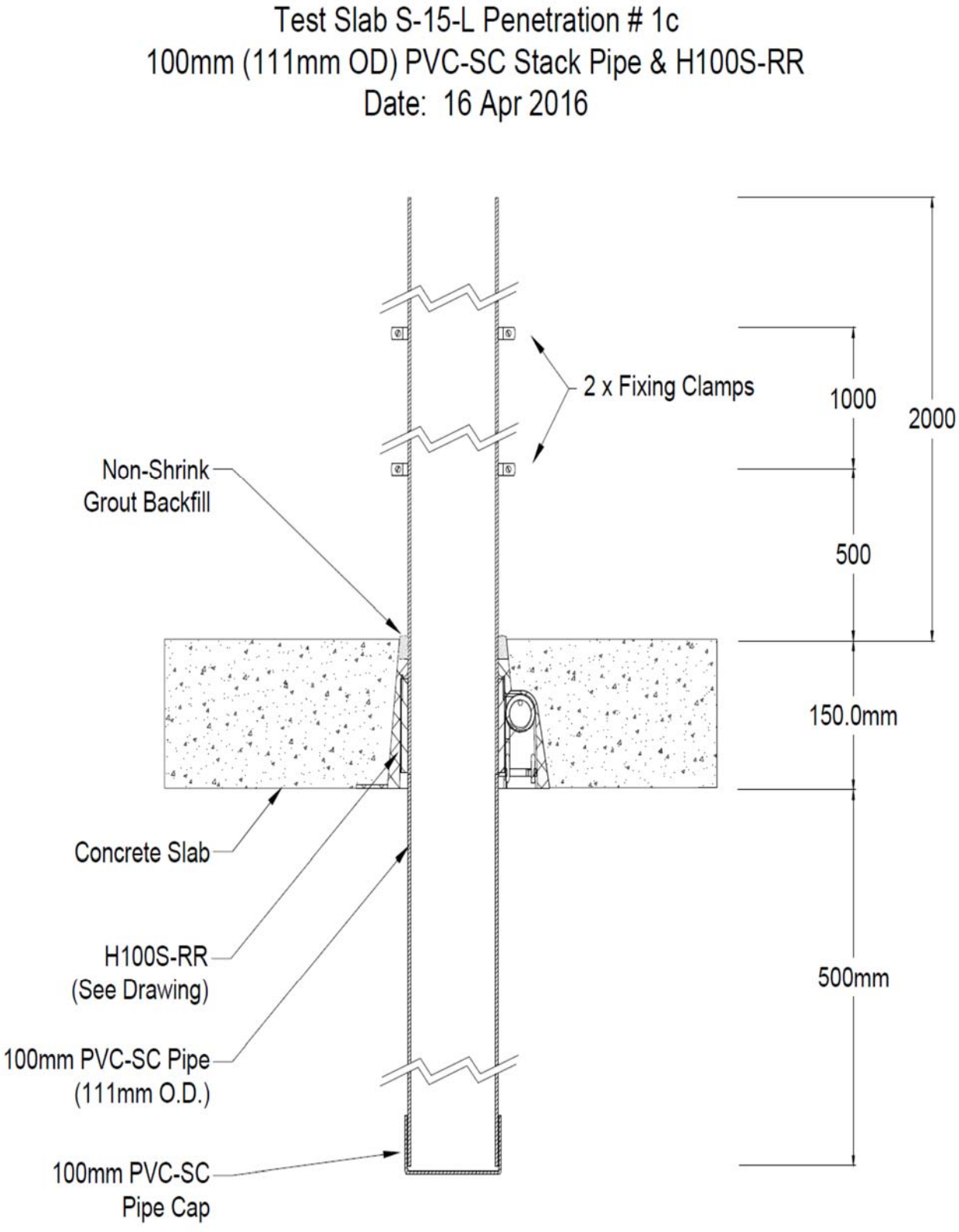


DRAWING TITLED "TEST SLAB S-15-L PENETRATION # 1A – 150MM (162MM) PVC-SC STACK PIPE & H150S -RR" DATED 16 APRIL 2016, BY SNAP FIRE SYSTEMS PTY LTD

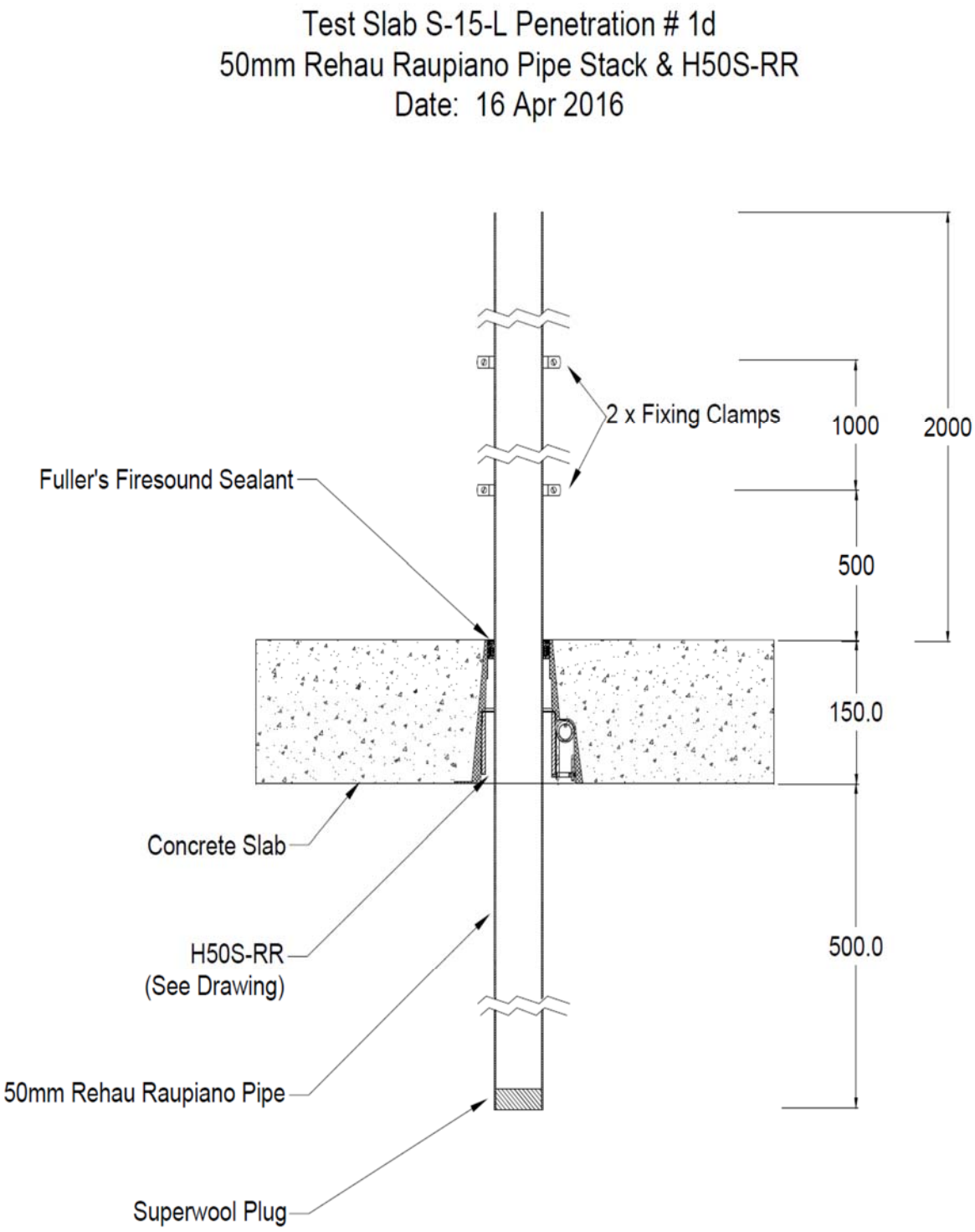
Test Slab S-15-L Penetration # 1b
110mm (108mm OD) HDPE Stack Pipe & H100S-RR
Date: 16 Apr 2016



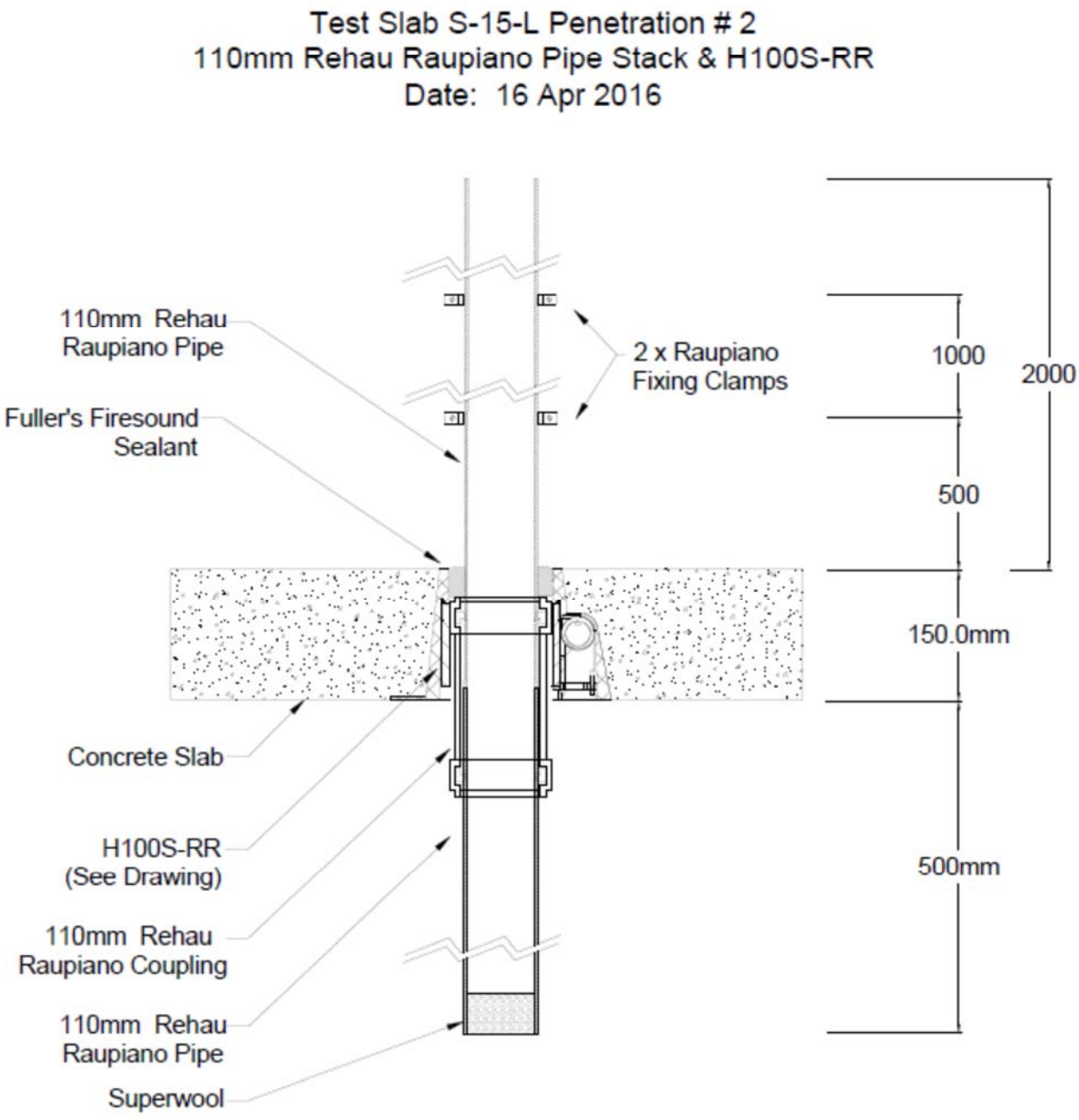
DRAWING TITLED "TEST SLAB S-15-L PENETRATION # 1B – 110MM (108MM) HDPE STACK PIPE & H100S - RR" DATED 16 APRIL 2016, BY SNAP FIRE SYSTEMS PTY LTD



DRAWING TITLED "TEST SLAB S-15-L PENETRATION # 1C – 100MM (111MM OD) PVC-SC STACK PIPE & H100S -RR" DATED 16 APRIL 2016, BY SNAP FIRE SYSTEMS PTY LTD

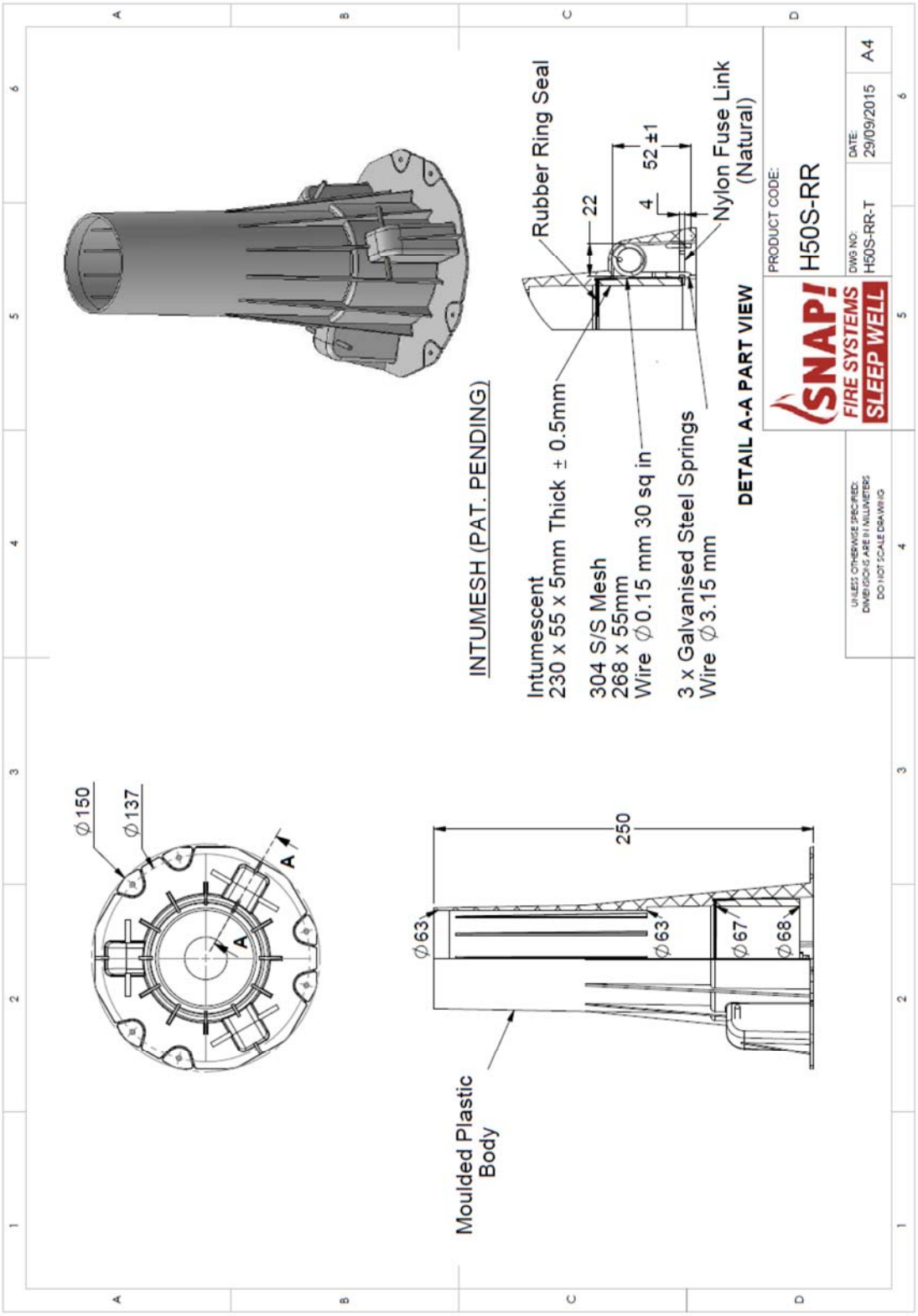


DRAWING TITLED "TEST SLAB S-15-L PENETRATION # 1D – 50MM REHAU RAUPIANO PIPE STACK & H50S - RR" DATED 16 APRIL 2016, BY SNAP FIRE SYSTEMS PTY LTD

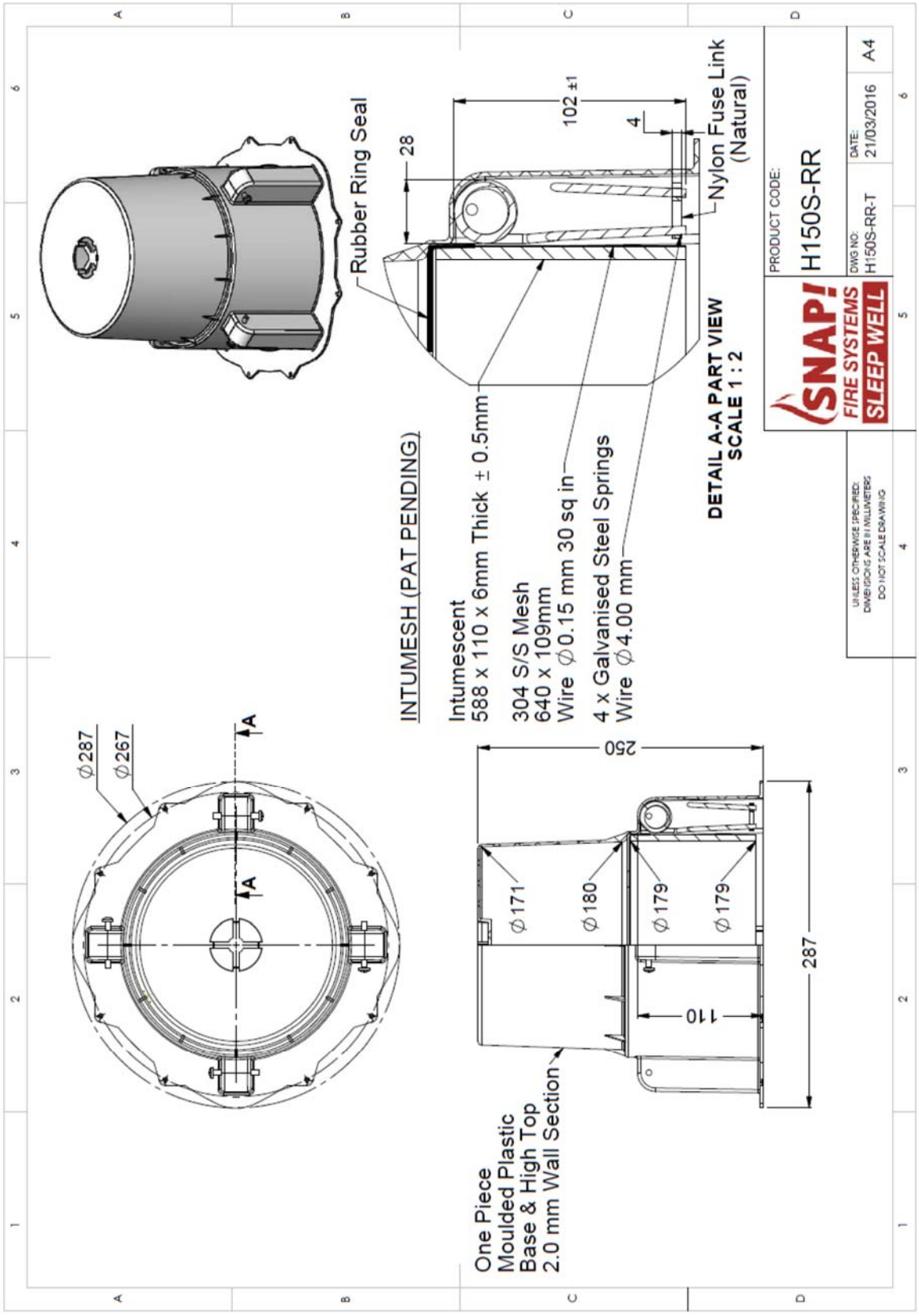


DRAWING TITLED "TEST SLAB S-15-L PENETRATION # 2 – 100MM REHAU RAUPIANO PIPE STACK & H100S -RR" DATED 16 APRIL 2016, BY SNAP FIRE SYSTEMS PTY LTD.

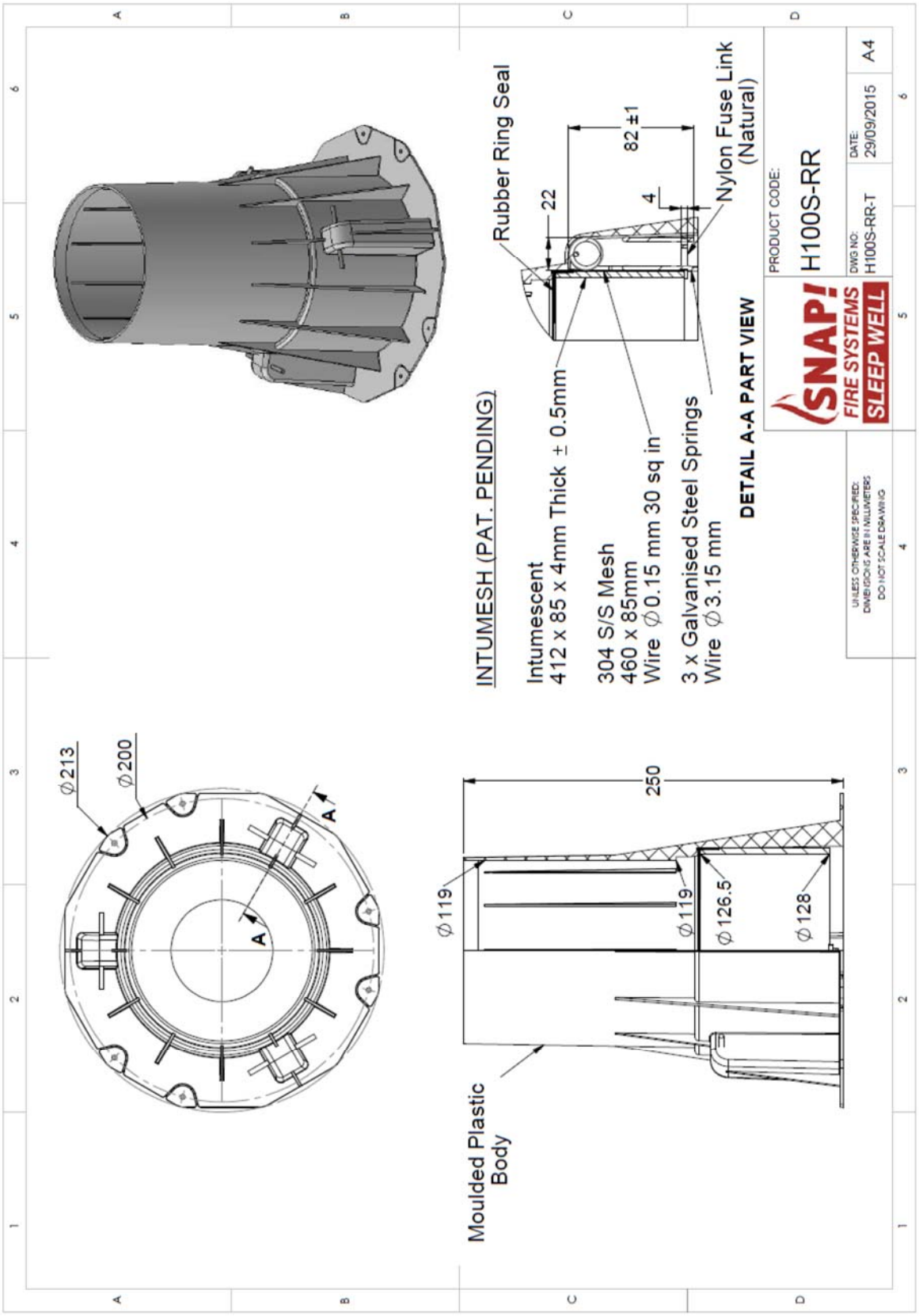
Appendix E – Specimen Drawings



DRAWING NUMBERED H50 S-RR-T, DATED 29 SEPTEMBER 2015, BY SNAP FIRE SYSTEMS PTY LTD.



DRAWING NUMBERED H150S RR-T, DATED 21 MARCH 2016, BY SNAP FIRE SYSTEMS PTY LTD.



DRAWING NUMBERED H100S RR-T, DATED 29 SEPTEMBER 2015, BY SNAP FIRE SYSTEMS PTY LTD.

Appendix F – Certificates

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. 2806a

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 4-2005 on behalf of:

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

A full description of the test specimen are detailed in the Division's Sponsored Investigation report numbered FSP 1741.

Product Name: (Specimen 1) Penetration 1a – H150S-RR cast-in fire collar, Penetration 1b – H100S-RR cast-in fire collar, Penetration 1c – H100S-RR cast-in fire collar, Penetration 1d – H50S-RR cast-in fire collar

Description: The sponsored identified the specimen as a cluster of SNAP fire collars fitted in close proximity to each other protecting an 1150-mm x 1150-mm x 150-mm thick reinforced concrete slab penetrated by stack pipes. Each pipe projected vertically 2000-mm above the concrete and 500-mm into the furnace chamber and was supported at 500-mm and 1000-mm from the unexposed face of the concrete slab. Penetration 1a – H150S-RR cast-in fire collar protecting a 150-mm dia. PVC-SC Stack Pipe. The penetrating service comprised a 150-mm PVC-SC stack pipe, with a wall thickness of 4.4-mm fitted through the collar's sleeve. On the exposed end, the pipe was capped with a PVC End Cap. On the unexposed face, the annular gap between the pipe and slab was sealed with non-shrink grout backfill. Penetration 1b – H100S-RR cast-in fire collar protecting a 110-mm dia. HDPE pipe Stack Pipe. The penetrating service comprised a 110-mm HDPE stack pipe, with a wall thickness of 4.8-mm fitted through the collar's sleeve. On the exposed end, the pipe was plugged with Superwool. On the unexposed face, the annular gap between the pipe and slab was sealed with non-shrink grout backfill. Penetration 1c – H100S-RR cast-in fire collar protecting a 100-mm dia. PVC-SC Stack Pipe. The penetrating service comprised a 100-mm PVC-SC stack pipe, with a wall thickness of 3.4-mm fitted through the collar's sleeve. On the exposed end, the pipe was capped with a 100mm PVC Pipe Cap. On the unexposed face, the annular gap between the pipe and slab was sealed with non-shrink grout backfill. Penetration 1d – H50S-RR cast-in fire collar protecting a 50-mm dia. Rehau Raupiano Stack Pipe. The penetrating service comprised a 50-mm Rehau Raupiano stack pipe, with wall thickness of 2.3-mm fitted through the collar's sleeve. On exposed end, the pipe was plugged with Superwool. On unexposed face, the annular gap between the pipe and slab was sealed with Fullers Firesound Sealant.

	Penetration 1a	Penetration 1b	Penetration 1c	Penetration 1d
Structural Adequacy	not applicable	not applicable	not applicable	not applicable
Integrity	no failure at 241 minutes	no failure at 241 minutes	no failure at 241 minutes	no failure at 241 minutes
Insulation	no failure at 140 minutes	no failure at 241 minutes	no failure at 241 minutes	no failure at 241 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/240/120*. The FRL is applicable for exposure to the fire from the same direction as tested. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance. * The FRL of the Specimen is representative of the Penetration with the least favourable results.

Testing Officer: Mario Lara-Ledermann Date of Test: 23 December 2015

Issued on the 24th day of June 2016 without alterations or additions. This Certificate supersedes COT 2806 issued on 26 May 2016.

Brett Roddy
Manager, Fire Testing & 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

COPY OF CERTIFICATE OF TEST – NO. 2806A

INFRASTRUCTURE TECHNOLOGIES
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14 Julius Avenue, North Ryde NSW 2113
PO Box 52, North Ryde NSW 1670, Australia
T (02) 9490 5444 • ABN 41 687 119 230

Certificate of Test

No. 2807

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 4-2005 on behalf of:

Snap Fire Systems Pty Ltd
Unit 2/160 Redland Bay Road
CAPALABA QLD

A full description of the test specimen are detailed in the Division's Sponsored Investigation report numbered FSP 1741.

Product Name: **(Specimen 2)** Penetration 2 – H100S-RR cast-in fire collar protecting a 110-mm diameter Rehau Raupiano Stack Pipe with a fitting inside the collar

Description: The sponsored identified the specimen as a H100S-RR cast-in fire collar protecting an 1150-mm x 1150-mm x 150-mm thick reinforced concrete slab penetrated by a 110-mm diameter Rehau Raupiano Stack Pipe with a fitting inside the collar. The SNAP Cast-in H100S-RR fire collar comprised a 1.6-mm thick polypropylene casing with a 126.5-mm inner diameter and a 213-mm diameter base flange. The 250-mm high collar casing incorporated a 412-mm x 85-mm x 4-mm thick Intumesh intumescent material and a rubber ring seal. The closing mechanism comprised three galvanised steel springs bound with nylon fuse links and a 460-mm x 85-mm stainless steel mesh as shown in drawing numbered H100 S-RR-T dated 29 September 2015, by SNAP Fire Systems Pty Ltd. The penetrating service comprised a 110-mm Rehau Raupiano stack pipe and a 110-mm Rahau Raupiano coupling, with a total wall thickness of 6.2-mm fitted through the collar's sleeve. The pipe projected vertically 2000-mm above the concrete and 500-mm into the furnace chamber. The pipe was supported at 500-mm and 1000-mm from the unexposed face of the concrete slab as shown in drawing titled "Test Slab S-15-L Penetration # 2 – 110mm Rehau Raupiano Pipe Stack & H100S -RR" dated 16 April 2016, by Snap Fire Systems Pty Ltd. On the exposed end, the pipe was plugged with Superwool. On the unexposed face, the annular gap between the pipe and slab was sealed with Fullers Firesound Sealant.

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 -/240/240. The FRL is applicable for exposure to the fire from the same direction as tested. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.

Testing Officer: Mario Lara-Ledermann Date of Test: 23 December 2015

Issued on the 26th day of May 2016 without alterations or additions.

B. Roddy

Brett Roddy
Manager, Fire Testing and Assessments

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

COPY OF CERTIFICATE OF TEST – NO. 2807

References

The following informative documents are referred to in this Report:

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

-----end of report-----

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Australia is founding its future on science and innovation. Its national science agency, CSIRO, is a powerhouse of ideas, technologies and skills for building prosperity, growth, health and sustainability. It serves governments, industries, business and communities across the nation.

FOR FURTHER INFORMATION

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