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

Test Report

Author: Mario Lara-Ledermann
Report number: FSP 1652a
Date: 23 December 2014 (This report supersedes issue dated 10 September 2014)

Client: Snap Fire Systems Pty Ltd

Commercial-in-confidence

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

Inquiries should be address to:

Fire Testing and Assessments	Author	The Client
Infrastructure Technologies 14 Julius Avenue North Ryde, NSW 2113 Telephone +61 2 9490 5444	Infrastructure Technologies 14 Julius Avenue North Ryde, NSW 2113 Telephone +61 2 9490 5500	Snap Fire Systems Pty Ltd Unit 2/160 Redland Bay Road Capalaba QLD Telephone +61 7 3245 2133

Report Status and Revision History:

VERSION	STATUS	DATE	DISTRIBUTION	ISSUE NUMBER
Revision A	Final for issue	10/09/2014	CSIRO/SNAP	FSP 1652
Revision B	Amended/Final for issue	23/12/2014	CSIRO/SNAP	FSP 1652a

Report Authorization:

AUTHOR	REVIEWED BY	AUTHORISED BY
Mario Lara-Ledermann	Brett Roddy	Brett Roddy
		
23 December 2014	23 December 2014	23 December 2014

Use of this Report

Use of Reports – Testing

This report is subject to binding obligations under which it was prepared. In particular, the Report must not be used:

- *as a means of endorsement; or*
- *in a company prospectus or notification to a Stock Exchange document for capital raising, without the prior written consent of CSIRO.*

The Report may be published verbatim and in full, provided that a statement is included on the publication that it is a copy of the Report issued by CSIRO.

Excerpts of the Report may not be published.

Use of Reports – Consultancy

This report is subject to binding obligations under which it was prepared. In particular, the Report may only be used for the following purposes:

- *the information in the Report may be used by the party that commissioned the Report for its internal business operations (but not licensing to third parties);*
- *the report may be copied for distribution within the organisation that commissioned the Report;*
- *copies of the Report (or extracts of the Report) may be distributed to contractors and agents of the organisation that commissioned the Report who have a need for the Report for its internal business operations. Any extracts of the Report distributed for this purpose must clearly note that the extract is part of a larger Report held by the organisation that commissioned the Report and which has been prepared by CSIRO.*

The name, trade mark or logo of the CSIRO must not be used without the prior written consent of CSIRO.

The Report must not be used as a means of endorsement without the prior written consent of CSIRO.

Copyright and disclaimer

© 2014 CSIRO To the extent permitted by law, all rights are reserved and no part of this publication covered by copyright may be reproduced or copied in any form or by any means except with the written permission of CSIRO.

Important disclaimer

CSIRO advises that the information contained in this publication comprises general statements based on scientific research. The reader is advised and needs to be aware that such information may be incomplete or unable to be used in any specific situation. No reliance or actions must therefore be made on that information without seeking prior expert professional, scientific and technical advice. To the extent permitted by law, CSIRO (including its employees and consultants) excludes all liability to any person for any consequences, including but not limited to all losses, damages, costs, expenses and any other compensation, arising directly or indirectly from using this publication (in part or in whole) and any information or material contained in it.

Contents

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

Sponsored Investigation No. FSP 1652a

1 Introduction

1.1 Identification of specimen

The sponsor identified the specimen as Snap Cast-in Fire Collars protecting a concrete slab penetrated by one (1) Valsir-TRIPLUS Floorwaste and five (5) Valsir-TRIPLUS stack pipes.

1.2 Sponsor

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

1.3 Manufacturer

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

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 Test number

CSIRO Reference test number: FS 4433/3770

1.7 Test date

The fire-resistance test was conducted on 14 July 2014.

2 Description of specimen

2.1 General

The specimen comprised a 1150-mm x 1150-mm x 150-mm thick reinforced concrete slab penetrated by one (1) Valsir-TRIPLUS Floorwaste and five (5) Valsir-TRIPLUS stack pipes protected by cast-in Snap Fire System fire collars.

For the purpose of the test, the specimens were referenced as Penetrations 1, 2, 3, 4, 5 and 6.

The Valsir-TRIPLUS pipes are stated to be constructed of a homopolymer polypropylene for inner and outer layers (1200kg/m^3 density), and mix of polypropylene and mineral loads for the middle layer (1400kg/m^3 density). The pipes are stated to be constructed in accordance with AS 7671:2003.

Penetration 1 – H150 S-RR cast-in fire collar protecting a 160-mm diameter Valsir-TRIPLUS Stack

The SNAP Cast-in H150 S-RR fire collar comprised a 2-mm thick polypropylene casing with a 179-mm inner diameter and a 287-mm diameter base flange. The 110-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 stainless steel springs bound with nylon fuse links and a 640-mm x 109-mm stainless steel mesh as shown in drawing numbered H150 S-RR-T dated 24 January 2014, by SNAP Fire Systems Pty Ltd.

The penetrating service comprised a 160-mm Valsir-TRIPLUS stack pipe, with a wall thickness of 5.4-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 "Penetration #1 – valsir-TRIPLUS (160-mm OD) Stack" dated 20 June 2014, by Snap Fire Systems Pty Ltd. On the exposed end, the pipe was capped with a Kaowool Plug.

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

Penetration 2 – H100 S-RR cast-in fire collar protecting a 110-mm diameter Valsir-TRIPLUS pipe

The SNAP Cast-in H100 S-RR fire collar comprised a 1.6-mm thick polypropylene casing with a 126.5-mm inner diameter and a 207-mm diameter base flange. The 105-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 24 June 2014, by SNAP Fire Systems Pty Ltd.

The penetrating service comprised a 110-mm Valsir-TRIPLUS stack pipe, with a wall thickness of 3.9-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 "Penetration #2 – valsir-TRIPLUS (110-mm OD) Stack" dated 20 June 2014, by Snap Fire Systems Pty Ltd. On the exposed end, the pipe was capped with a Kaowool Plug.

On the unexposed face, the annular gap between the pipe and the slab was sealed with a 10-mm bed of Fullers Firesound fire sealant.

Penetration 3 – L40S cast-in fire collar protecting a 40-mm diameter Valsir-TRIPLUS pipe

The SNAP Cast-in L40S fire collar comprised a 1.6-mm thick polypropelyne casing with a 70.5-mm inner diameter and a 146-mm diameter base flange. The 86-mm high collar casing incorporated a 240-mm x 58-mm x 4-mm thick Intumesh intumescent material. The closing mechanism comprised three galvanised steel springs bound with nylon fuse links and a 280-mm x 58-mm stainless steel mesh as shown in drawing numbered L40S-T dated 25 June 2014, by SNAP Fire Systems Pty Ltd.

The penetrating service comprised a 40-mm Valsir-TRIPLUS stack pipe, with a wall thickness of 2.1-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 "Penetration #3 – valsir-TRIPLUS (40-mm OD) Stack" dated 20 June 2014, by Snap Fire Systems Pty Ltd. On the exposed end, the pipe was capped with a Kaowool Plug.

On the unexposed face, the annular gap between the pipe and the slab was sealed with a 10-mm bead of Fullers Firesound fire sealant.

Penetration 4 – L80S cast-in fire collar protecting a 75-mm diameter Valsir-TRIPLUS pipe

The SNAP Cast-in L80S fire collar comprised a 1.6-mm thick polypropylene casing with a 126.5-mm inner diameter and a 207-mm diameter base flange. The 123-mm high collar casing incorporated a 412-mm x 85-mm x 4-mm thick Intumesh intumescent material. 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 L80S-T dated 25 June 2014, by SNAP Fire Systems Pty Ltd.

The penetrating service comprised a 75-mm Valsir-TRIPLUS stack pipe, with a wall thickness of 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 "Penetration #4 – valsir-TRIPLUS (75-mm OD) Stack" dated 20 June 2014, by Snap Fire Systems Pty Ltd. On the exposed end, the pipe was capped with a Kaowool Plug.

On the unexposed face, the annular gap between the pipe and the slab was sealed with a 10-mm bead of Fullers Firesound fire sealant.

Penetration 5 – L100FWS cast-in fire collar protecting a 110-mm diameter Valsir-TRIPLUS floor waste

The SNAP Cast-in L100FWS fire collar comprised a 1.6-mm thick polypropylene casing with an 126.5-mm inner diameter and a 207-mm diameter base flange. The 116-mm high collar casing incorporated a 412-mm x 85-mm x 4-mm thick Intumesh intumescent material. The closing mechanism comprised three stainless steel springs bound with nylon fuse links and a 460-mm x 85-mm stainless steel mesh as shown in drawing numbered L100FWS-T dated 25 June 2014, by SNAP Fire Systems Pty Ltd.

The penetrating service comprised a 110-mm Valsir-TRIPLUS pipe, with a wall thickness of 3.4-mm fitted through the collar's sleeve. The floor waste system was fitted on the unexposed face with a Chrome brass floor waste grate. On the exposed side of the slab, a TRIPLUS Siphon Trap was connected to the penetrating pipe with a gland nut within the collar, supported by 2 x M10 HKD

clamps fixed to the concrete slab as shown in drawing titled “Penetration #5 – valsir-TRIPLUS (110-mm OD) Floorwaste” dated 20 June 2014, by Snap Fire Systems Pty Ltd.

The trap was filled with water before the start of the test to the level shown in drawing titled “Penetration #5 – valsir-TRIPLUS (110-mm OD) Floorwaste” dated 25 June 2014, by Snap Fire Systems Pty Ltd.

Penetration 6 – H50 S-RR cast-in fire collar protecting a 50-mm diameter Valsir-TRIPLUS pipe

The SNAP Cast-in H50 S-RR fire collar comprised a 1.6-mm thick polypropylene casing with a 70.5-mm inner diameter and a 146-mm diameter base flange. The 76-mm high collar casing incorporated a 240-mm x 58-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 280-mm x 58-mm stainless steel mesh as shown in drawing numbered H50 S-RR-T dated 2 September 2014, by SNAP Fire Systems Pty Ltd.

The penetrating service comprised a 50-mm Valsir-TRIPLUS stack pipe, with a wall thickness of 2.2-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 “Penetration #6 – valsir-TRIPLUS (50-mm OD) Stack” dated 20 June 2014, by Snap Fire Systems Pty Ltd. On the exposed end, the pipe was capped with a Kaowool Plug.

On the unexposed face, the annular gap between the pipe and slab was sealed with sand and cement backfill.

2.2 Dimensions

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

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

The construction was organised by the sponsor, and 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 “Penetration #1 – valsir-TRIPLUS (160-mm OD) Stack” dated 20 June 2014, by Snap Fire Systems Pty Ltd.

Drawing titled “Penetration #2 – valsir-TRIPLUS (110-mm OD) Stack” dated 20 June 2014, by Snap Fire Systems Pty Ltd.

Drawing titled “Penetration #3 – valsir-TRIPLUS (40-mm OD) Stack” dated 20 June 2014, by Snap Fire Systems Pty Ltd.

Drawing titled “Penetration #4 – valsir-TRIPLUS (75-mm OD) Stack” dated 20 June 2014, by Snap Fire Systems Pty Ltd.

Drawing titled “Penetration #5 – valsir-TRIPLUS (110-mm OD) Floorwaste” dated 20 June 2014, by Snap Fire Systems Pty Ltd.

Drawing titled “Penetration #6 – valsir-TRIPLUS (50-mm OD) Stack” dated 20 June 2014, by Snap Fire Systems Pty Ltd.

Drawing numbered H150 S-RR-T dated 24 January 2014, by SNAP Fire Systems Pty Ltd.

Drawing numbered H100 S-RR-T dated 24 June 2014, by SNAP Fire Systems Pty Ltd.

Drawing numbered L40S-T dated 25 June 2014, by SNAP Fire Systems Pty Ltd.

Drawing numbered L80S-T dated 25 June 2014, by SNAP Fire Systems Pty Ltd.

Drawing numbered L100FWS-T dated 25 June 2014, by SNAP Fire Systems Pty Ltd.

Drawing numbered H50 S-RR-T dated 2 September 2014, 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 21°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
3 minutes -	Smoke is visible from Penetration 2 and Penetration 4.
4 minutes -	Smoke is visible from Penetration 5 (floor waste).
-	Cotton wool pad applied over Penetration 5 (floor waste) – No ignition.
5 minutes -	Smoke is visible from Penetrations 1 and 2. Penetration 4 has ceased fluing.
11 minutes -	Light smoke is visible from Penetration 1.
12 minutes -	Spalling noises can be heard from the specimen.
15 minutes -	Smoke is fluing from Penetration 5.
44 minutes -	Penetrations are no longer fluing.
48 minutes -	Smoke is being emitted from Penetrations 3 and 5.
57 minutes -	Water is pooling on the unexposed face of the slab.
183 minutes -	Insulation failure of Penetration 1: maximum temperature rise limit of 180°C measured on the slab.
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 1.

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

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

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

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

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

8.5 Performance

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

<u>Penetration 1 – H150 S-RR cast-in fire collar protecting a 160-mm diameter valsir-TRIPLUS pipe</u>

Structural adequacy	-	Not applicable
Integrity	-	No failure at 241 minutes
Insulation	-	183 minutes

<u>Penetration 2 – H100 S-RR cast-in fire collar protecting a 110-mm diameter valsir-TRIPLUS pipe</u>

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

Penetration 3 – L40S cast-in fire collar protecting a 40-mm diameter valsir-TRIPLUS pipe

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

Penetration 4 – L80S cast-in fire collar protecting a 75-mm diameter valsir-TRIPLUS pipe

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

Penetration 5 – L100FWS cast-in fire collar protecting a 110-mm diameter floor waste

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

Penetration 6 – H50 S-RR cast-in fire collar protecting a 50-mm diameter valsir-TRIPLUS pipe

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

This report details methods of construction, the test conditions and the results obtained when the specific element of construction described herein was tested following the procedure outlined in 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 1	-	-/240/180;
Penetration 2	-	-/240/240;
Penetration 3	-	-/240/240;
Penetration 4	-	-/240/240;
Penetration 5	-	-/240/240; and
Penetration 6	-	-/240/240.

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

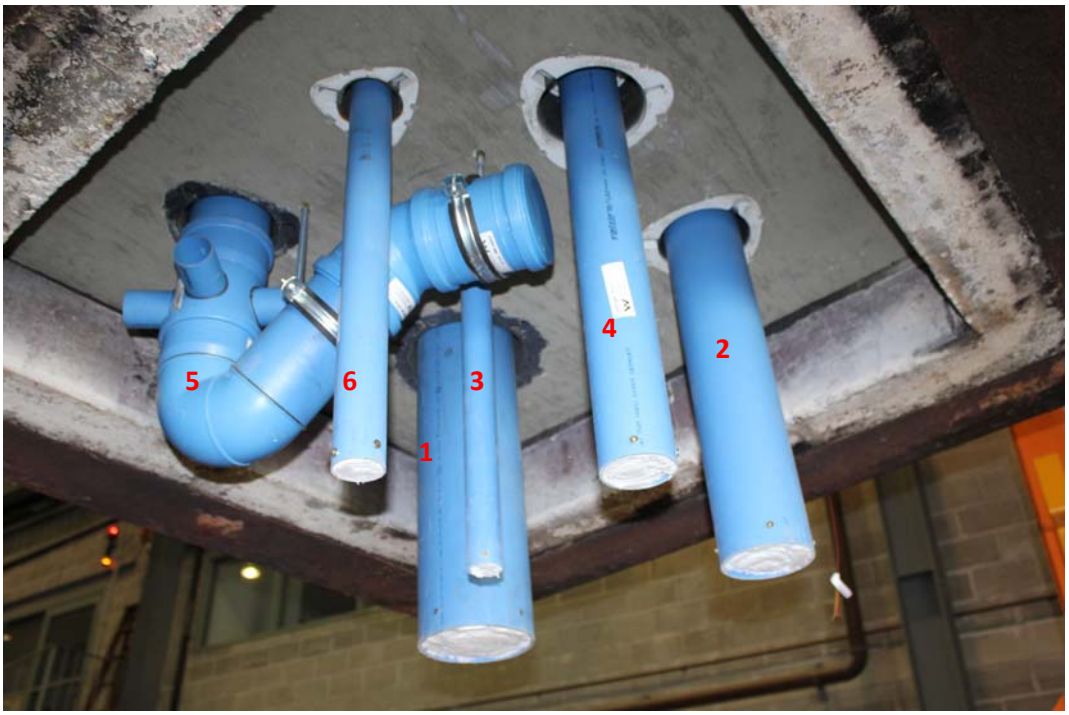
Mario Lara-Ledermann
Testing Officer

Appendices

Appendix A – Measurement location

Measurement Location		
Group location	**T/C Position**	**T/C designation**
Specimen		
Penetration 1	On slab 25-mm from pipe.	S1
	On slab 25-mm from pipe.	S2
	On pipe 25-mm from slab.	S3
	On pipe 25-mm from slab.	S4
Penetration 2	On slab 25-mm from pipe.	S5
	On slab 25-mm from pipe.	S6
	On pipe 25-mm from slab.	S7
	On pipe 25-mm from slab.	S8
Penetration 3	On slab 25-mm from pipe.	S9
	On slab 25-mm from pipe.	S10
	On pipe 25-mm from slab.	S11
	On pipe 25-mm from slab.	S12
Penetration 4	On slab 25-mm from pipe.	S13
	On slab 25-mm from pipe.	S14
	On pipe 25-mm from slab.	S15
	On pipe 25-mm from slab.	S16
Penetration 5	On slab 25-mm from pipe.	S17
	On slab 25-mm from pipe.	S18
	On step 25-mm from slab.	S19
	On step 25-mm from slab.	S20
	On grate	S21
Penetration 6	On slab 25-mm from pipe.	S22
	On slab 25-mm from pipe.	S23
	On pipe 25-mm from slab.	S24
	On pipe 25-mm from slab.	S25

Appendix B – Photographs



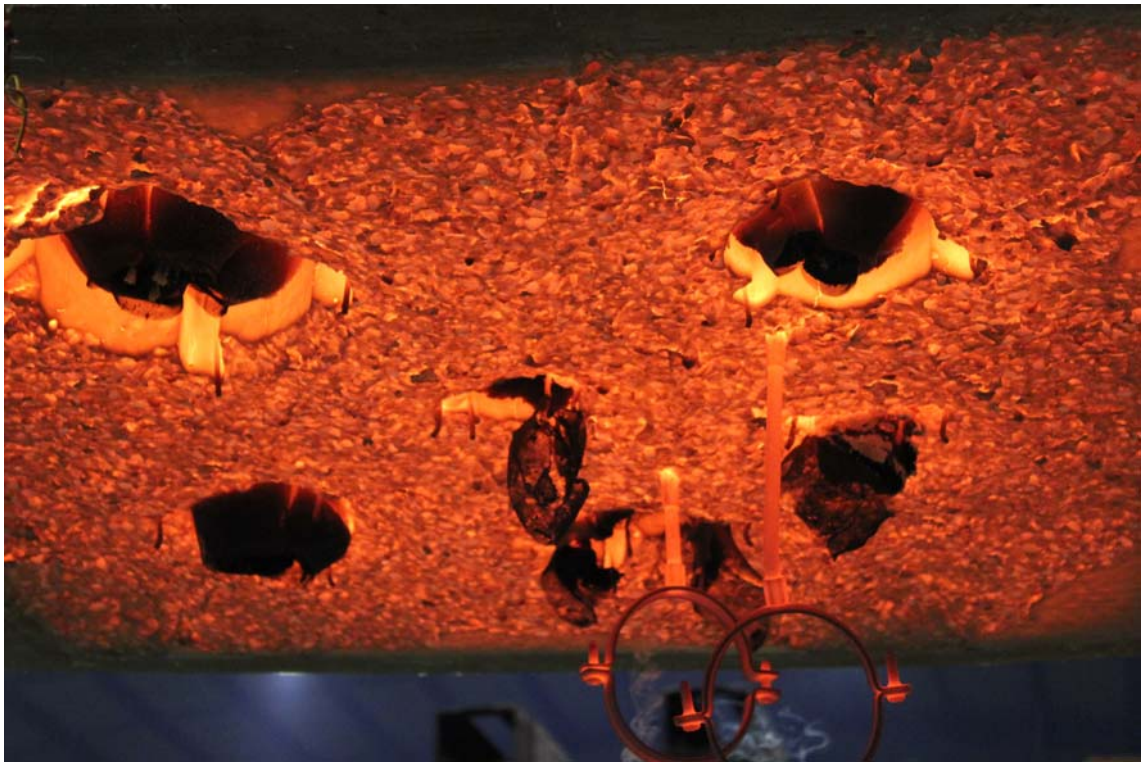
PHOTOGRAPH 1 – EXPOSED FACE OF SPECIMENS PRIOR TO TESTING

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 – EXPOSED FACE OF SPECIMENS AT CONCLUSION OF TESTING

Appendix C – Furnace Temperature

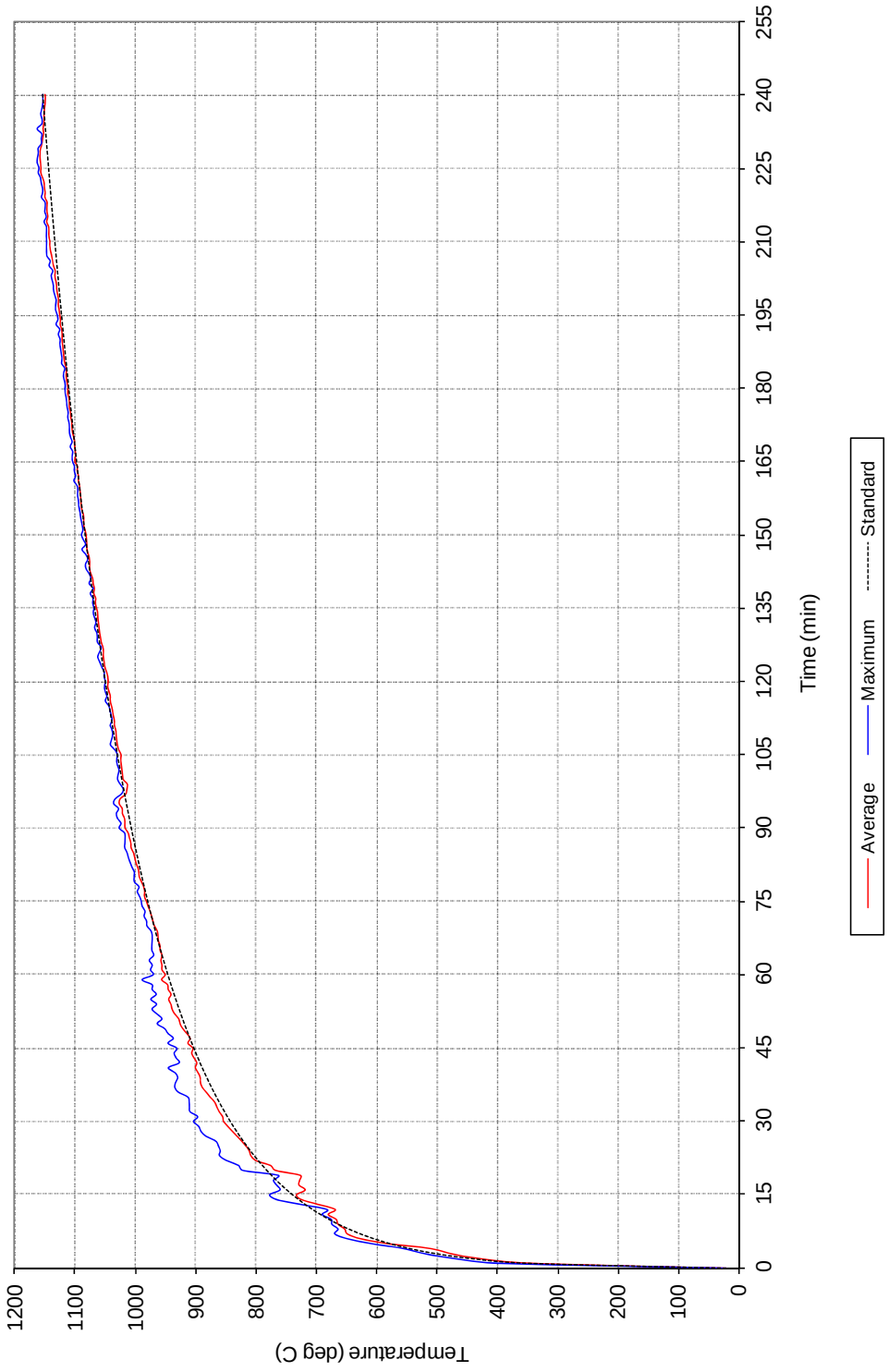


FIGURE 1 – FURNACE TEMPERATURE

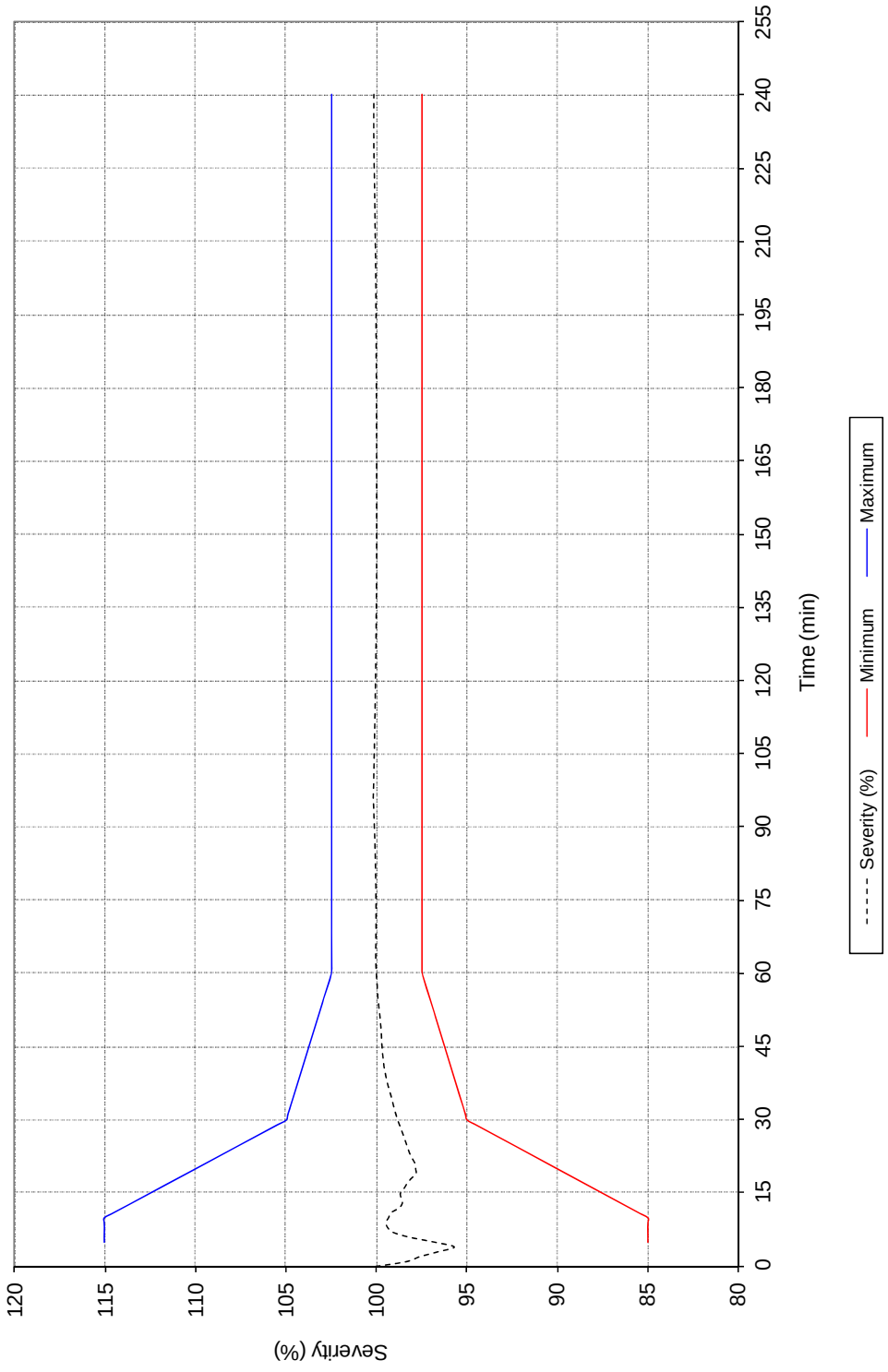


FIGURE 2 – FURNACE SEVERITY

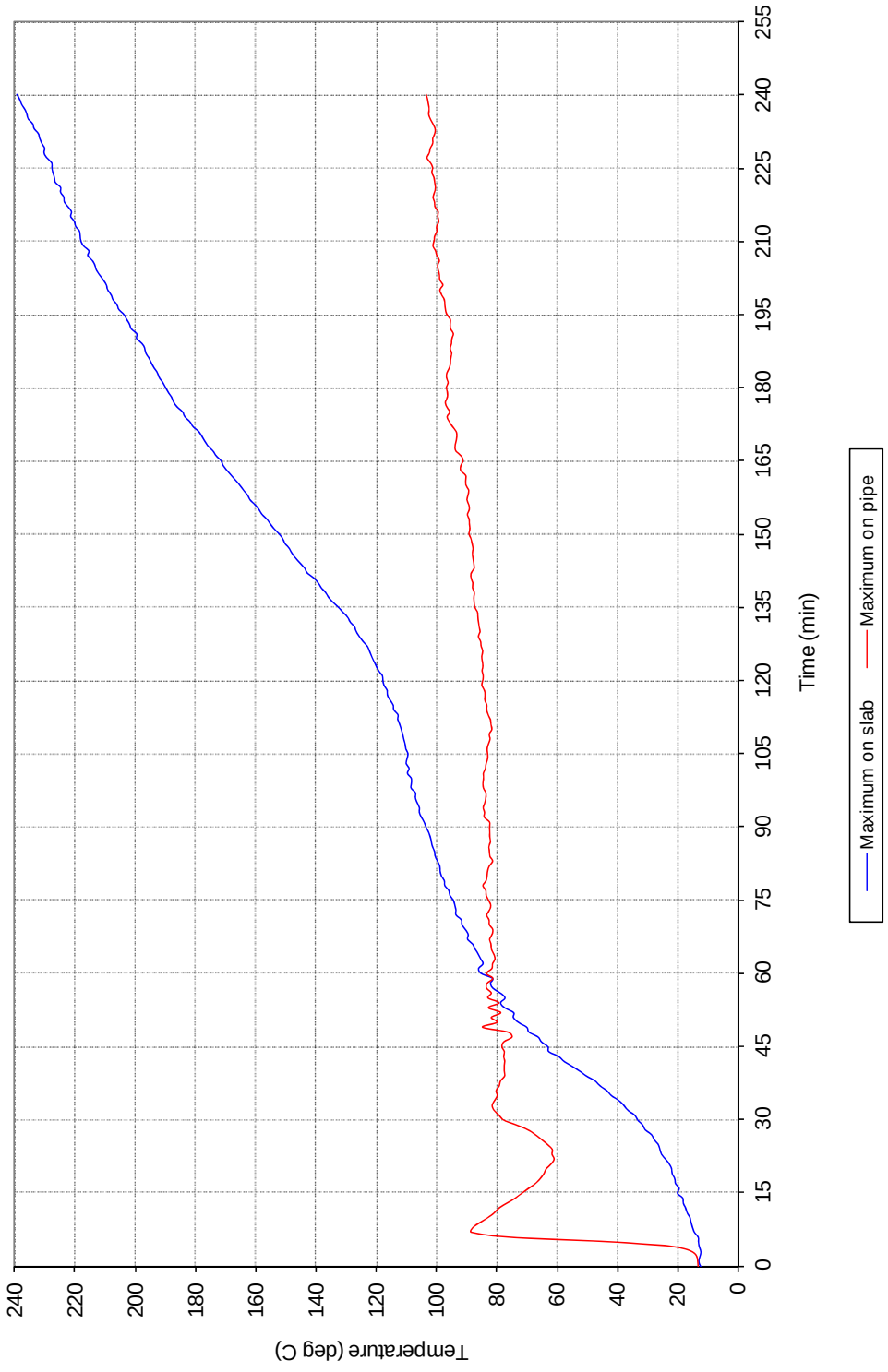


FIGURE 3 – SPECIMEN TEMPERATURE – ASSOCIATED WITH PENETRATION 1

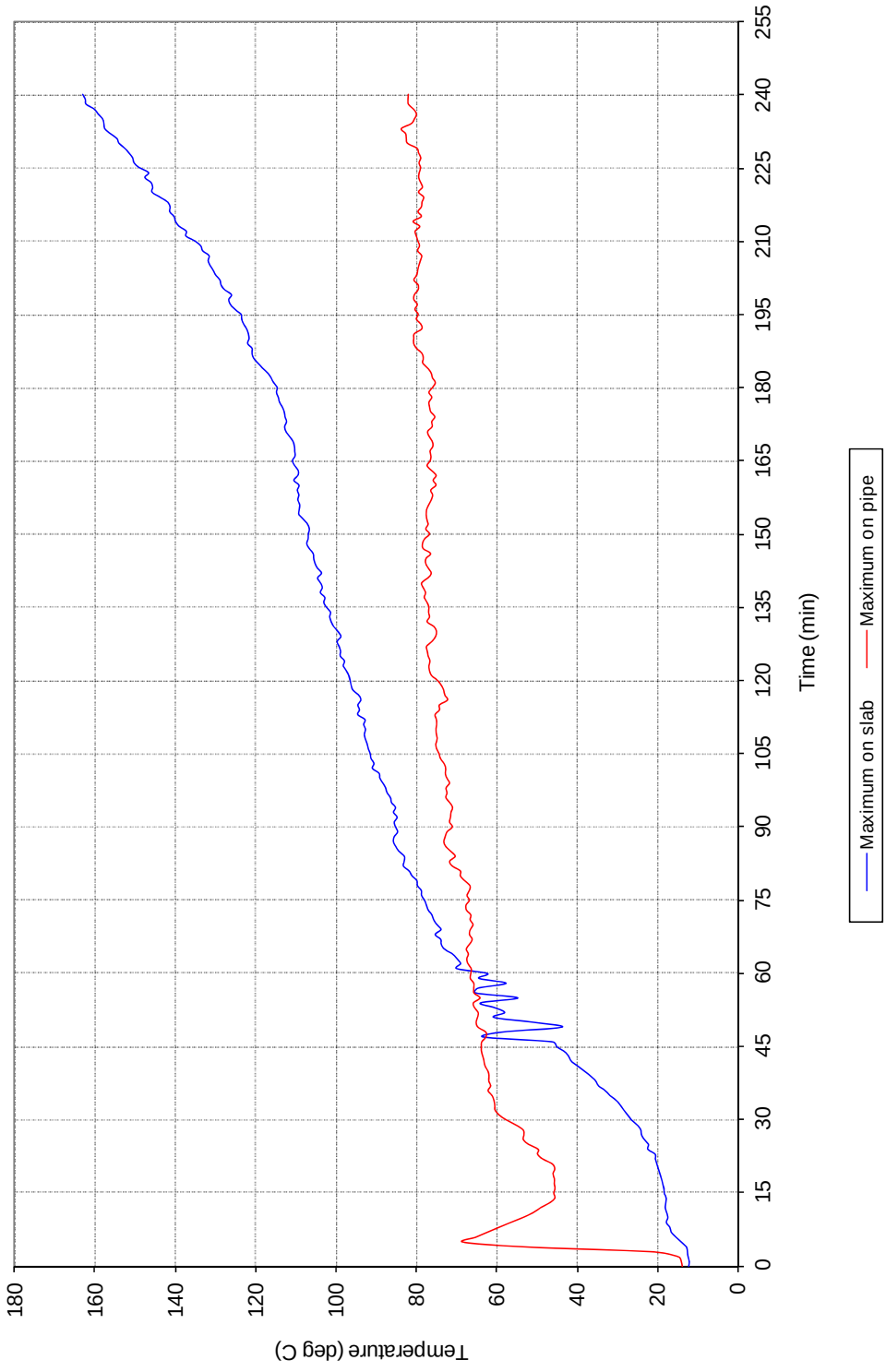


FIGURE 4 – SPECIMEN TEMPERATURE – ASSOCIATED WITH PENETRATION 2

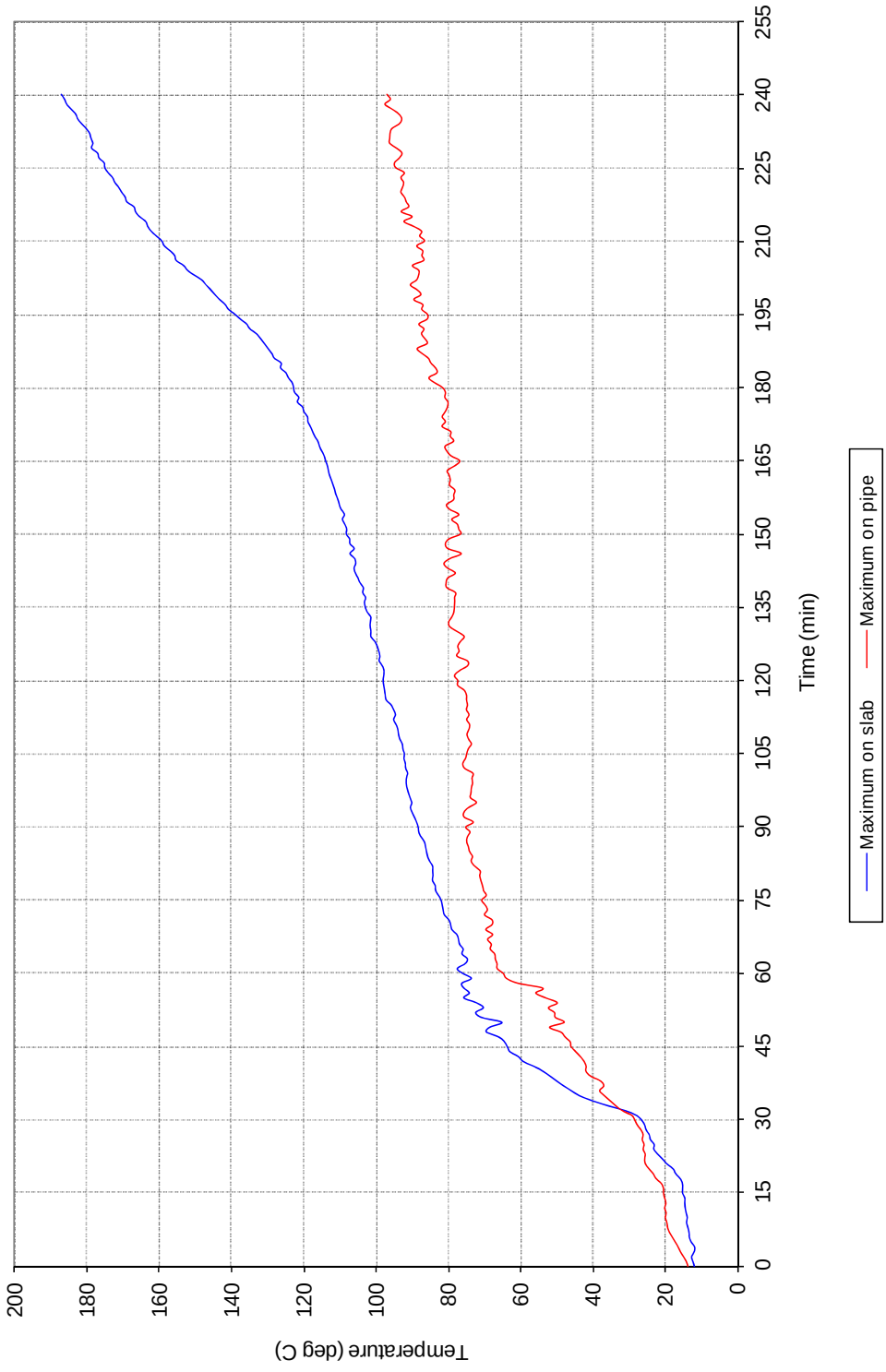


FIGURE 5 – SPECIMEN TEMPERATURE – ASSOCIATED WITH PENETRATION 3

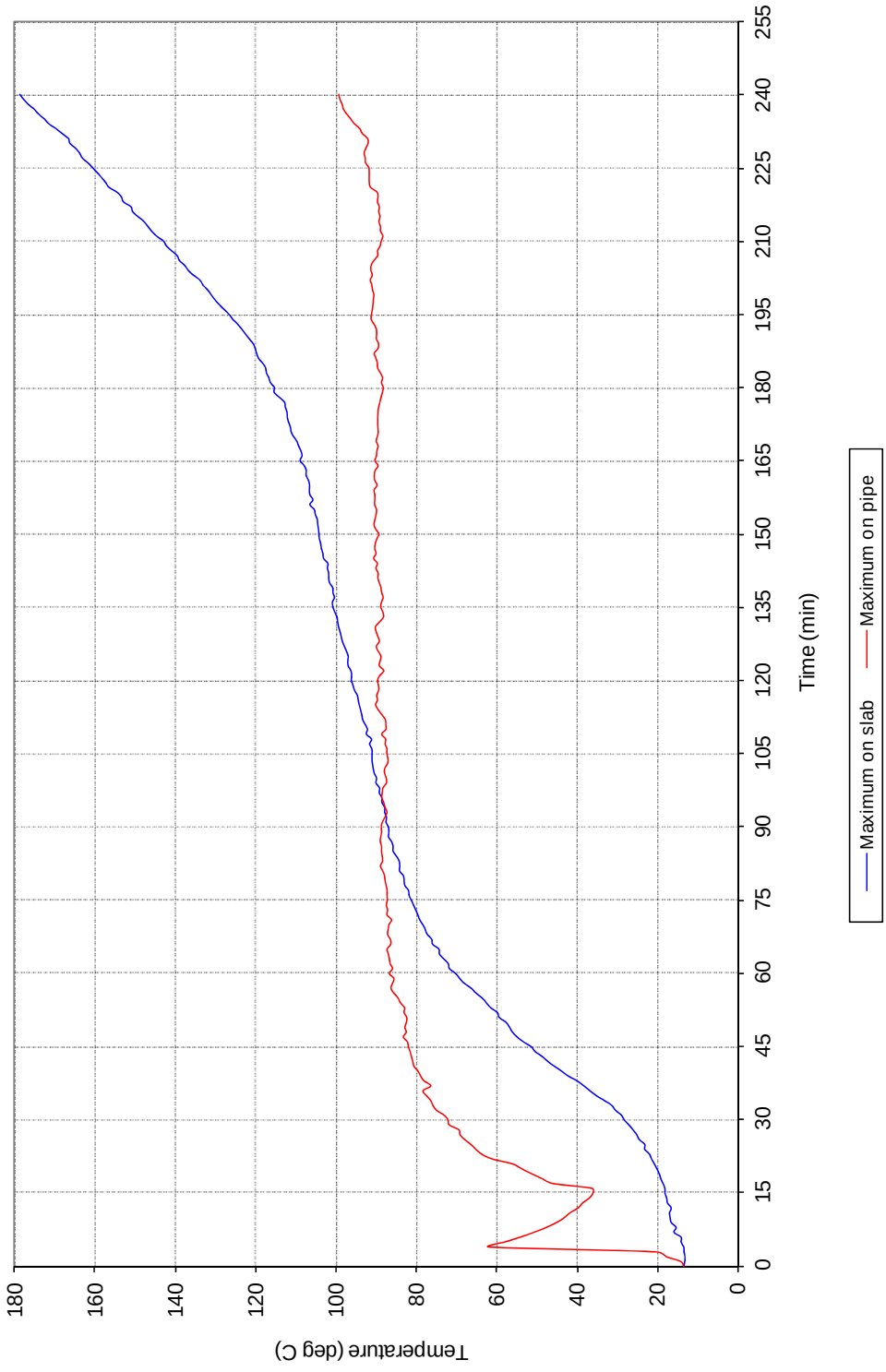


FIGURE 6 – SPECIMEN TEMPERATURE – ASSOCIATED WITH PENETRATION 4

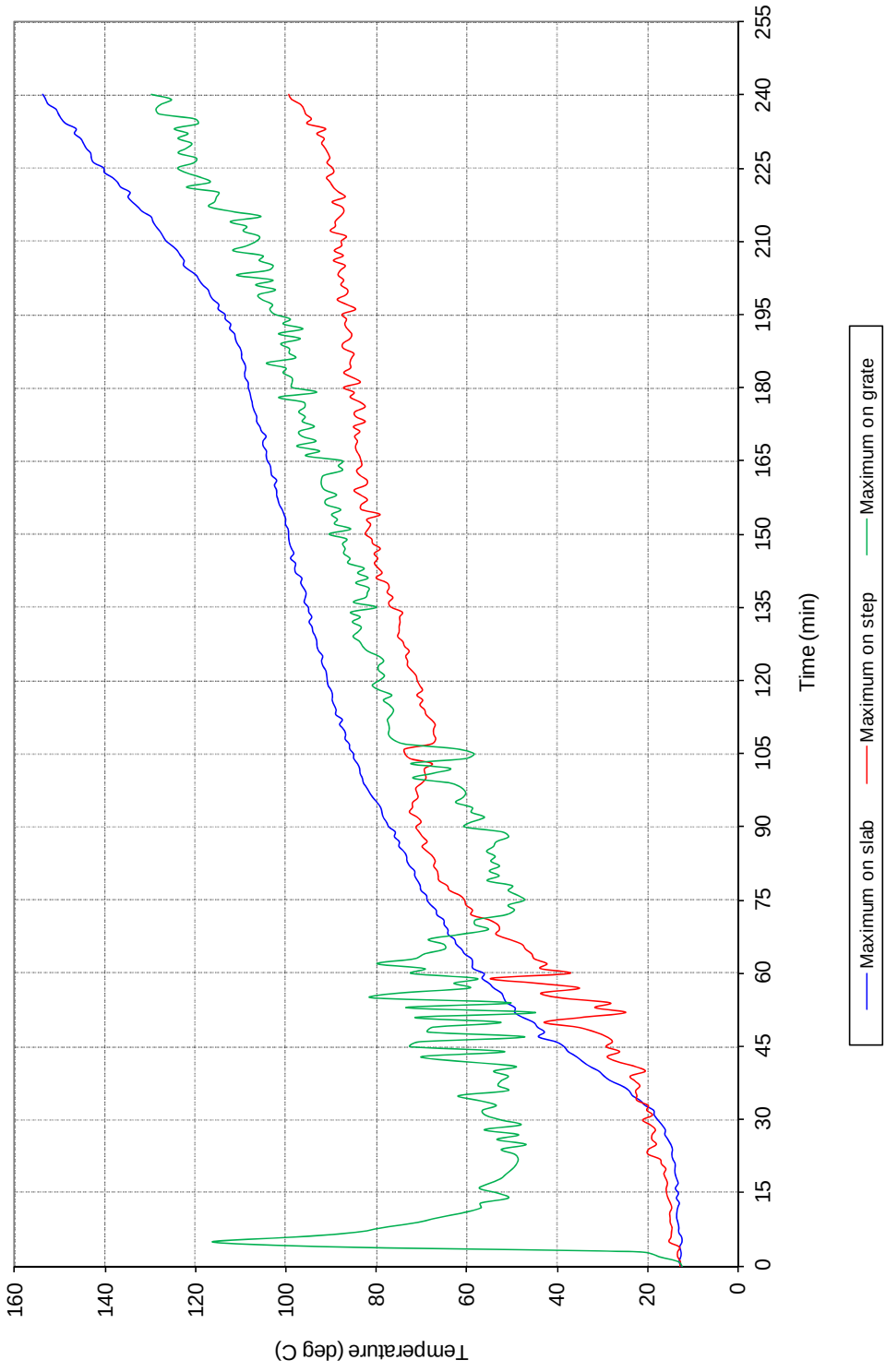


FIGURE 7 – SPECIMEN TEMPERATURE – ASSOCIATED WITH PENETRATION 5

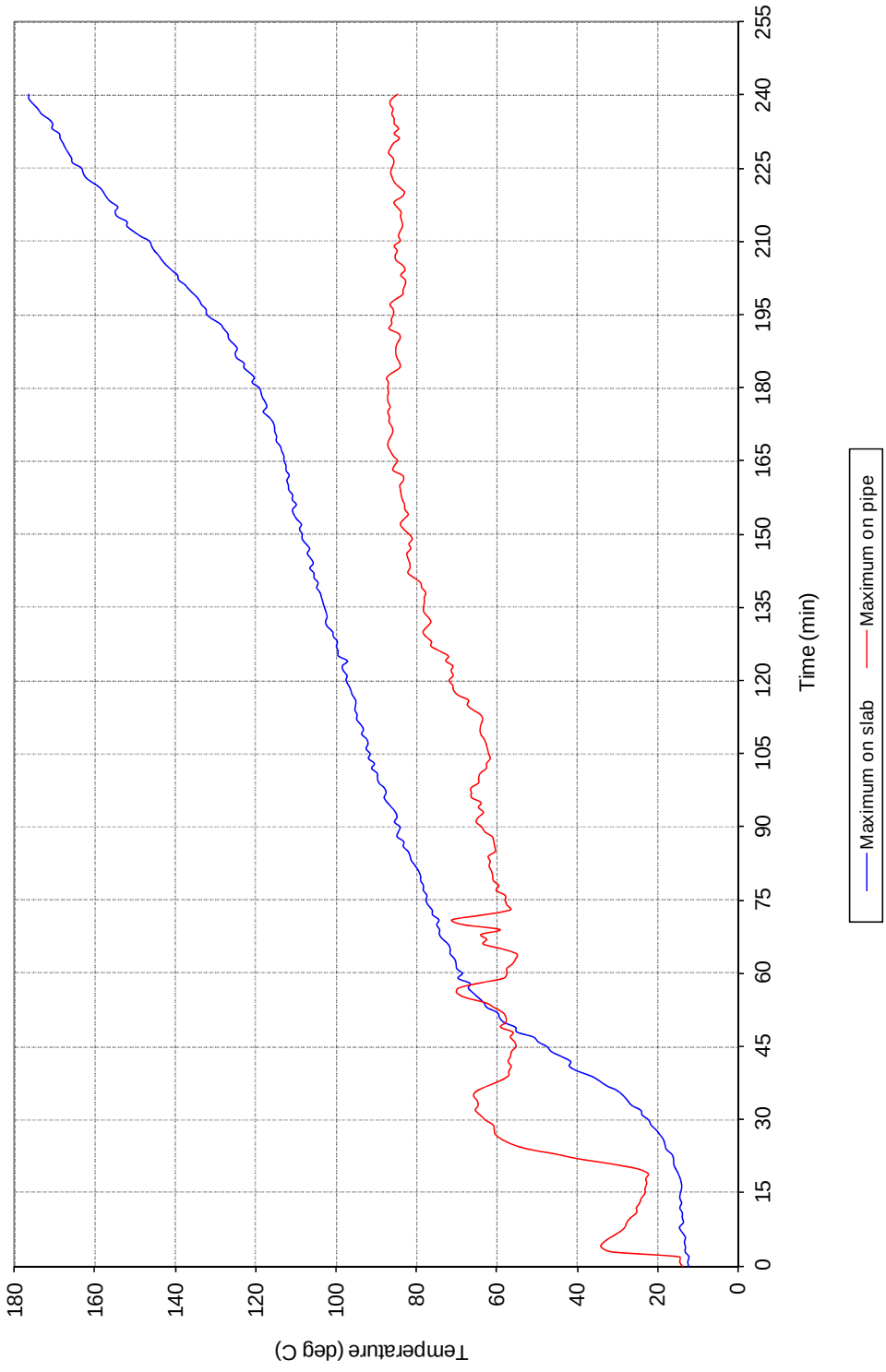
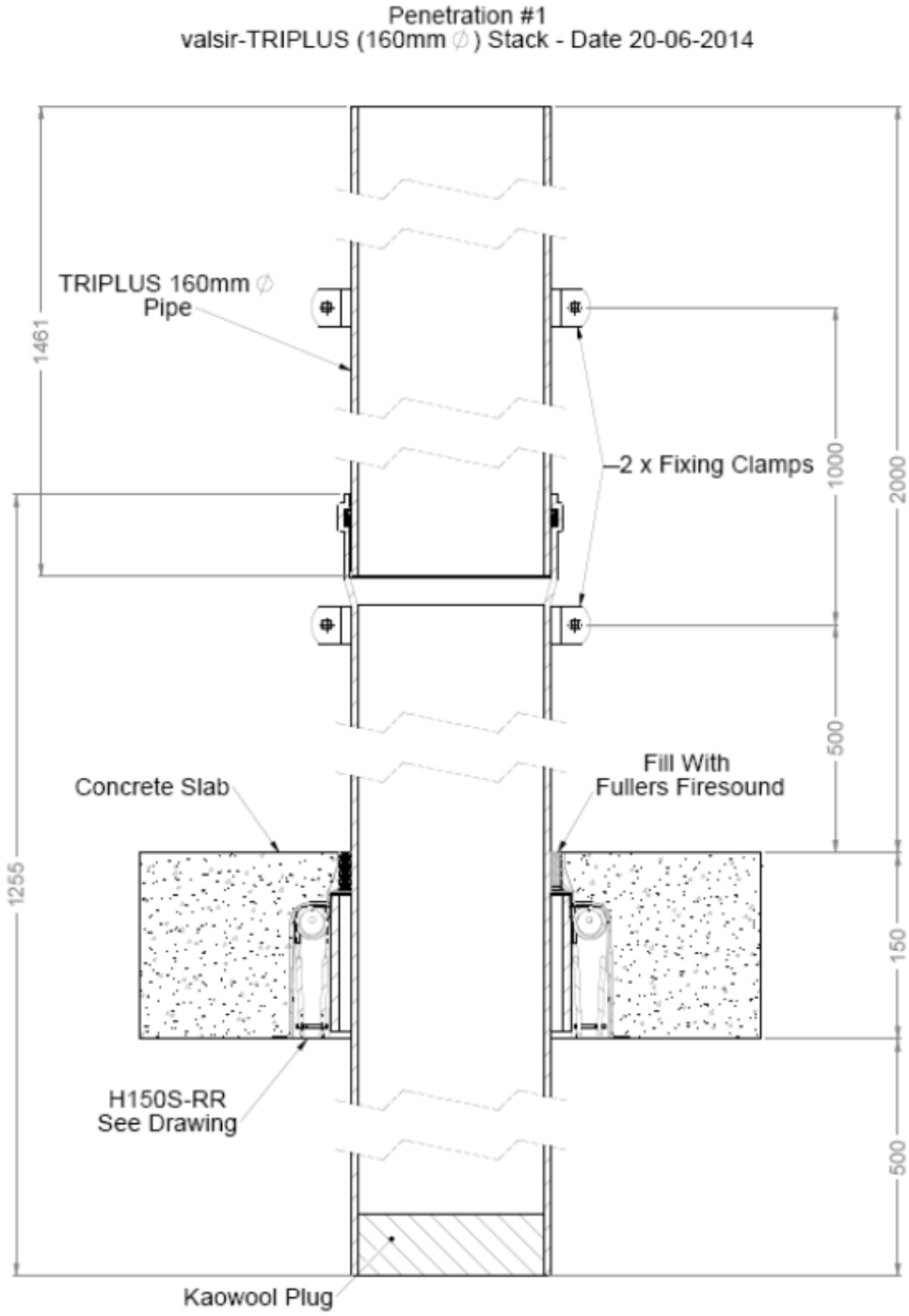
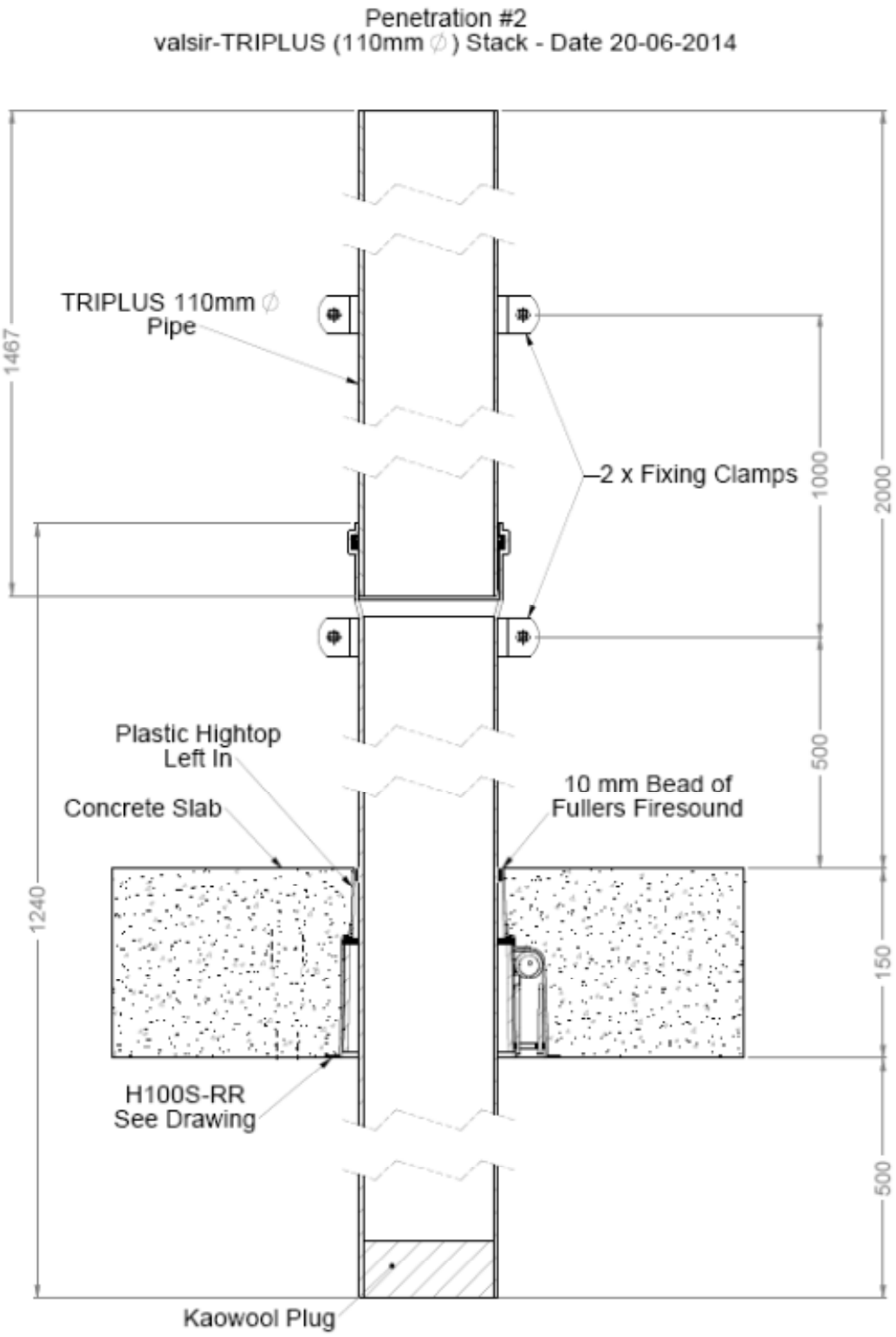


FIGURE 8 – SPECIMEN TEMPERATURE – ASSOCIATED WITH PENETRATION 6

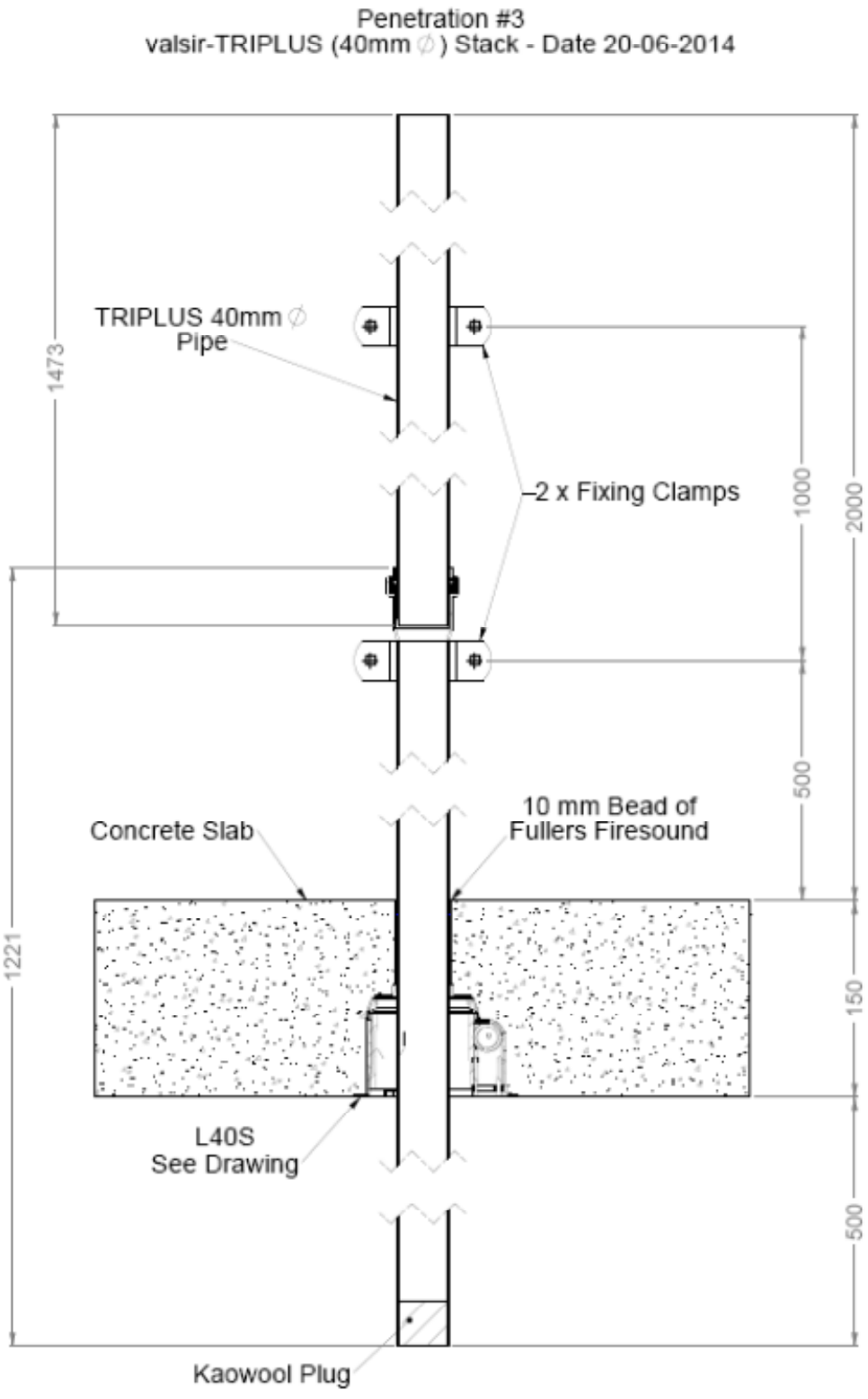
Appendix D – Installation drawings



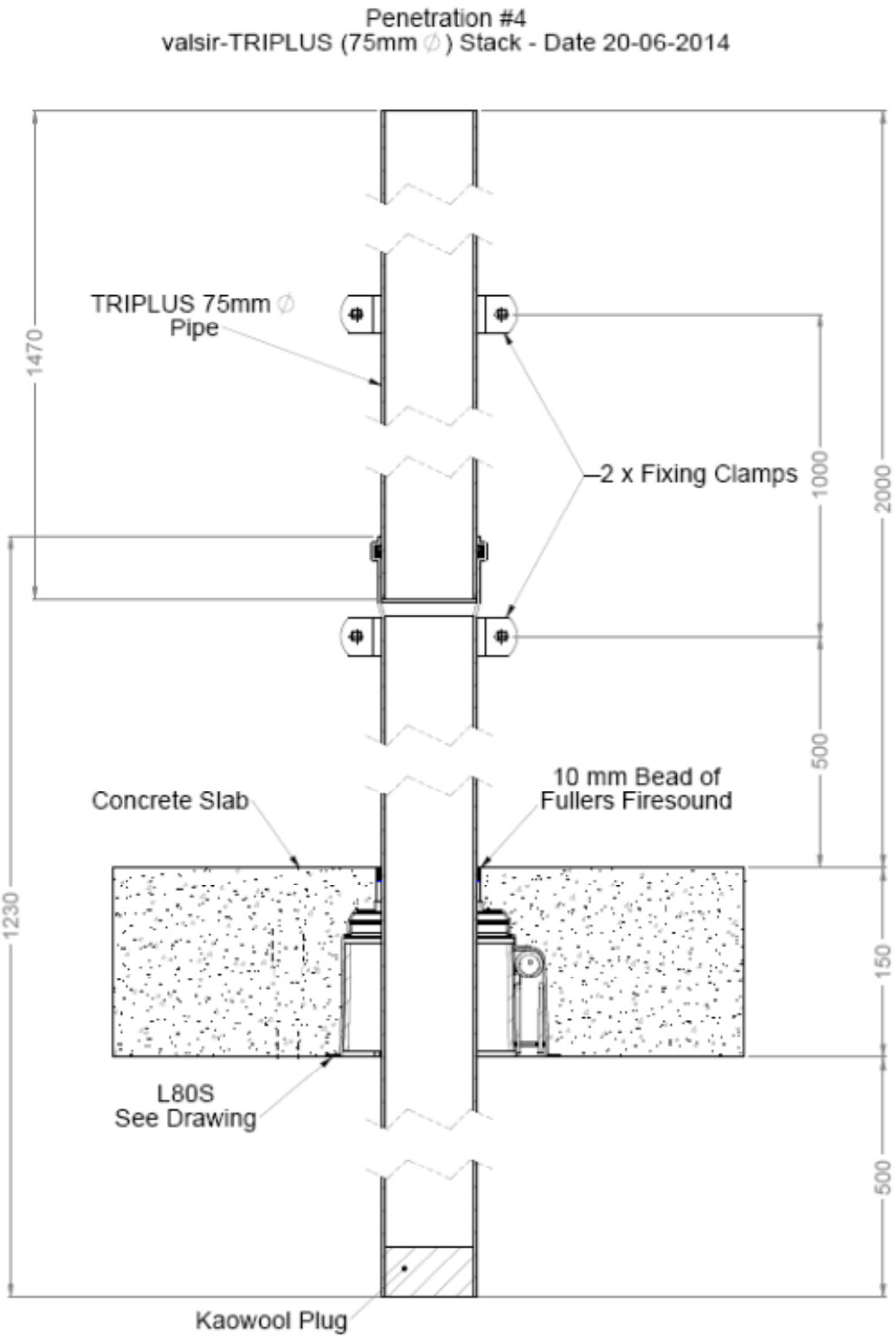
DRAWING TITLED "PENETRATION #1 – VALSIR-TRIPLUS (160-MM OD) STACK" DATED 20 JUNE 2014, BY SNAP FIRE SYSTEMS PTY LTD



DRAWING TITLED "PENETRATION #2 – VALSIR-TRIPLUS (110-MM OD) STACK" DATED 20 JUNE 2014, BY SNAP FIRE SYSTEMS PTY LTD

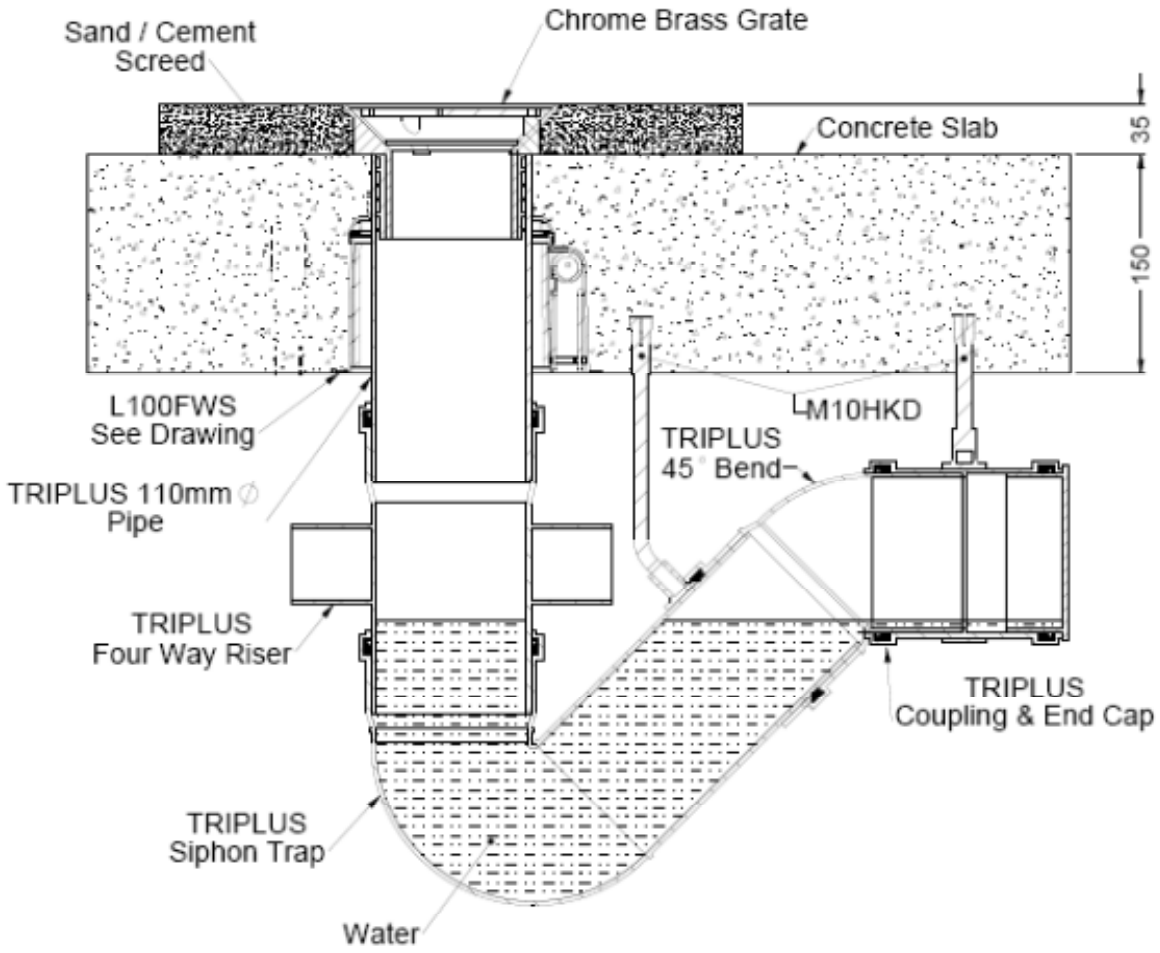


DRAWING TITLED "PENETRATION #3 – VALSIR-TRIPLUS (40-MM OD) STACK" DATED 20 JUNE 2014, BY SNAP FIRE SYSTEMS PTY LTD

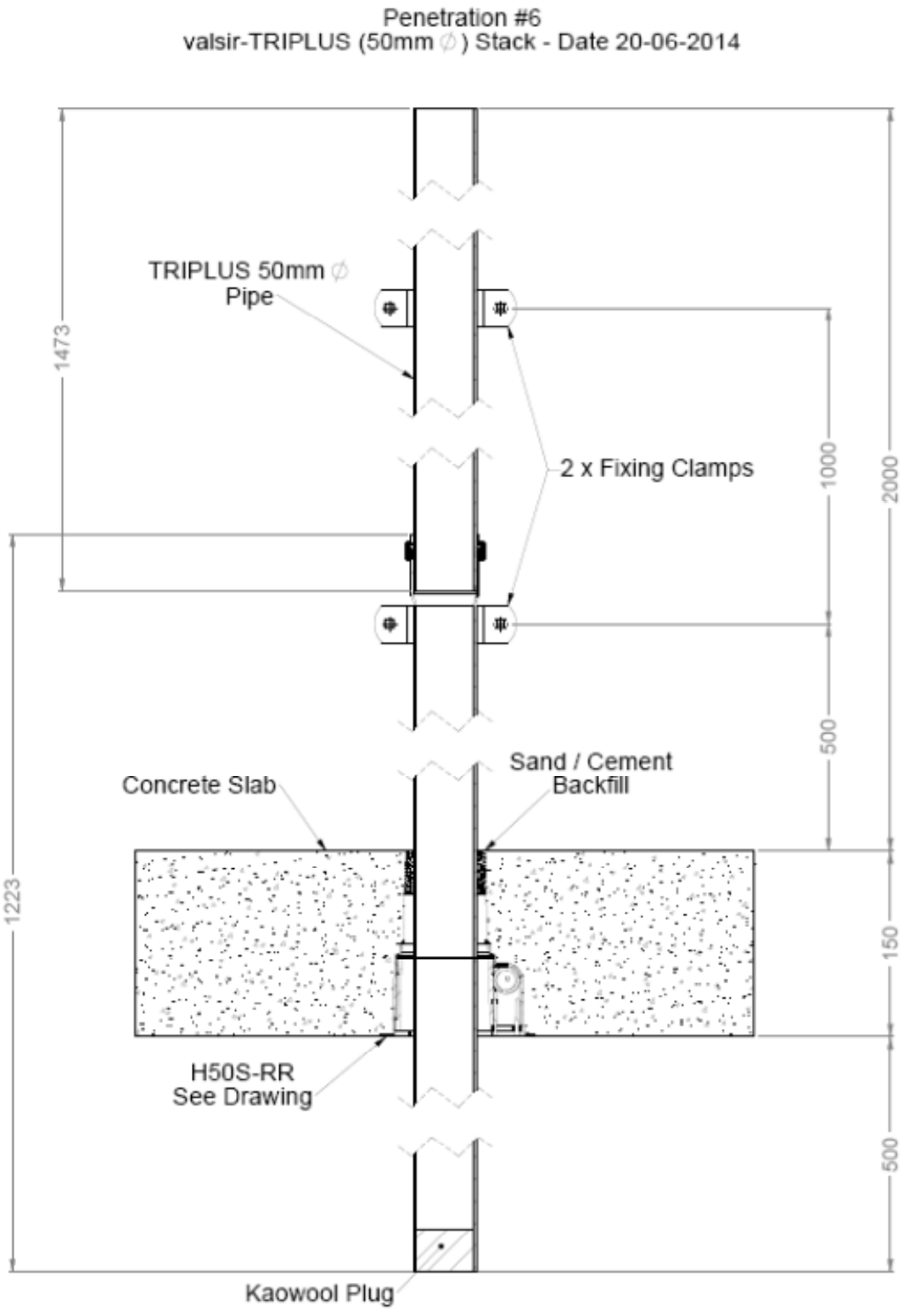


DRAWING TITLED "PENETRATION #4 – VALSIR-TRIPLUS (75-MM OD) STACK" DATED 20 JUNE 2014, BY SNAP FIRE SYSTEMS PTY LTD

Penetration #5
valsir-TRIPLUS (110mm ∅) Floorwaste - Date 20-06-2014

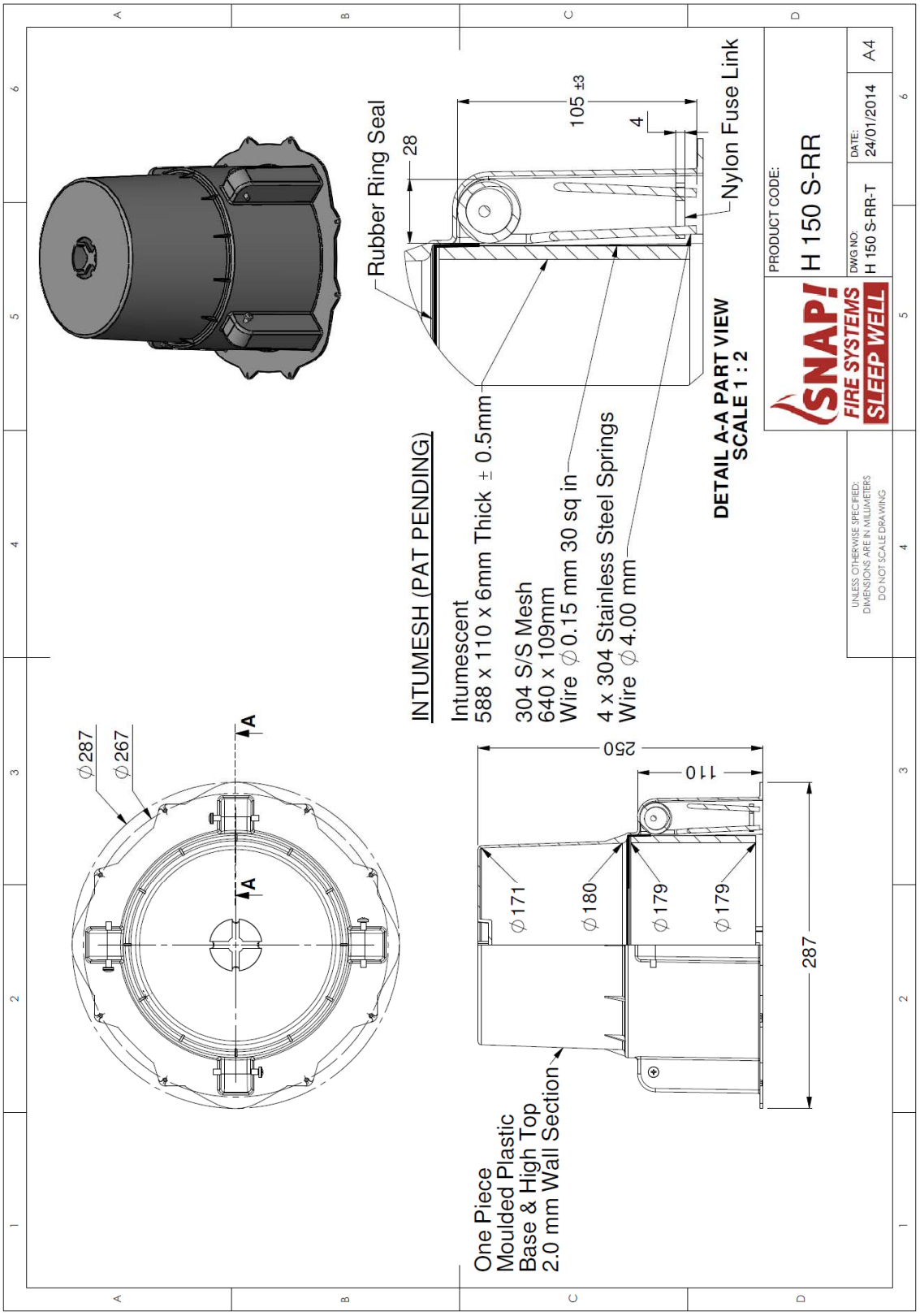


DRAWING TITLED "PENETRATION #5 – VALSIR-TRIPLUS (110-MM OD) FLOORWASTE" DATED 20 JUNE 2014, BY SNAP FIRE SYSTEMS PTY LTD

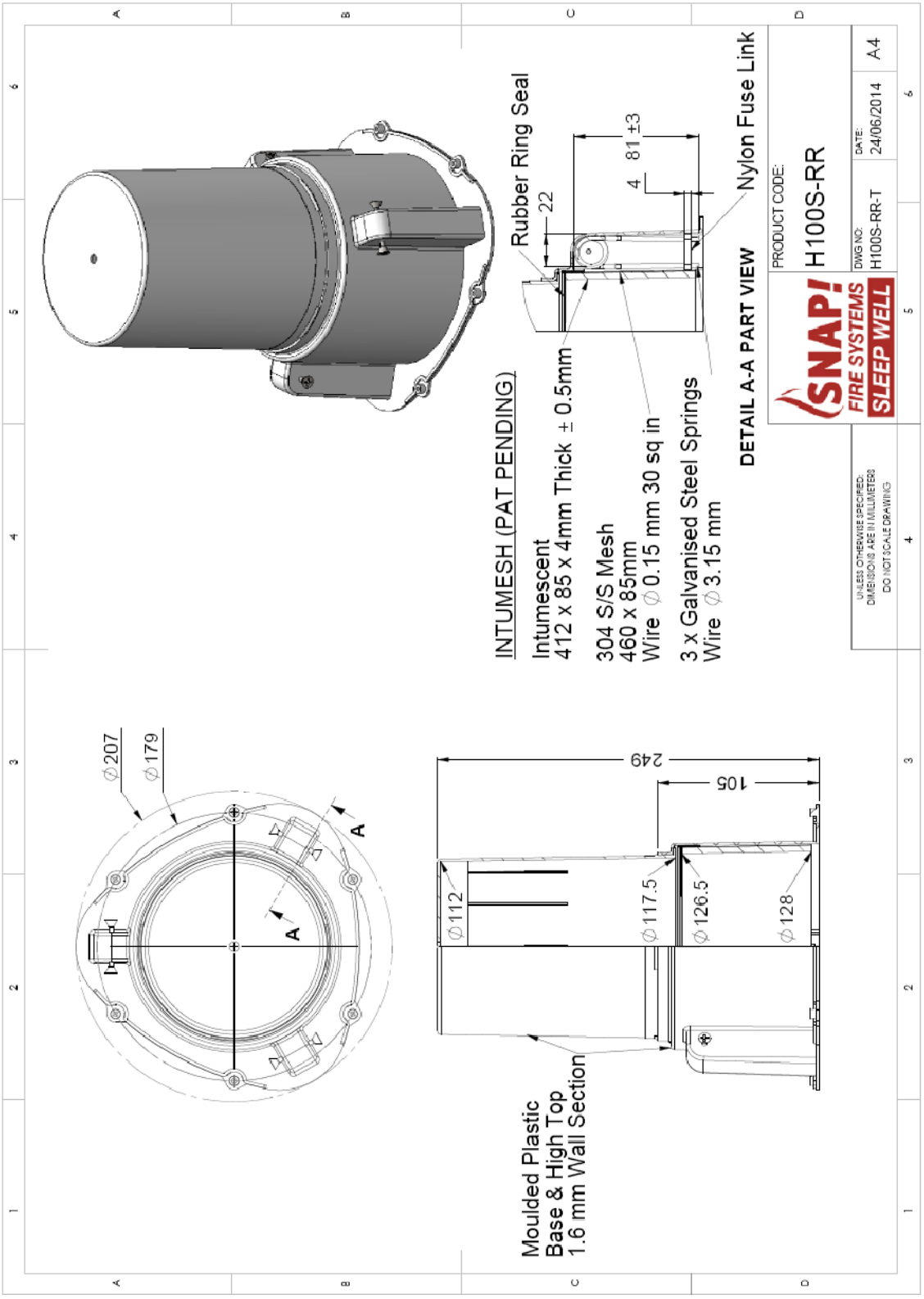


DRAWING TITLED "PENETRATION #6 – VALSIR-TRIPLUS (50-MM OD) STACK" DATED 20 JUNE 2014, BY SNAP FIRE SYSTEMS PTY LTD

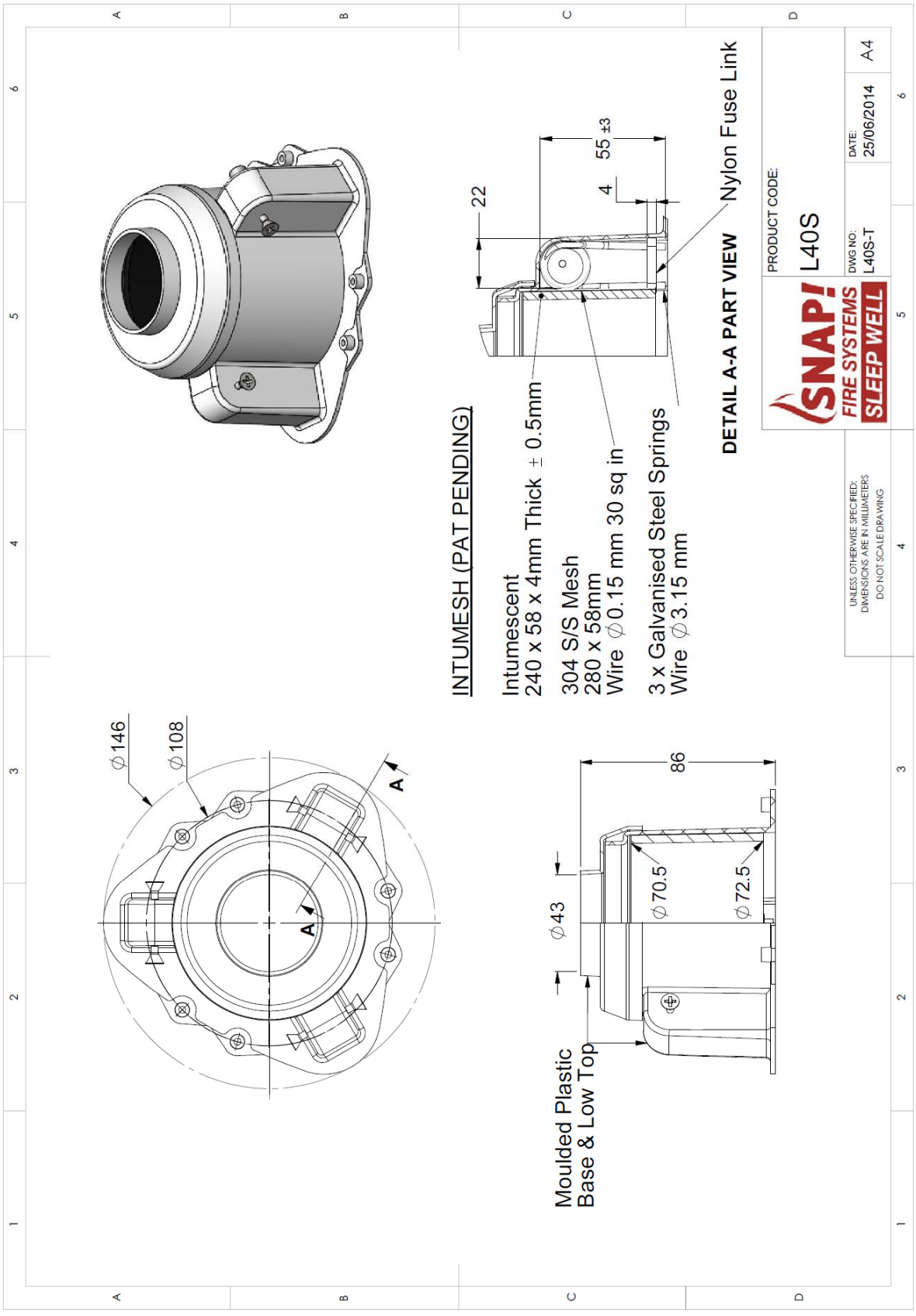
Appendix E – Specimen Drawings



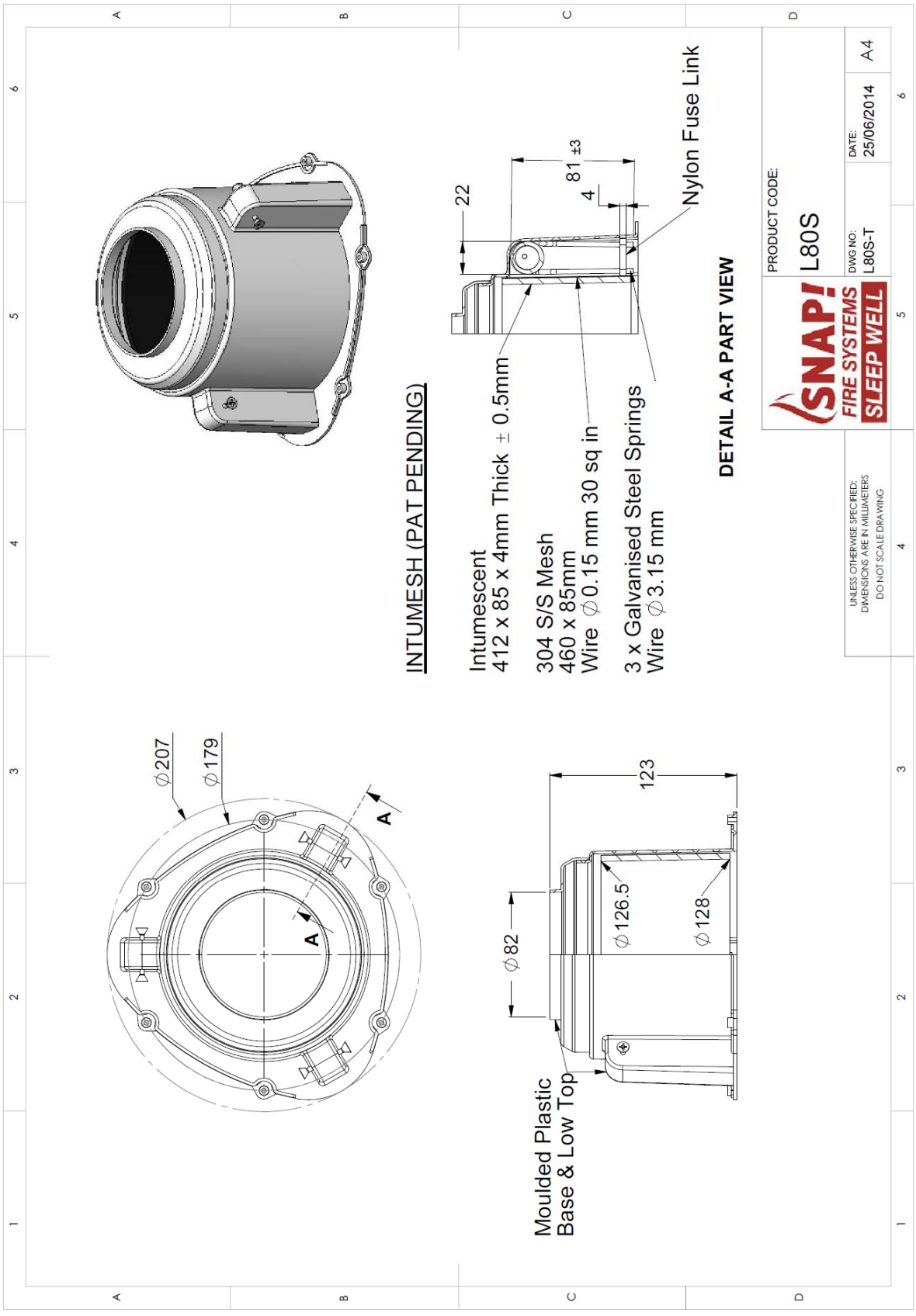
DRAWING NUMBERED H150 S-RR-T DATED 24 JANUARY 2014, BY SNAP FIRE SYSTEMS PTY LTD



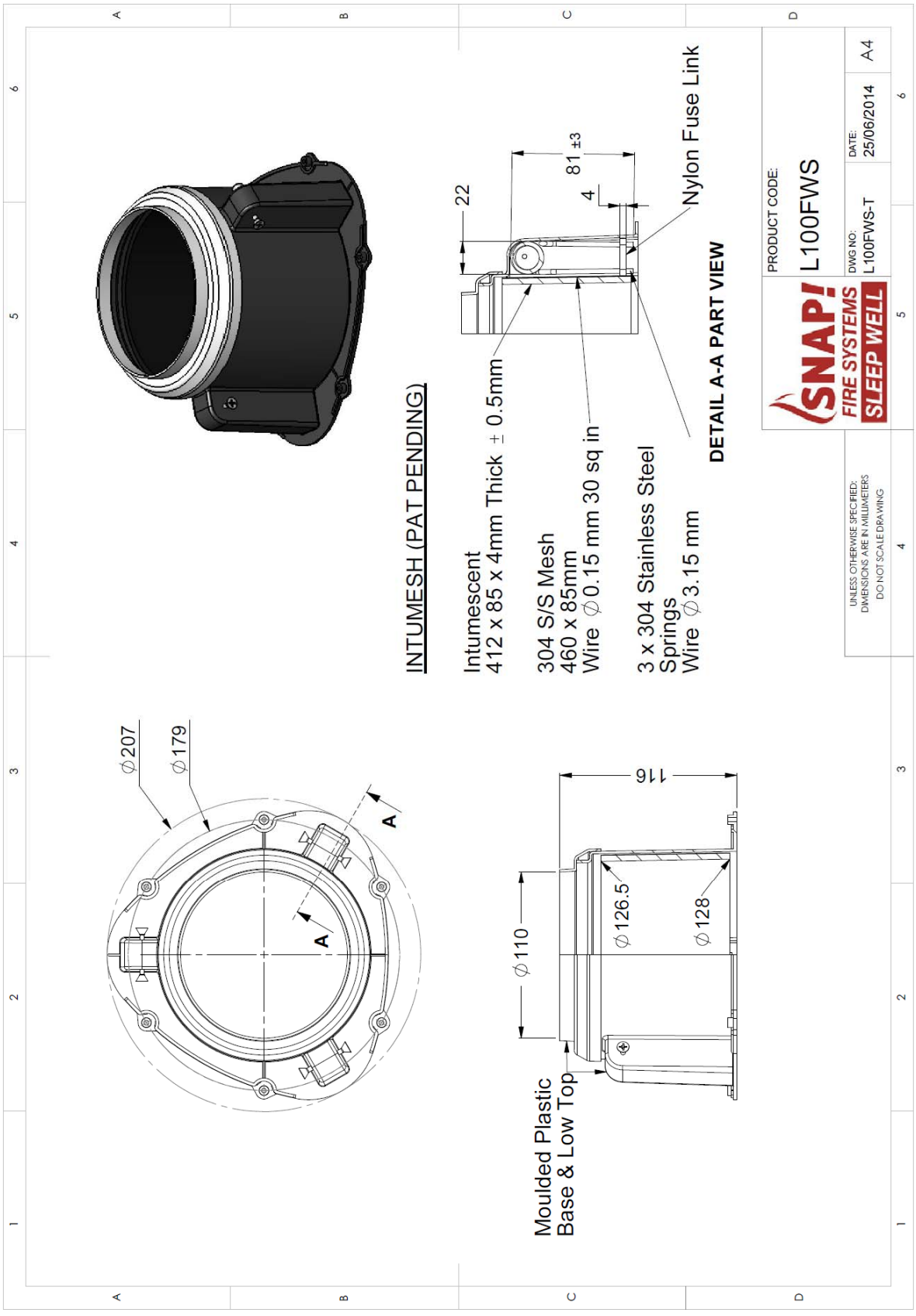
DRAWING NUMBERED H100 S-RR-T DATED 24 JUNE 2014, BY SNAP FIRE SYSTEMS PTY LTD



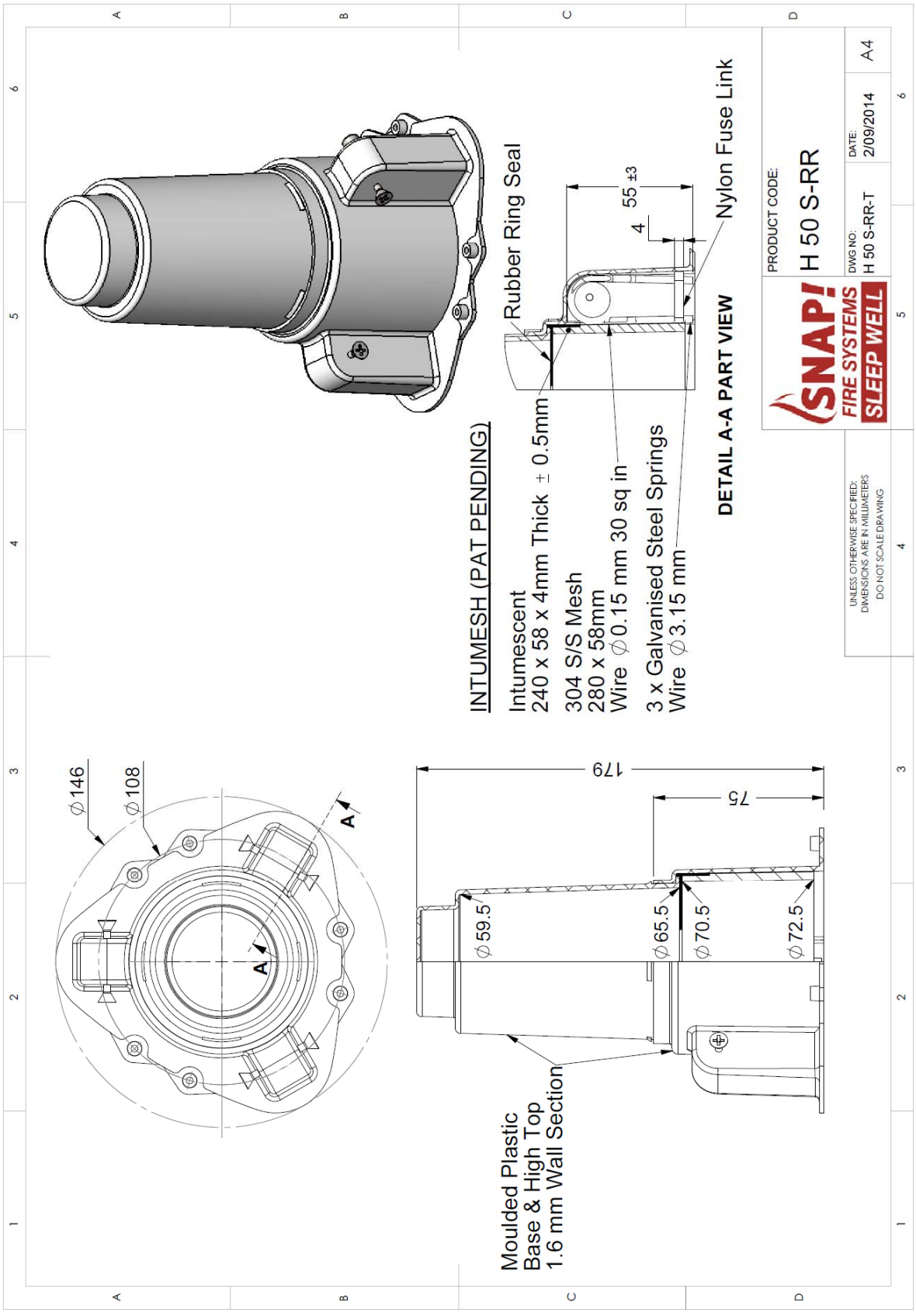
DRAWING NUMBERED L40S-T DATED 25 JUNE 2014, BY SNAP FIRE SYSTEMS PTY LTD



DRAWING NUMBERED L80S-T DATED 25 JUNE 2014, BY SNAP FIRE SYSTEMS PTY LTD



DRAWING NUMBERED L100FWS-T DATED 25 JUNE 2014, BY SNAP FIRE SYSTEMS PTY LTD



DRAWING NUMBERED H50 S-RR-T DATED 2 SEPTEMBER 2014, BY SNAP FIRE SYSTEMS PTY LTD

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.

Appendix F – Certificates

COPY OF CERTIFICATE OF TEST – NO. 2581A

COPY OF CERTIFICATE OF TEST – NO. 2582A

COPY OF CERTIFICATE OF TEST – NO. 2583A

COPY OF CERTIFICATE OF TEST – NO. 2584A

COPY OF CERTIFICATE OF TEST – NO. 2585A

COPY OF CERTIFICATE OF TEST – NO. 2586A

INFRASTRUCTURE TECHNOLOGIES
www.csiro.au

14 Julius Avenue, North Ryde NSW 2113
PO Box 310, North Ryde NSW 1670, Australia
T (02) 9490 5444 • **ABN** 41 687 119 230

Certificate of Test

No. 2581a

"Copyright CSIRO 2014 ©"
Copying or alteration of this report
without written authorisation from CSIRO is forbidden.

This is to certify that the element of construction described below was tested by the CSIRO Division of Materials Science and Engineering 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 and the complete test results are detailed in the Division's Sponsored Investigation report numbered FSP 1652a.

Penetration 1 – H150 S-RR cast-in fire collar protecting a 160-mm diameter Valsir-TRIPLUS Stack

Description: The SNAP Cast-in H150 S-RR fire collar comprised a 2-mm thick polypropylene casing with a 179-mm inner diameter and a 287-mm diameter base flange. The 110-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 stainless steel springs bound with nylon fuse links and a 640-mm x 109-mm stainless steel mesh as shown in drawing numbered H150 S-RR-T dated 24 January 2014, by SNAP Fire Systems Pty Ltd.
The penetrating service comprised a 160-mm Valsir-TRIPLUS stack pipe, with a wall thickness of 5.4-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 "Penetration #1 – valsir-TRIPLUS (160-mm OD) Stack" dated 20 June 2014, by Snap Fire Systems Pty Ltd. On the exposed end, the pipe was capped with a Kaowool Plug.
On the unexposed face, the annular gap between the pipe and the slab was filled with Fullers Firesound sealant.
The element of construction described above satisfied the following criteria for fire-resistance for the period stated.

Structural Adequacy	not applicable
Integrity	no failure at 241 minutes
Insulation	183 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/240/180. 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: 14 July 2014

Issued on the 23rd day of December 2014 without alterations or additions. This Certificate supersedes issue dated 10 September 2014

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

INFRASTRUCTURE TECHNOLOGIES
www.csiro.au

14 Julius Avenue, North Ryde NSW 2113
PO Box 310, North Ryde NSW 1670, Australia
T (02) 9490 5444 • **ABN** 41 687 119 230

Certificate of Test

No. 2582a

"Copyright CSIRO 2014 ©"
Copying or alteration of this report
without written authorisation from CSIRO is forbidden.

This is to certify that the element of construction described below was tested by the CSIRO Division of Materials Science and Engineering 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 and the complete test results are detailed in the Division's Sponsored Investigation report numbered FSP 1652a.

Product Name: Penetration 2 – H100 S-RR cast-in fire collar protecting a 110-mm diameter Valsir-TRIPLUS pipe

Description: The SNAP Cast-in H100 S-RR fire collar comprised a 1.6-mm thick polypropylene casing with a 126.5-mm inner diameter and a 207-mm diameter base flange. The 105-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 24 June 2014, by SNAP Fire Systems Pty Ltd.
The penetrating service comprised a 110-mm Valsir-TRIPLUS stack pipe, with a wall thickness of 3.9-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 "Penetration #2 – valsir-TRIPLUS (110-mm OD) Stack" dated 20 June 2014, by Snap Fire Systems Pty Ltd. On the exposed end, the pipe was capped with a Kaowool Plug.
On the unexposed face, the annular gap between the pipe and the slab was sealed with a 10-mm bed of Fullers Firesound fire 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: 14 July 2014

Issued on the 23rd day of December 2014 without alterations or additions. This Certificate supersedes issue dated 10 September 2014.

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

INFRASTRUCTURE TECHNOLOGIES
www.csiro.au

14 Julius Avenue, North Ryde NSW 2113
PO Box 310, North Ryde NSW 1670, Australia
T (02) 9490 5444 • **ABN** 41 687 119 230

Certificate of Test

No. 2583a

"Copyright CSIRO 2014 ©"
Copying or alteration of this report
without written authorisation from CSIRO is forbidden.

This is to certify that the element of construction described below was tested by the CSIRO Division of Materials Science and Engineering 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 and the complete test results are detailed in the Division's Sponsored Investigation report numbered FSP 1652a.

Product Name: Penetration 3 – L40S cast-in fire collar protecting a 40-mm diameter Valsir-TRIPLUS pipe

Description: The SNAP Cast-in L40S fire collar comprised a 1.6-mm thick polypropylene casing with a 70.5-mm inner diameter and a 146-mm diameter base flange. The 86-mm high collar casing incorporated a 240-mm x 58-mm x 4-mm thick Intumesh intumescent material. The closing mechanism comprised three galvanised steel springs bound with nylon fuse links and a 280-mm x 58-mm stainless steel mesh as shown in drawing numbered L40S-T dated 25 June 2014, by SNAP Fire Systems Pty Ltd.
The penetrating service comprised a 40-mm Valsir-TRIPLUS stack pipe, with a wall thickness of 2.1-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 "Penetration #3 – valsir-TRIPLUS (40-mm OD) Stack" dated 20 June 2014, by Snap Fire Systems Pty Ltd. On the exposed end, the pipe was capped with a Kaowool Plug.
On the unexposed face, the annular gap between the pipe and the slab was sealed with a 10-mm bead of Fullers Firesound fire 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: 14 July 2014

Issued on the 23rd day of December 2014 without alterations or additions. This Certificate supersedes issue dated 10 September 2014

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

INFRASTRUCTURE TECHNOLOGIES
www.csiro.au

14 Julius Avenue, North Ryde NSW 2113
PO Box 310, North Ryde NSW 1670, Australia
T (02) 9490 5444 • **ABN** 41 687 119 230

Certificate of Test

No. 2584a

"Copyright CSIRO 2014 ©"
Copying or alteration of this report
without written authorisation from CSIRO is forbidden.

This is to certify that the element of construction described below was tested by the CSIRO Division of Materials Science and Engineering 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 and the complete test results are detailed in the Division's Sponsored Investigation report numbered FSP 1652a.

Product Name: Penetration 4 – L80S cast-in fire collar protecting a 75-mm diameter Valsir-TRIPLUS pipe

Description: The SNAP Cast-in L80S fire collar comprised a 1.6-mm thick polypropylene casing with a 126.5-mm inner diameter and a 207-mm diameter base flange. The 123-mm high collar casing incorporated a 412-mm x 85-mm x 4-mm thick Intumesh intumescent material. 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 L80S-T dated 25 June 2014, by SNAP Fire Systems Pty Ltd.
The penetrating service comprised a 75-mm Valsir-TRIPLUS stack pipe, with a wall thickness of 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 "Penetration #4 – valsir-TRIPLUS (75-mm OD) Stack" dated 20 June 2014, by Snap Fire Systems Pty Ltd. On the exposed end, the pipe was capped with a Kaowool Plug.
On the unexposed face, the annular gap between the pipe and the slab was sealed with a 10-mm bead of Fullers Firesound fire 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: 14 July 2014

Issued on the 23rd day of December 2014 without alterations or additions. This Certificate supersedes issue dated 10 September 2014

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

INFRASTRUCTURE TECHNOLOGIES
www.csiro.au

14 Julius Avenue, North Ryde NSW 2113
PO Box 310, North Ryde NSW 1670, Australia
T (02) 9490 5444 • **ABN** 41 687 119 230

Certificate of Test

No. 2585a

"Copyright CSIRO 2014 ©"
Copying or alteration of this report
without written authorisation from CSIRO is forbidden.

This is to certify that the element of construction described below was tested by the CSIRO Division of Materials Science and Engineering 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 and the complete test results are detailed in the Division's Sponsored Investigation report numbered FSP 1652a.

Product Name: Penetration 5 – L100FWS cast-in fire collar protecting a 110-mm diameter Valsir-TRIPLUS floor waste.

Description: The SNAP Cast-in L100FWS fire collar comprised a 1.6-mm thick polypropylene casing with an 126.5-mm inner diameter and a 207-mm diameter base flange. The 116-mm high collar casing incorporated a 412-mm x 85-mm x 4-mm thick Intumesh intumescent material. The closing mechanism comprised three stainless steel springs bound with nylon fuse links and a 460-mm x 85-mm stainless steel mesh as shown in drawing numbered L100FWS-T dated 25 June 2014, by SNAP Fire Systems Pty Ltd.

The penetrating service comprised a 110-mm Valsir-TRIPLUS pipe, with a wall thickness of 3.4-mm fitted through the collar's sleeve. The floor waste system was fitted on the unexposed face with a Chrome brass floor waste grate. On the exposed side of the slab, a TRIPLUS Siphon Trap was connected to the penetrating pipe with a gland nut within the collar, supported by 2 x M10 HKD clamps fixed to the concrete slab as shown in drawing titled "Penetration #5 – valsir-TRIPLUS (110-mm OD) Floorwaste" dated 20 June 2014, by Snap Fire Systems Pty Ltd.

The trap was filled with water before the start of the test to the level shown in drawing titled "Penetration #5 – valsir-TRIPLUS (110-mm OD) Floorwaste" dated 25 June 2014, by Snap Fire Systems Pty Ltd.

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: 14 July 2014

Issued on the 23rd day of December 2014 without alterations or additions. This Certificate supersedes issue dated 10 September 2014.

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

INFRASTRUCTURE TECHNOLOGIES
www.csiro.au

14 Julius Avenue, North Ryde NSW 2113
PO Box 310, North Ryde NSW 1670, Australia
T (02) 9490 5444 • **ABN** 41 687 119 230

Certificate of Test

No. 2586a

"Copyright CSIRO 2014 ©"
Copying or alteration of this report
without written authorisation from CSIRO is forbidden.

This is to certify that the element of construction described below was tested by the CSIRO Division of Materials Science and Engineering 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 and the complete test results are detailed in the Division's Sponsored Investigation report numbered FSP 1652a.

Product Name: Penetration 6 – H50 S-RR cast-in fire collar protecting a 50-mm diameter Valsir-TRIPLUS pipe.

Description: The SNAP Cast-in H50 S-RR fire collar comprised a 1.6-mm thick polypropylene casing with a 70.5-mm inner diameter and a 146-mm diameter base flange. The 76-mm high collar casing incorporated a 240-mm x 58-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 280-mm x 58-mm stainless steel mesh as shown in drawing numbered H50 S-RR-T dated 2 September 2014, by SNAP Fire Systems Pty Ltd.
The penetrating service comprised a 50-mm Valsir-TRIPLUS stack pipe, with a wall thickness of 2.2-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 "Penetration #6 – valsir-TRIPLUS (50-mm OD) Stack" dated 20 June 2014, by Snap Fire Systems Pty Ltd. On the exposed end, the pipe was capped with a Kaowool Plug.
On the unexposed face, the annular gap between the pipe and slab was sealed with sand and cement backfill.

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: 14 July 2014

Issued on the 23rd day of December 2014 without alterations or additions. This Certificate supersedes issue dated 10 September 2014.

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

CONTACT US

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

YOUR CSIRO

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

Infrastructure Technologies
Mario Lara-Ledermann
Senior Fire Resistance and Assessments Engineer
t +61 2 94905500
e mario.lara@csiro.au
w www.csiro.au/Organisation-Structure/Divisions/CMSE/Infrastructure-Technologies/Fire-safety.aspx

Infrastructure Technologies
Brett Roddy
Team Leader, Fire Testing and Assessments
t +61 2 94905449
e brett.roddy@csiro.au
w www.csiro.au/Organisation-Structure/Divisions/CMSE/Infrastructure-Technologies/Fire-safety.aspx