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

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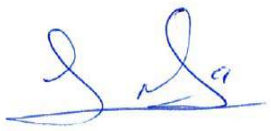		
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Fire-resistance test on fire collars protecting a concrete slab penetrated by services

Sponsored Investigation No. FSP 1648

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) Akatherm dBlue Floorwaste and five (5) Akatherm-dBlue 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 4431/3771

1.7 Test date

The fire-resistance test was conducted on 7 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) Akatherm dBlue Floorwaste and five (5) Akatherm dBlue 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 Akatherm dBlue pipes are stated to be constructed of a polypropylene inner layer (1.4 g/cm^3 density), a mineral-filled polypropylene middle layer and a polypropylene outer layer (1.2 g/cm^3 density).

Penetration 1 – H150 S-RR cast-in fire collar protecting a 160-mm diameter dBlue pipe

The SNAP Cast-in H150 S-RR fire collar comprised a 2-mm thick polypropelene 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, 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 dBlue stack pipe, with a wall thickness of 6-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 – Akatherm-dBlue (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 as shown in drawing titled "Penetration #2 – Akatherm-dBlue (110-mm OD) Stack" dated 20 June 2014, by Snap Fire Systems Pty Ltd.

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

The SNAP Cast-in H100 S-RR fire collar comprised a 1.6-mm thick polypropelene 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 stainless steel springs, 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 dBlue 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 "Penetration #2 – Akatherm-dBlue (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 bead of Fullers Firesound fire sealant.

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

The SNAP Cast-in L40S fire collar comprised a 1.6-mm thick polypropelene 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, 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 dBlue stack pipe, with a wall thickness of 1.8-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 "Penetration #3 – Akatherm-dBlue (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 dBlue pipe

The SNAP Cast-in L80S fire collar comprised a 1.6-mm thick polypropelene 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, 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 dBlue 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 "Penetration #4 – Akatherm-dBlue (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 floor waste

The SNAP Cast-in L100FWS fire collar comprised a 1.6-mm thick polypropelene 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, 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 dBlue 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 dBlue floor waste gully was connected to the penetrating pipe with a glad nut within the collar, supported by 2 x M10 HKD clamps fixed to the concrete slab as shown in drawing titled "Penetration #5 – Akatherm-dBlue

(110-mm OD) Floorwaste" dated 20 June 2014, by Snap Fire Systems Pty Ltd. On the exposed end, the pipe was capped with a Kaowool Plug.

The trap was filled with water before the start of the test to the level shown in drawing titled "Penetration #5 – Akatherm-dBlue (110-mm OD) Floorwaste" dated 20 June 2014, by Snap Fire Systems Pty Ltd.

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

The SNAP Cast-in H50 S-RR fire collar comprised a 1.6-mm thick polypropelene 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, with nylon fuse links and a 280-mm x 58-mm stainless steel mesh as shown in drawing numbered H50 S-RR-T dated 7 November 2013, by SNAP Fire Systems Pty Ltd.

The penetrating service comprised a 50-mm dBlue stack pipe, with a wall thickness of 2.5-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 – Akatherm-dBlue (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 – Akatherm-dBlue (160-mm OD) Stack” dated 20 June 2014, by Snap Fire Systems Pty Ltd.

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

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

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

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

Drawing titled “Penetration #6 – Akatherm-dBlue (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 7 November 2013, 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
1 minute -	Light smoke is visible from top of Penetration 6 lasting approximately 10 seconds.
2 minutes -	Smoke is visible from Penetration 2 and Penetration 6.
	Fluing from penetrations has ceased.
3 minutes -	Smoke is visible from furnace flues.
4 minutes -	Light smoke is visible from Penetrations 1, 2 and 4.
	Smoke is increasing from furnace flues. A small amount of smoke is visible from Penetrations 1 and 2.
5 minutes - -	Smoke is visible from Penetration 5 (floor waste).
-	Cotton wool pad applied over Penetration 5 (floor waste) – No ignition.
6 minutes -	Insulation failure of Penetration 5: maximum temperature rise limit of 180°C measured on the floor grate.
7 minutes - -	Light smoke is visible from Penetrations 1, 2 and Penetration 5 (floor waste).
10 minutes - -	Large amount of smoke is visible from furnace flues.

12 minutes -	Spalling noises are audible from furnace chamber.
14 minutes -	Quantity of smoke fluing from the furnace has decreased. A small amount of smoke is visible from Penetration 2 and 5 (floor waste).
16 minutes -	Further spalling noises are audible from the furnace flues.
18 minutes -	Light smoke is visible from Penetrations 1, 2 and 5 (floor waste).
21 minutes -	No smoke is visible from furnace flues. Light smoke is visible from Penetration 2 and Penetration 5 (floor waste).
27 minutes -	Moisture is visible at the base of Penetrations 3 and 6 from the slab.
29 minutes -	Sealant is bulging at the base of Penetration 1.
51 minutes -	Sealant on Penetration 2 is expanding.
56 minutes -	Roving thermocouple was applied near Thermocouple 1 and 2 on Penetration 1. Temperature of 60°C recorded.
120 minutes -	No visible change to unexposed face of specimen.
153 minutes -	Insulation failure of Penetration 1 : maximum temperature rise limit of 180°C measured on the slab.
160 minutes -	Error noted on Thermocouple S14 – repaired at 2 hours 44 minutes.
162 minutes -	Further swelling of mastic noted at base of Penetration 1.
182 minutes -	Steam/Smoke is being emitted from unexposed ends of Penetrations 1 and 2.
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:

Penetration 1 – H150 S-RR cast-in fire collar protecting a 160-mm diameter dBlue pipe

Structural adequacy	-	Not applicable
Integrity	-	No failure at 241 minutes
Insulation	-	153 minutes

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

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 dBlue 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 dBlue 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	-	6 minutes

Penetration 6 – H50 S-RR cast-in fire collar protecting a 50-mm diameter dBlue 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:

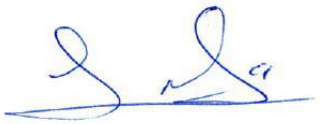
Penetration 1	-	-/240/120;
Penetration 2	-	-/240/240;
Penetration 3	-	-/240/240;
Penetration 4	-	-/240/240
Penetration 5	-	-/240/0; and
Penetration 6	-	-/240/240.

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

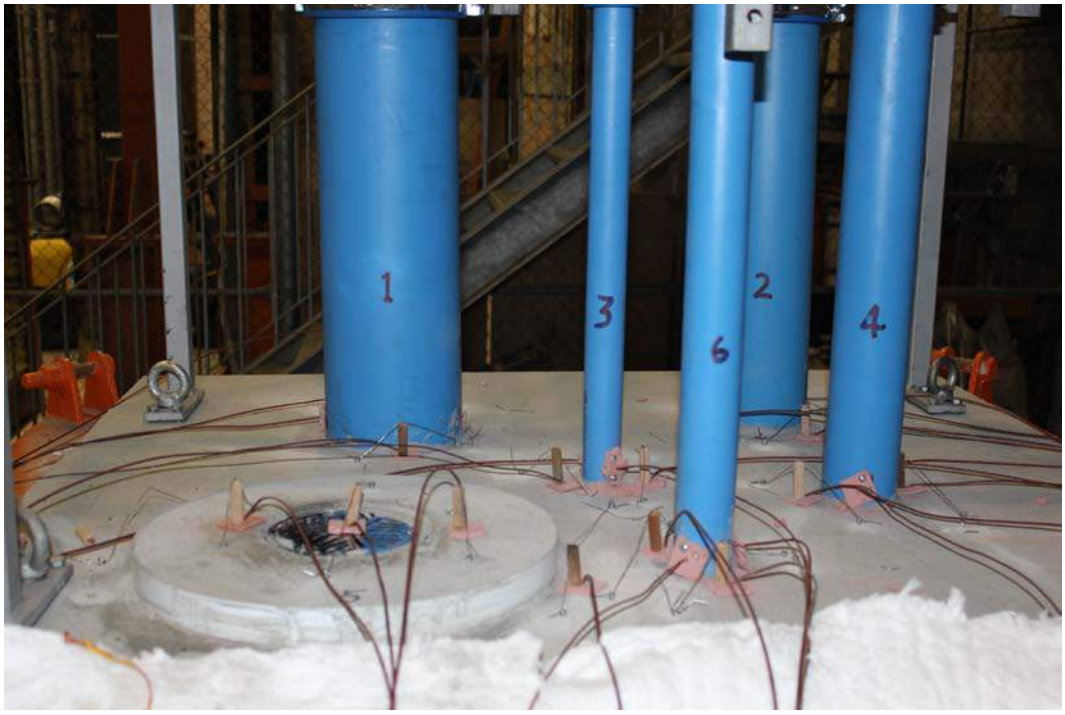
Appendices

Appendix A – Measurement location

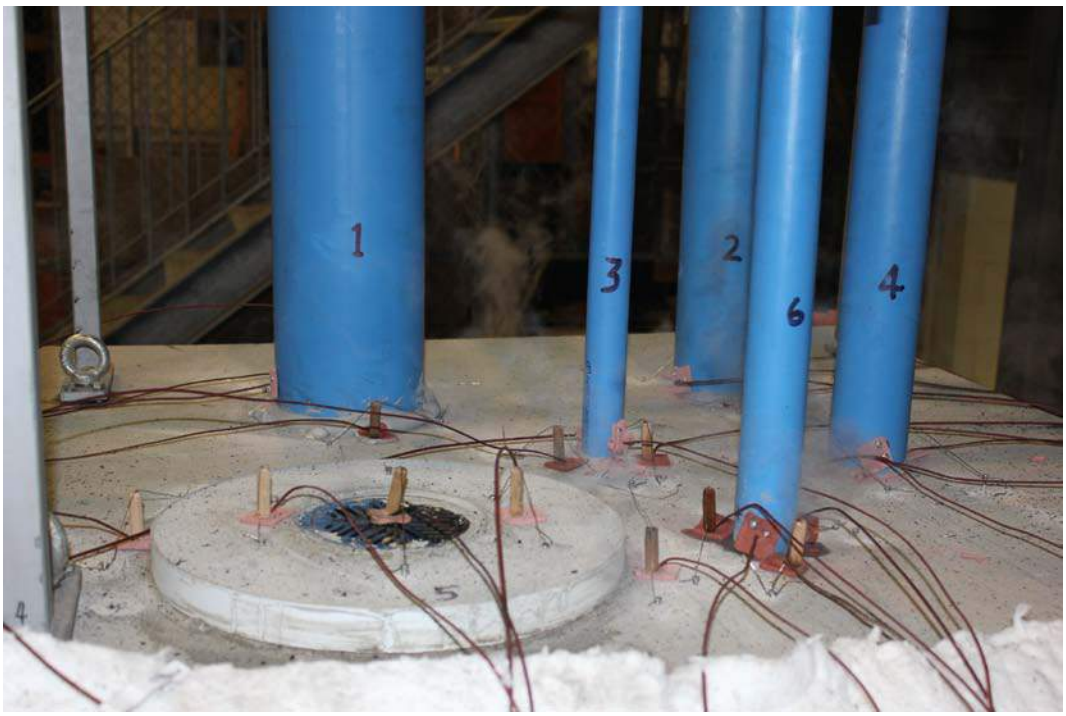
Measurement Location		
Group location	**T/C Position**	**T/C designation**
Specimen		
Penetration 1	On slab 25-mm from pipe.	S1
	On slab 25-mm from pipe.	S2
	On pipe 25-mm from slab.	S3
	On pipe 25-mm from slab.	S4
Penetration 2	On slab 25-mm from pipe.	S5
	On slab 25-mm from pipe.	S6
	On pipe 25-mm 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



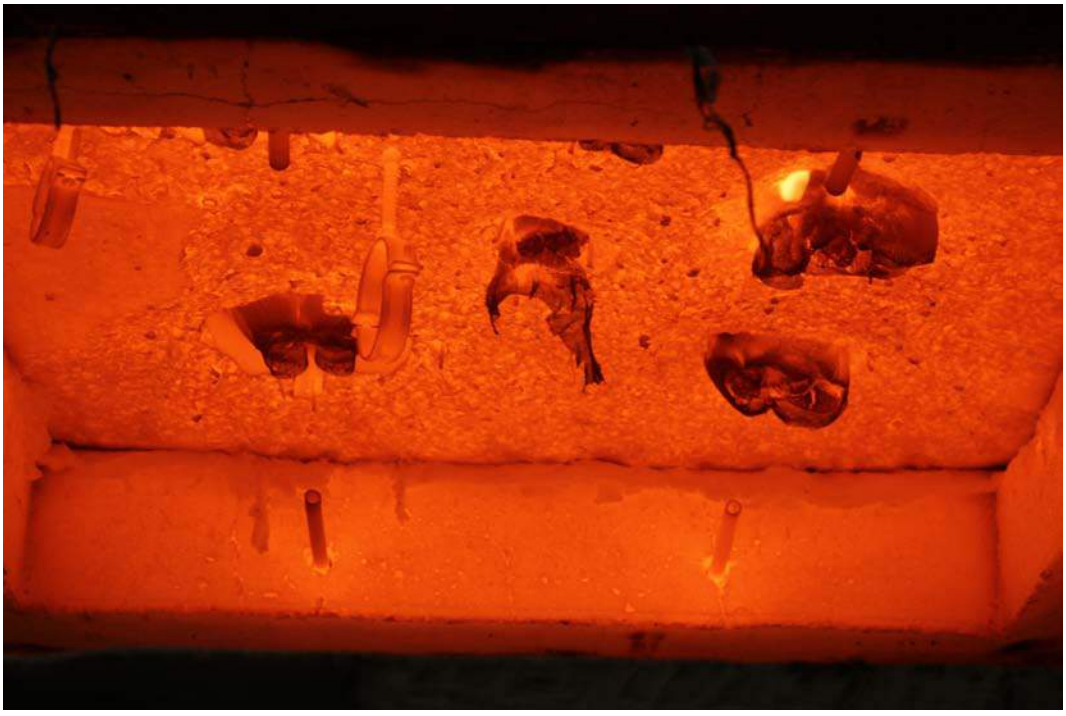
PHOTOGRAPH 2 – UNEXPOSED FACE OF SPECIMENS PRIOR TO TESTING



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

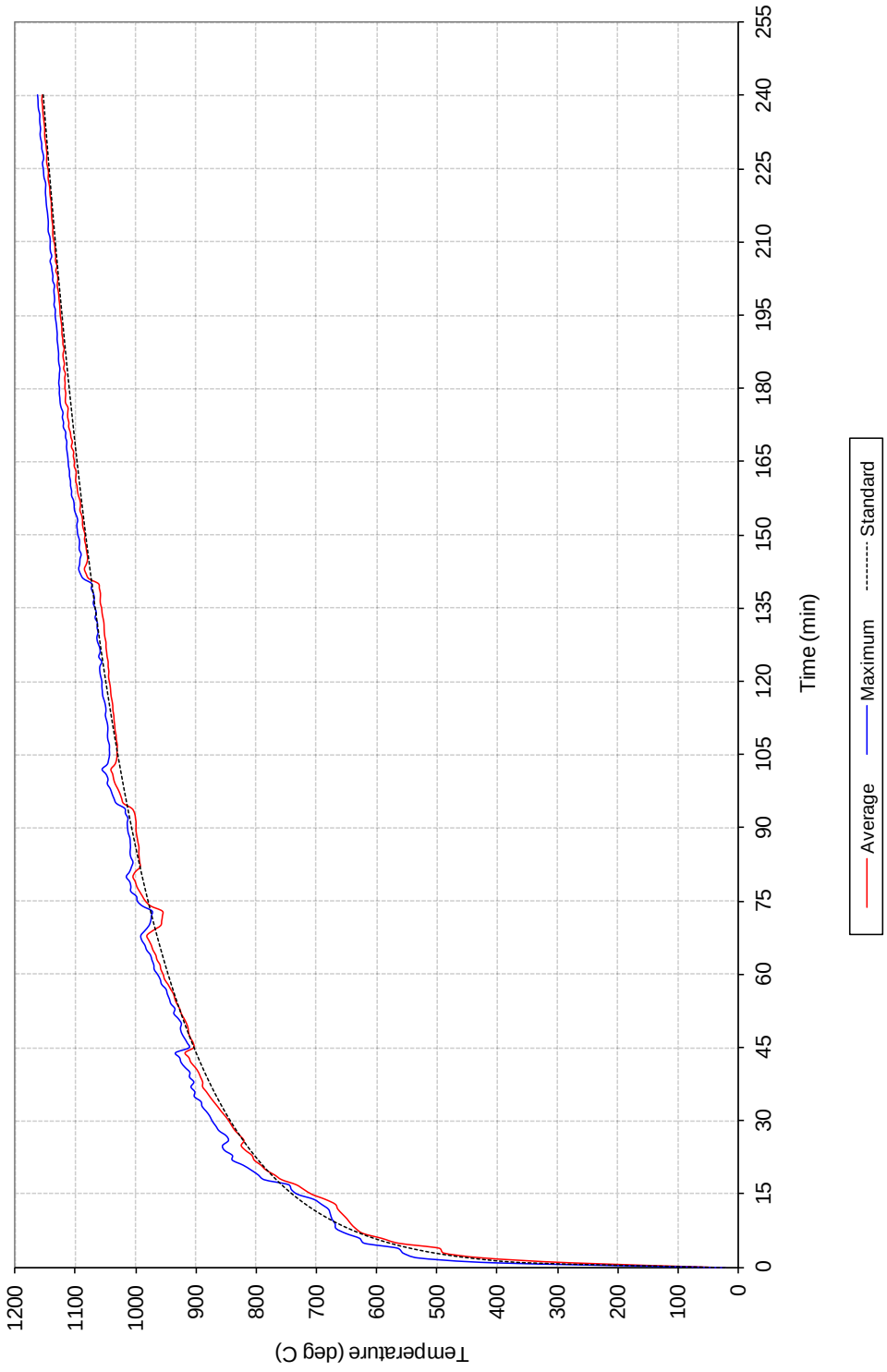


FIGURE 1 – FURNACE TEMPERATURE

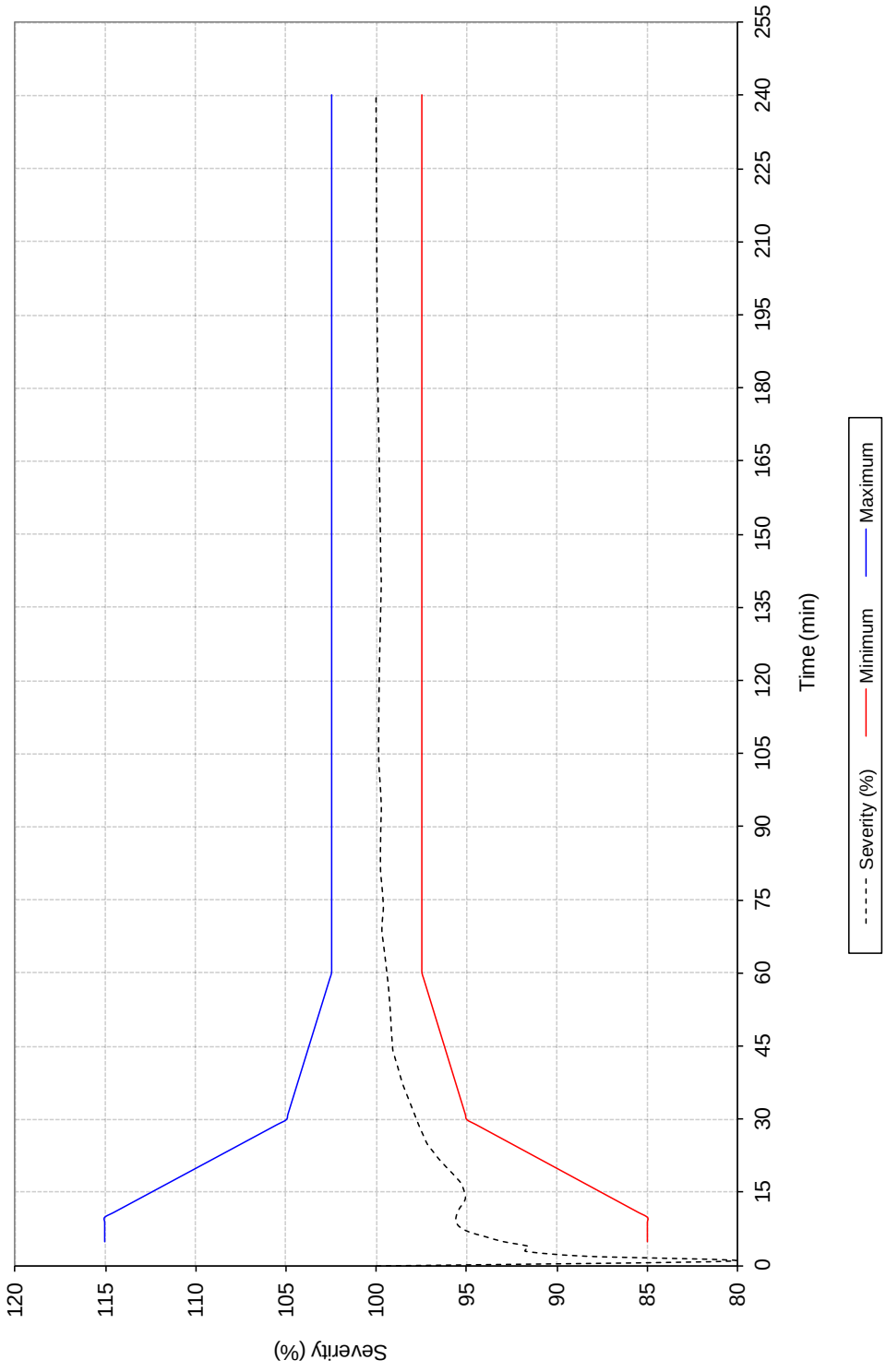


FIGURE 2 – FURNACE SEVERITY

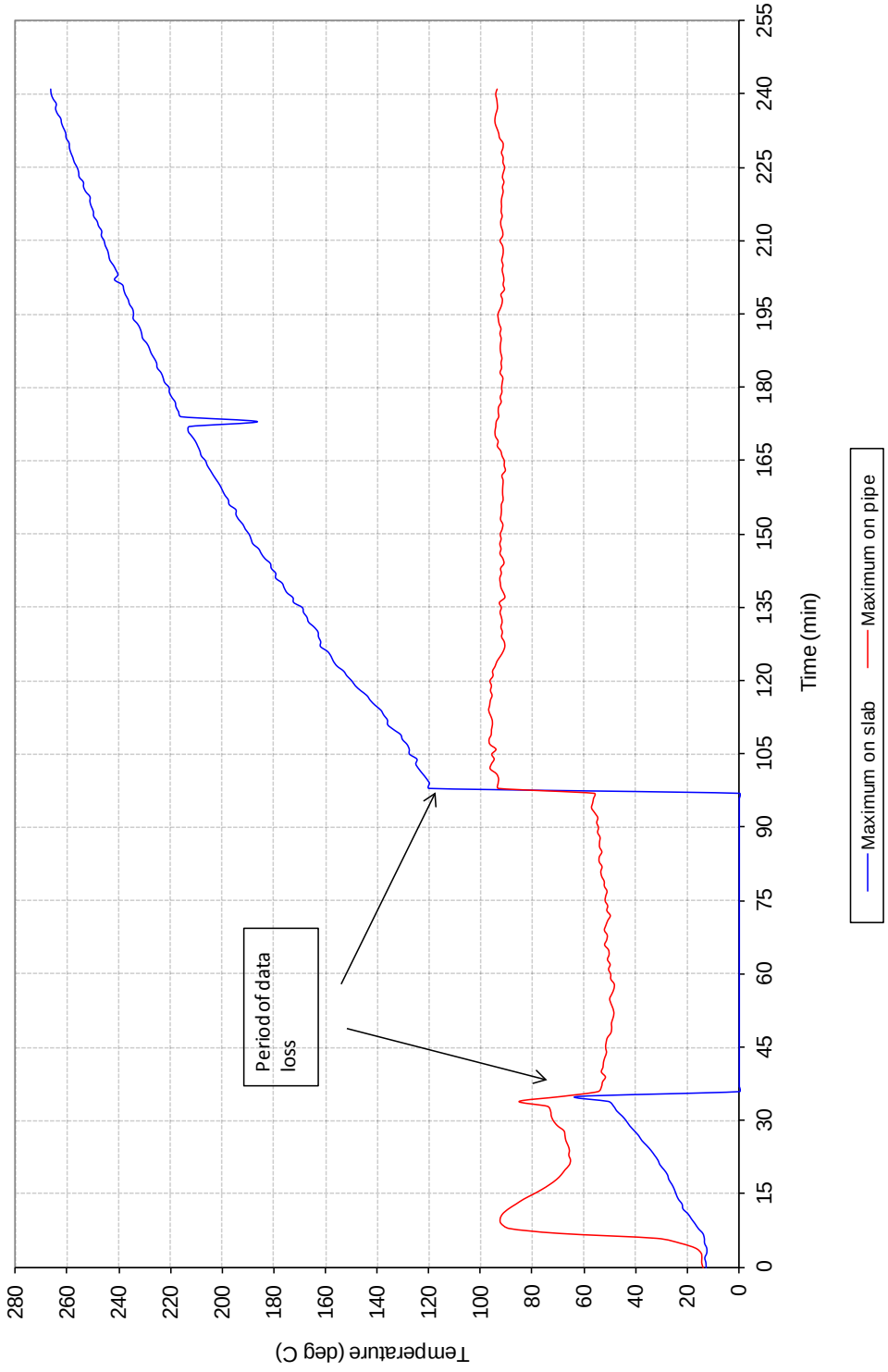


FIGURE 3 – SPECIMEN TEMPERATURE – ASSOCIATED WITH PENETRATION 1

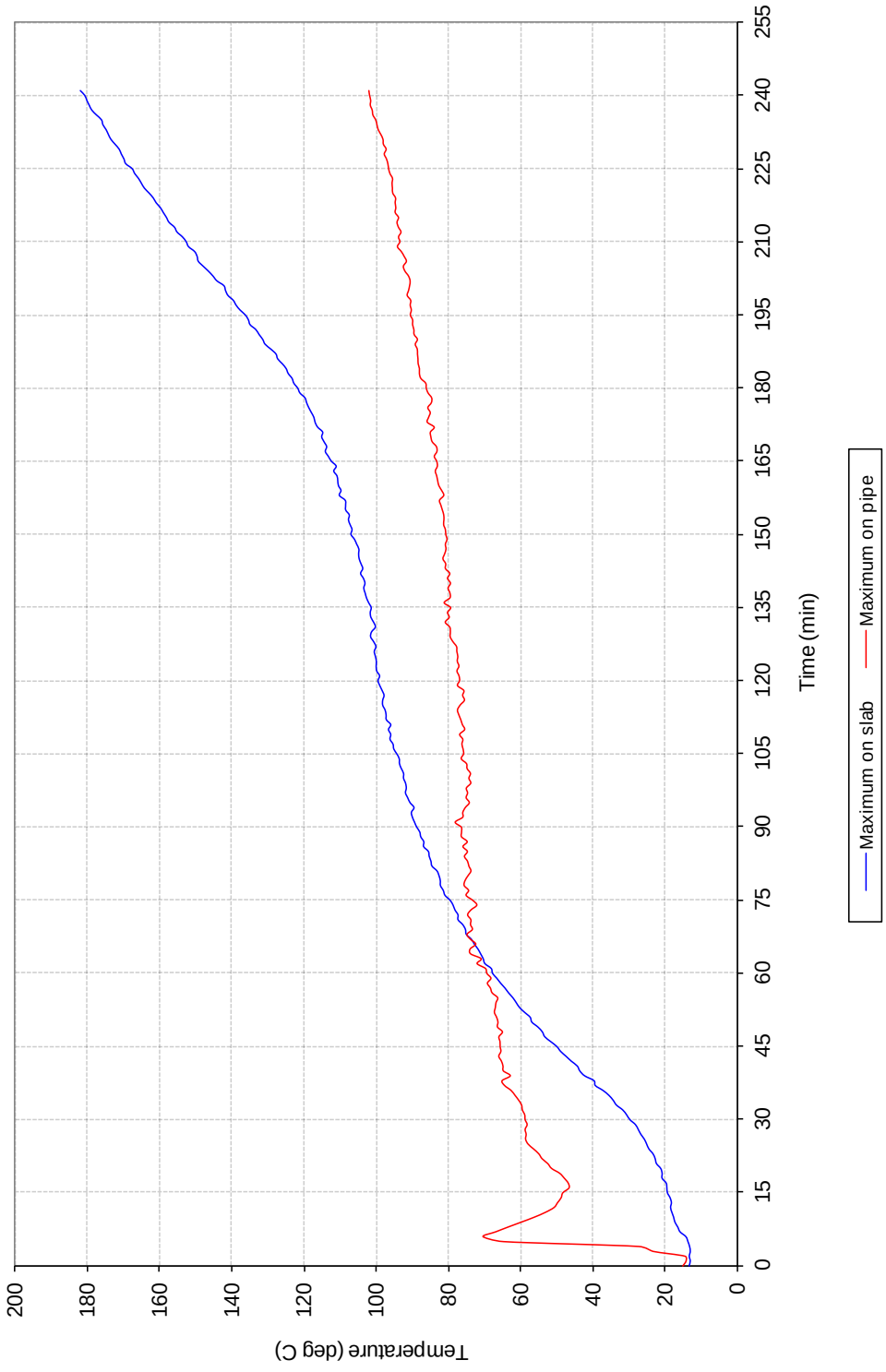


FIGURE 4 – SPECIMEN TEMPERATURE – ASSOCIATED WITH PENETRATION 2

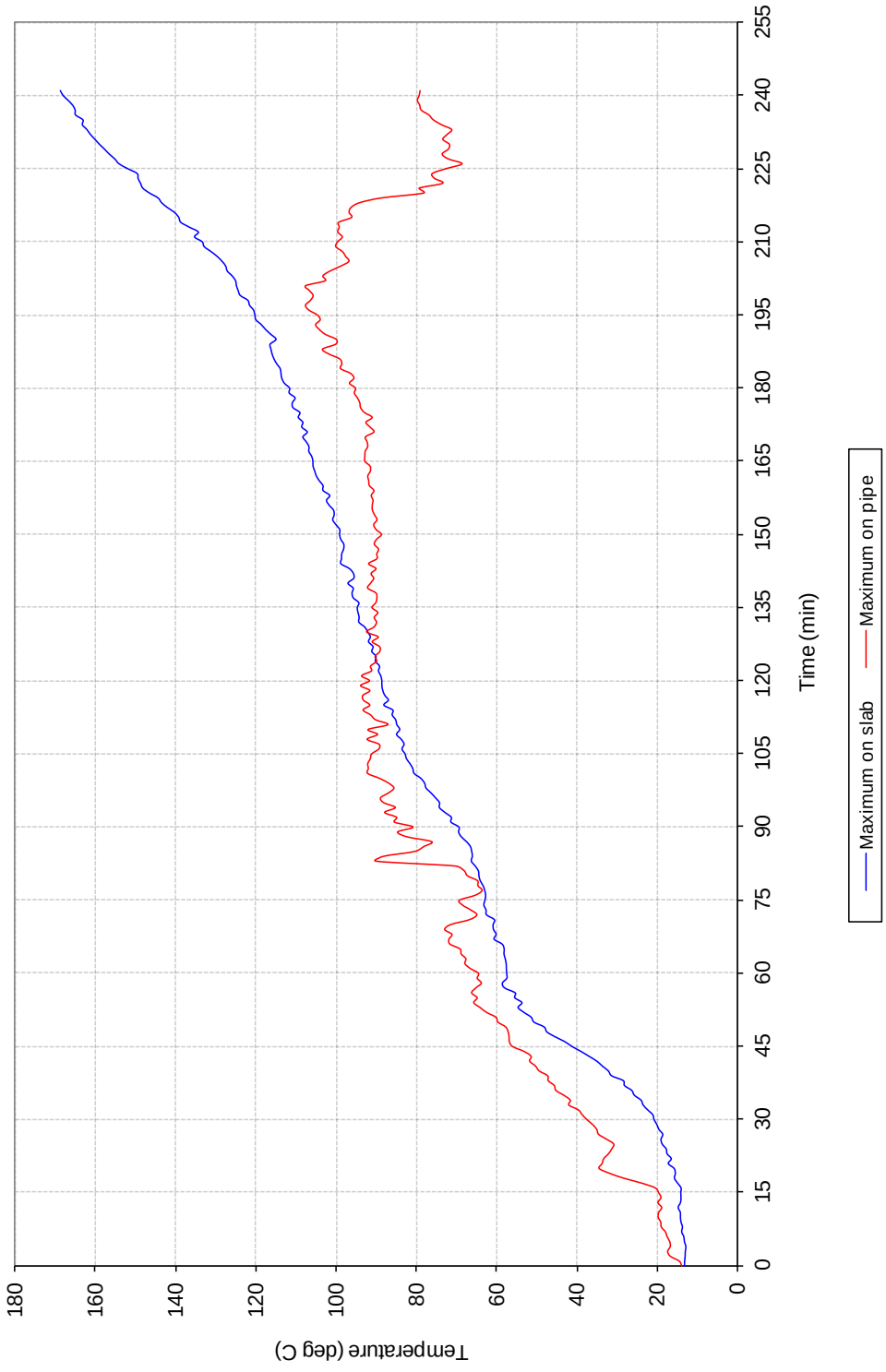


FIGURE 5 – SPECIMEN TEMPERATURE – ASSOCIATED WITH PENETRATION 3

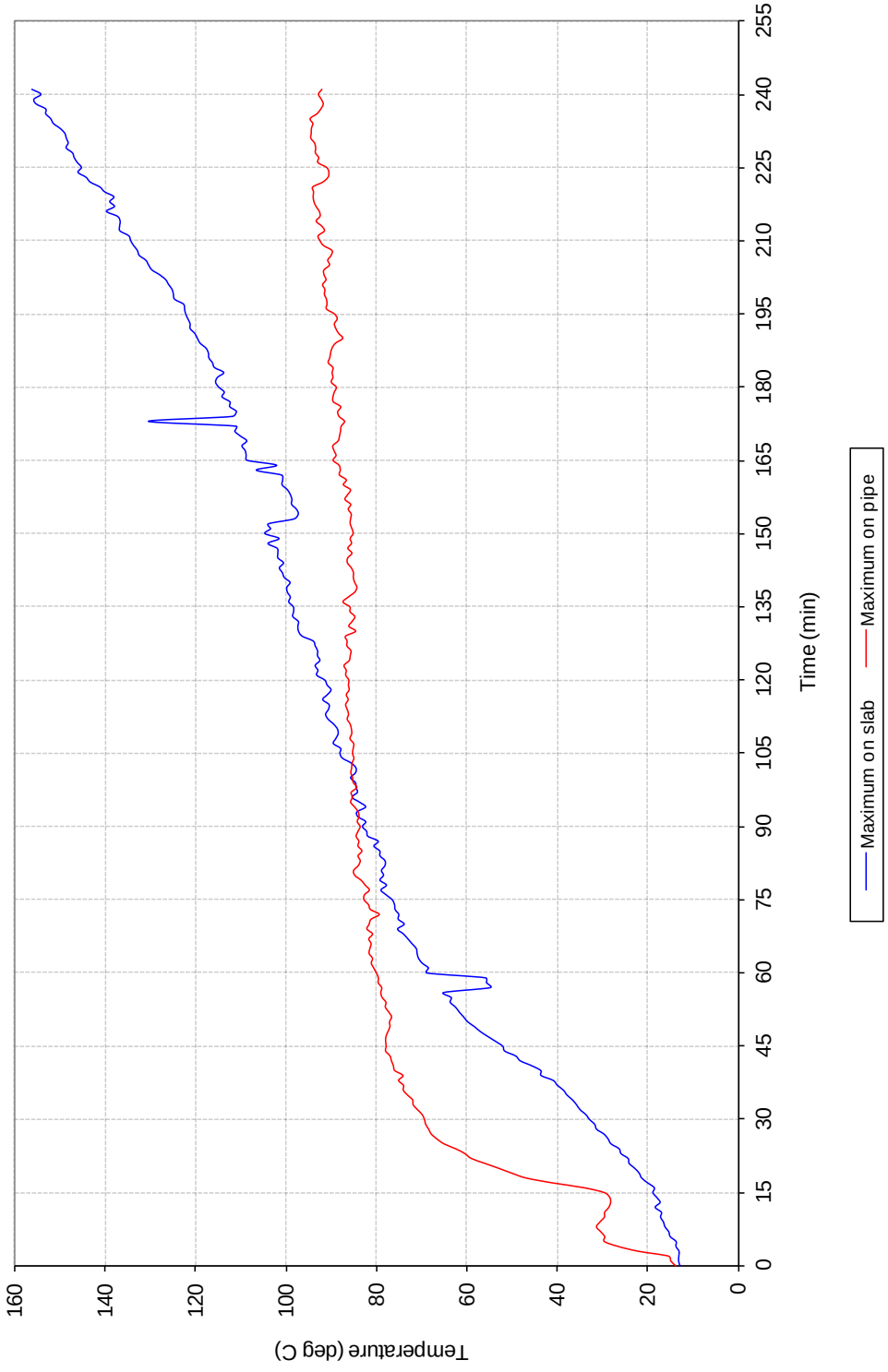


FIGURE 6 – SPECIMEN TEMPERATURE – ASSOCIATED WITH PENETRATION 4

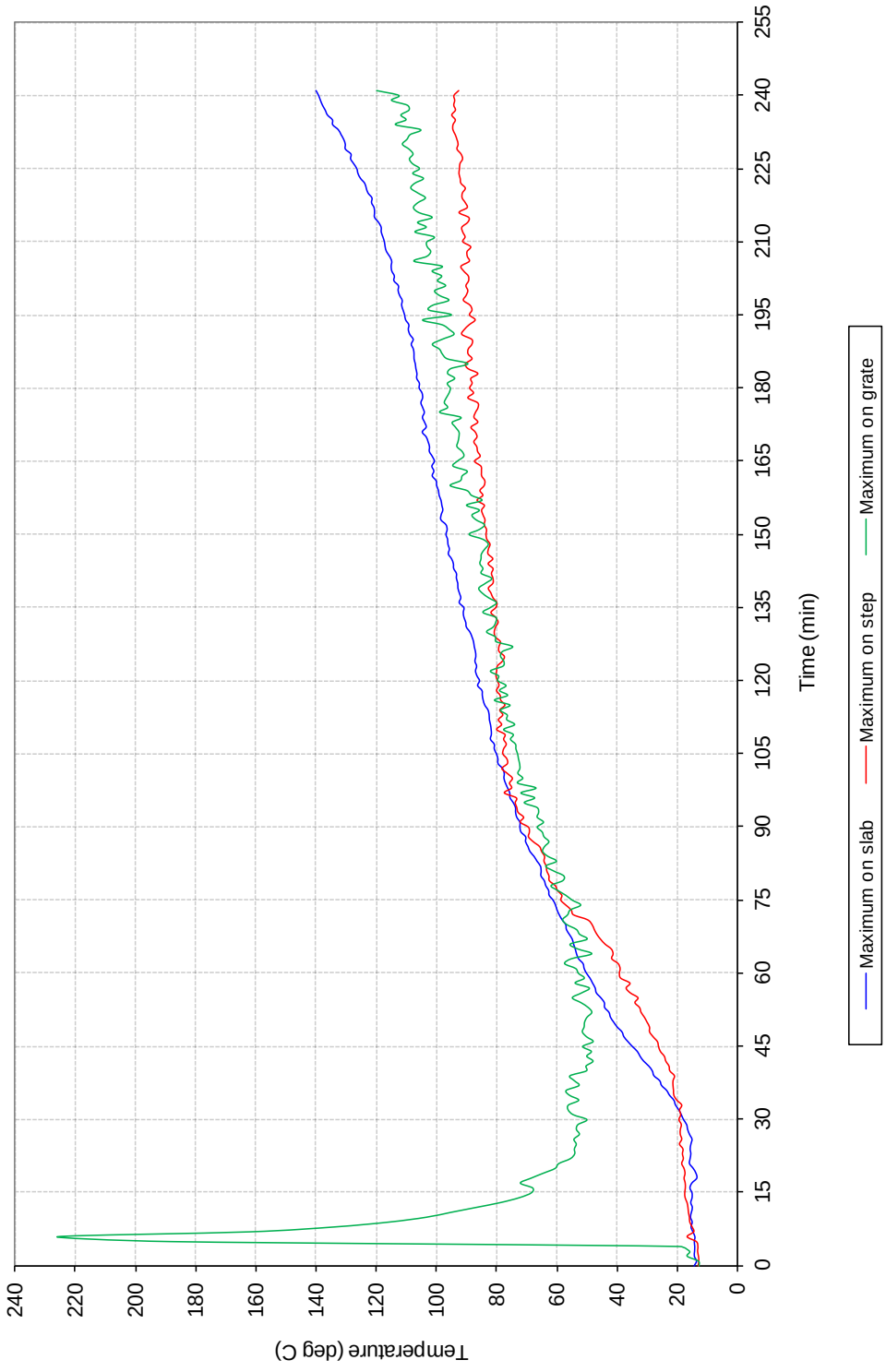


FIGURE 7 – SPECIMEN TEMPERATURE – ASSOCIATED WITH PENETRATION 5

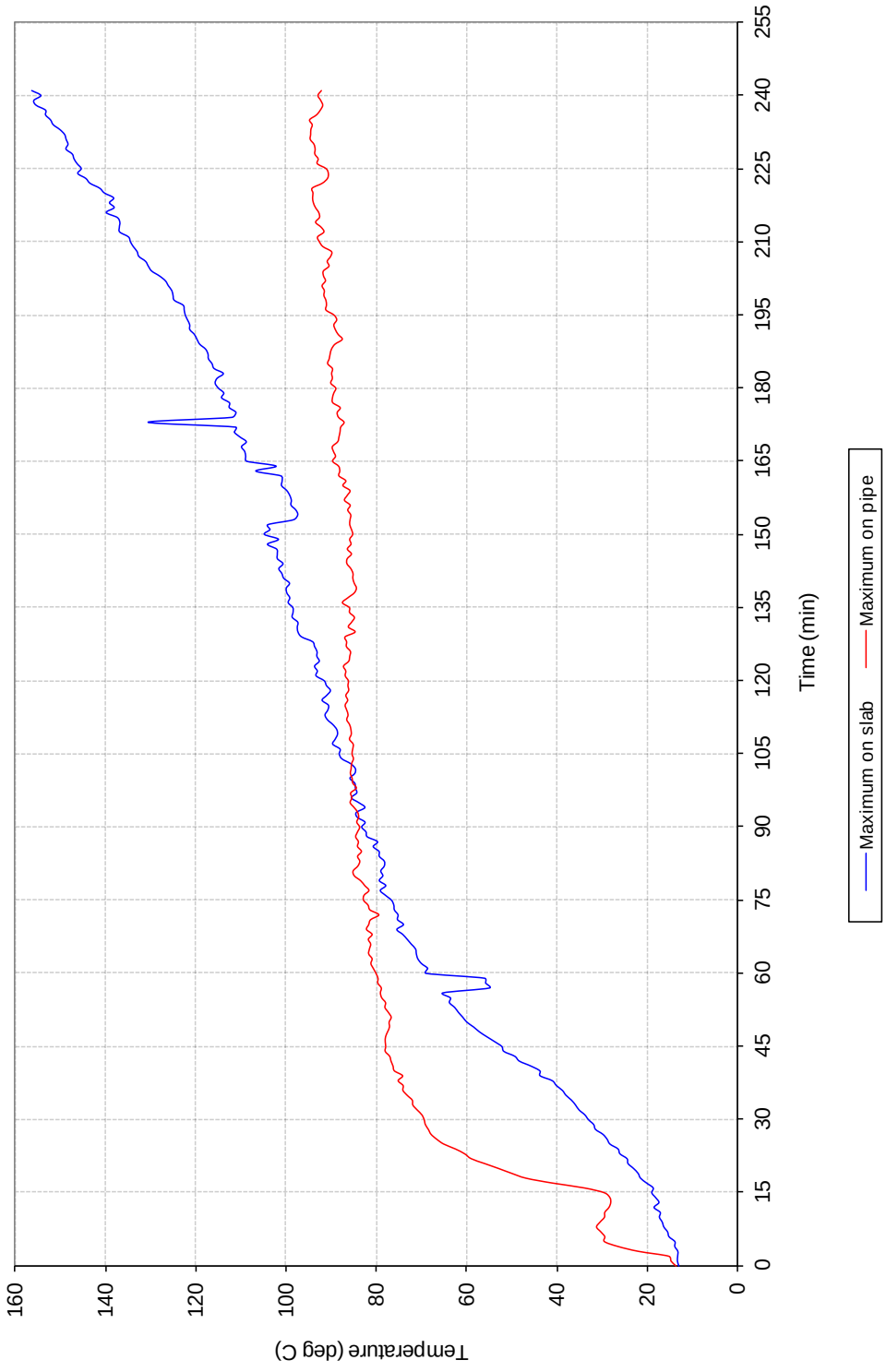
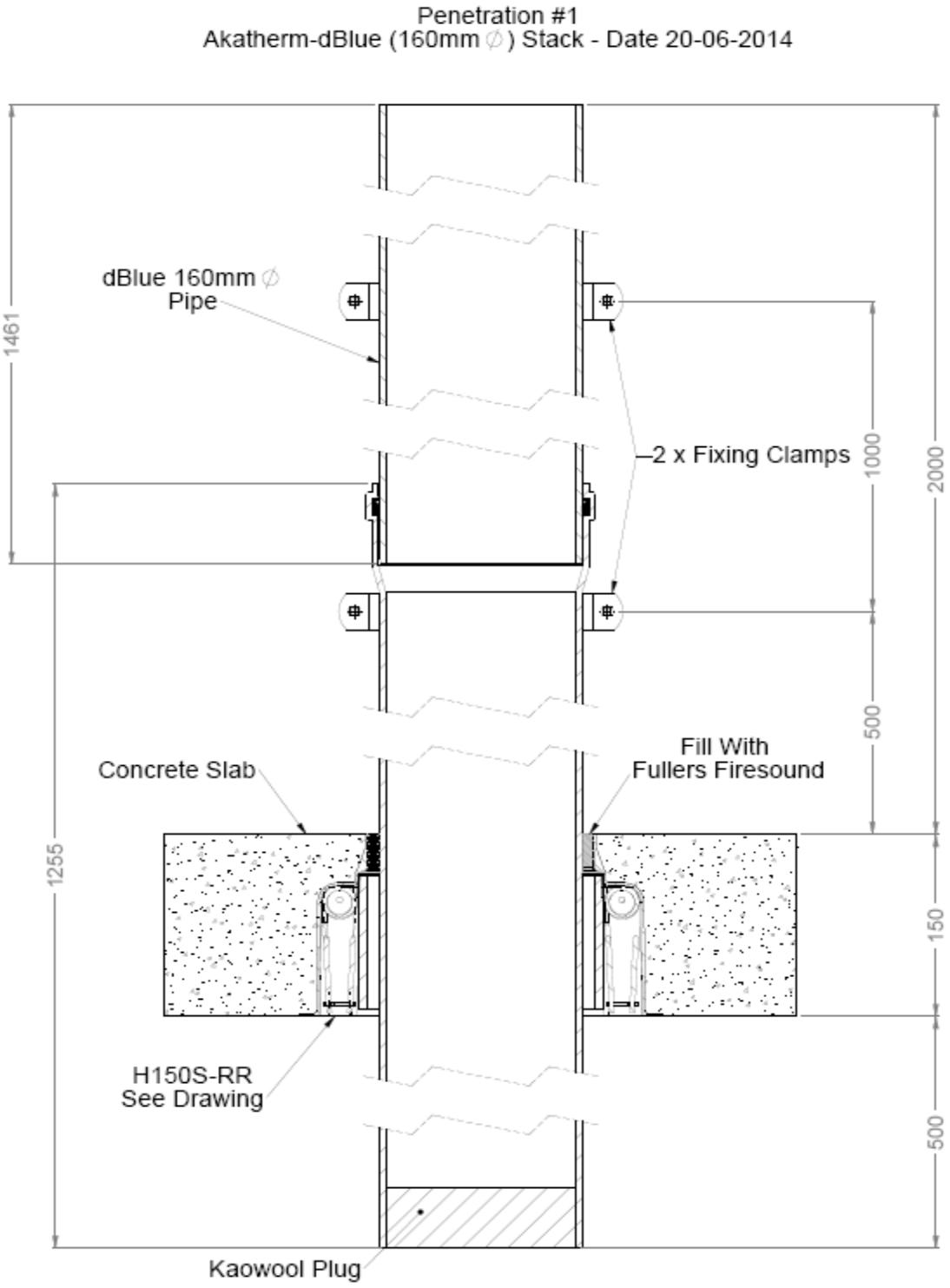
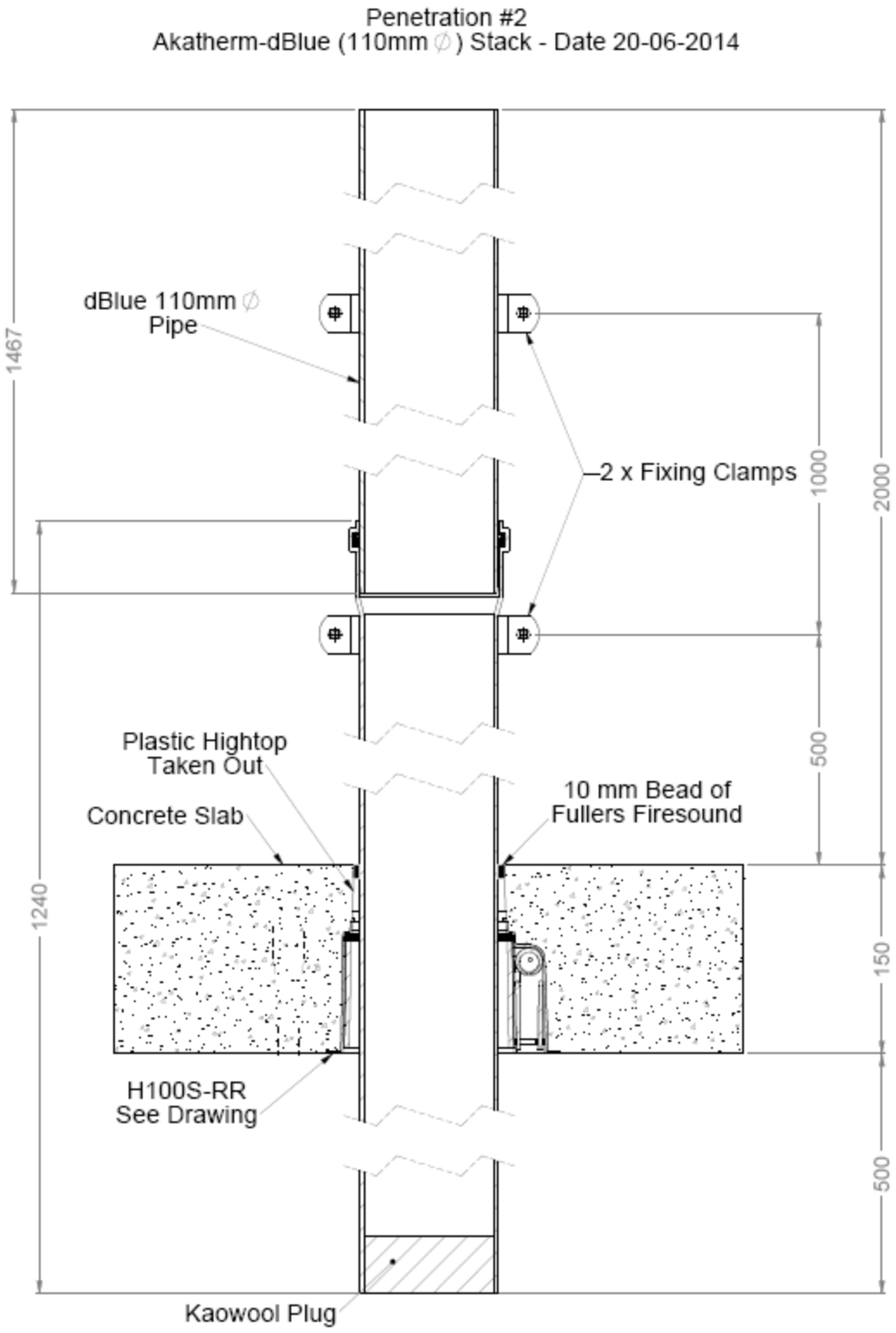


FIGURE 8 – SPECIMEN TEMPERATURE – ASSOCIATED WITH PENETRATION 6

Appendix D – Installation drawings



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



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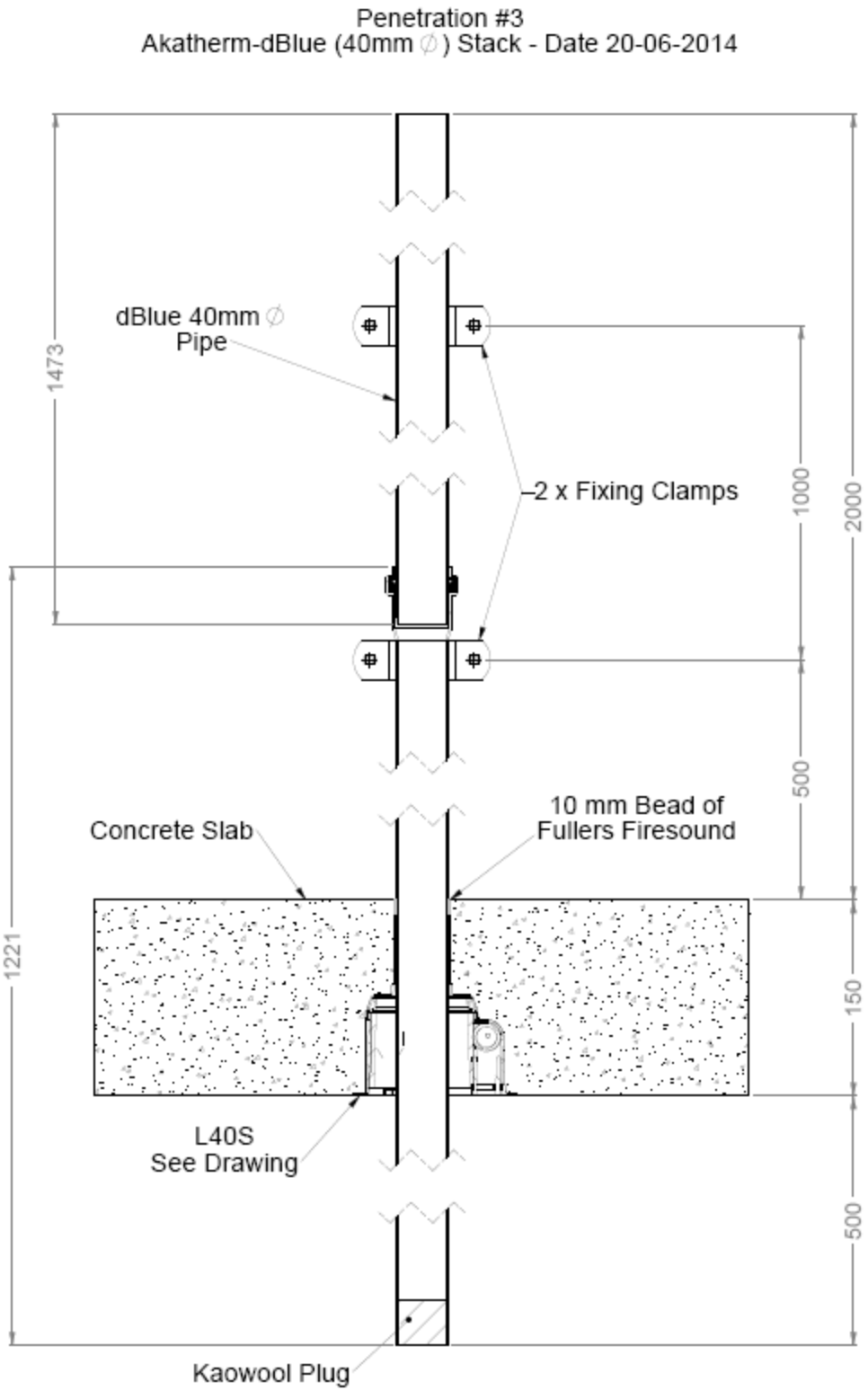

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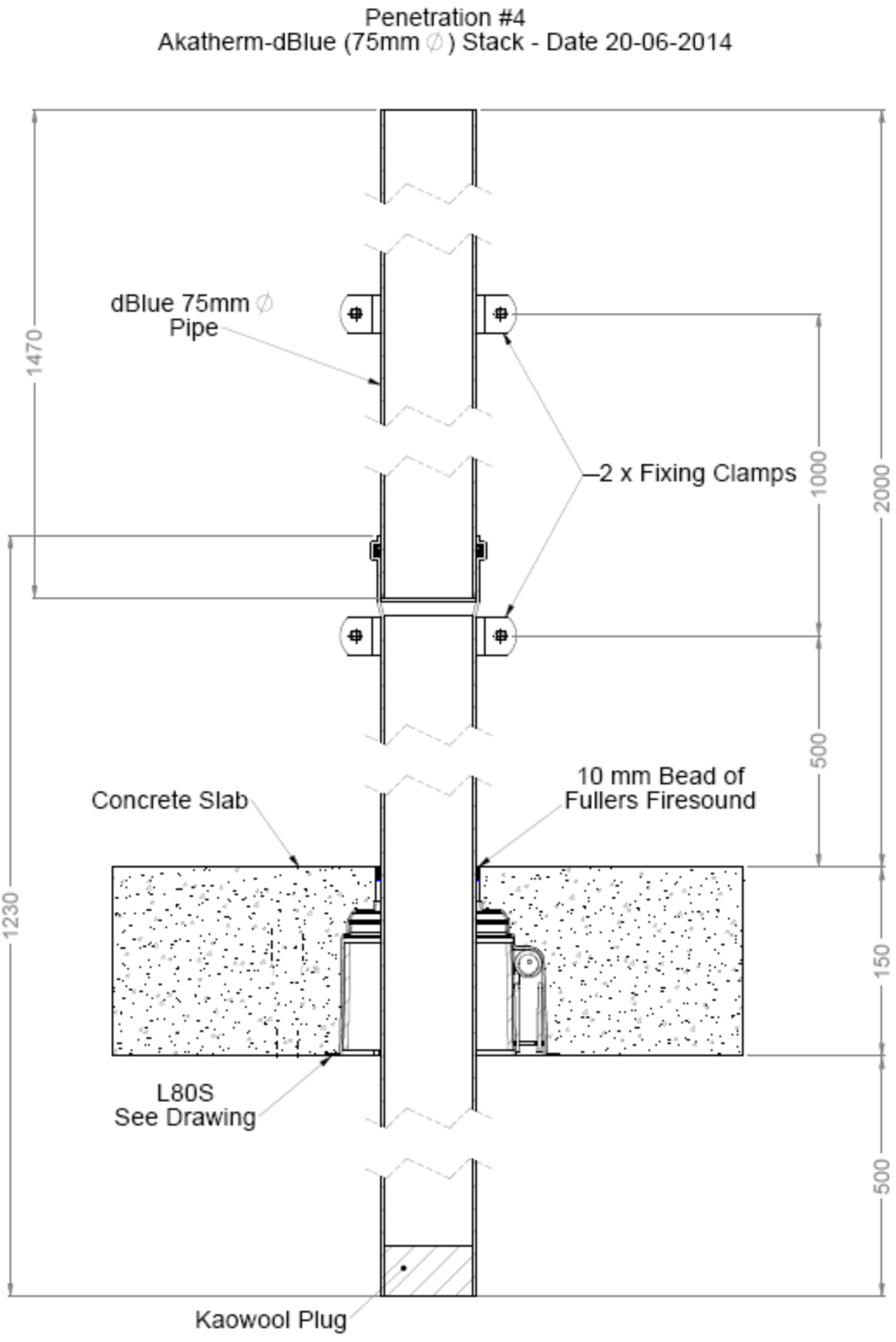
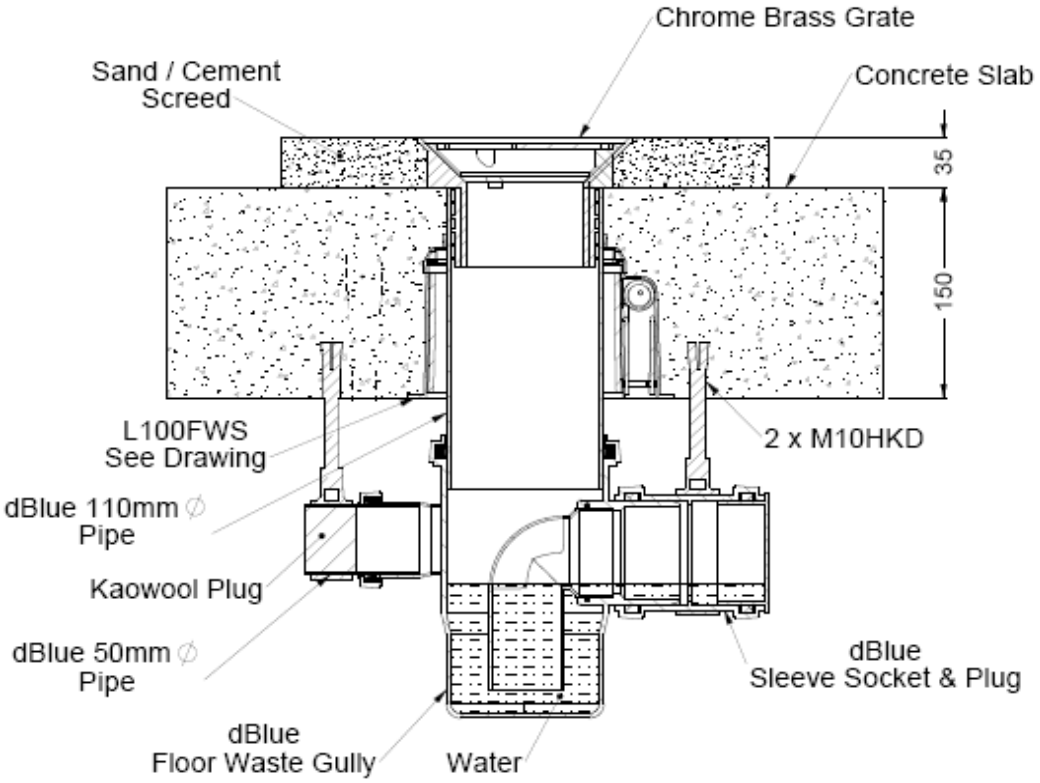


DRAWING TITLED "PENETRATION #4 – AKATHERM-DBLUE (75-MM OD) STACK" DATED 20 JUNE 2014, BY SNAP FIRE SYSTEMS PTY LTD

Penetration #5
Akatherm-dBlue (110mm ∅) Floorwaste - Date 20-06-2014



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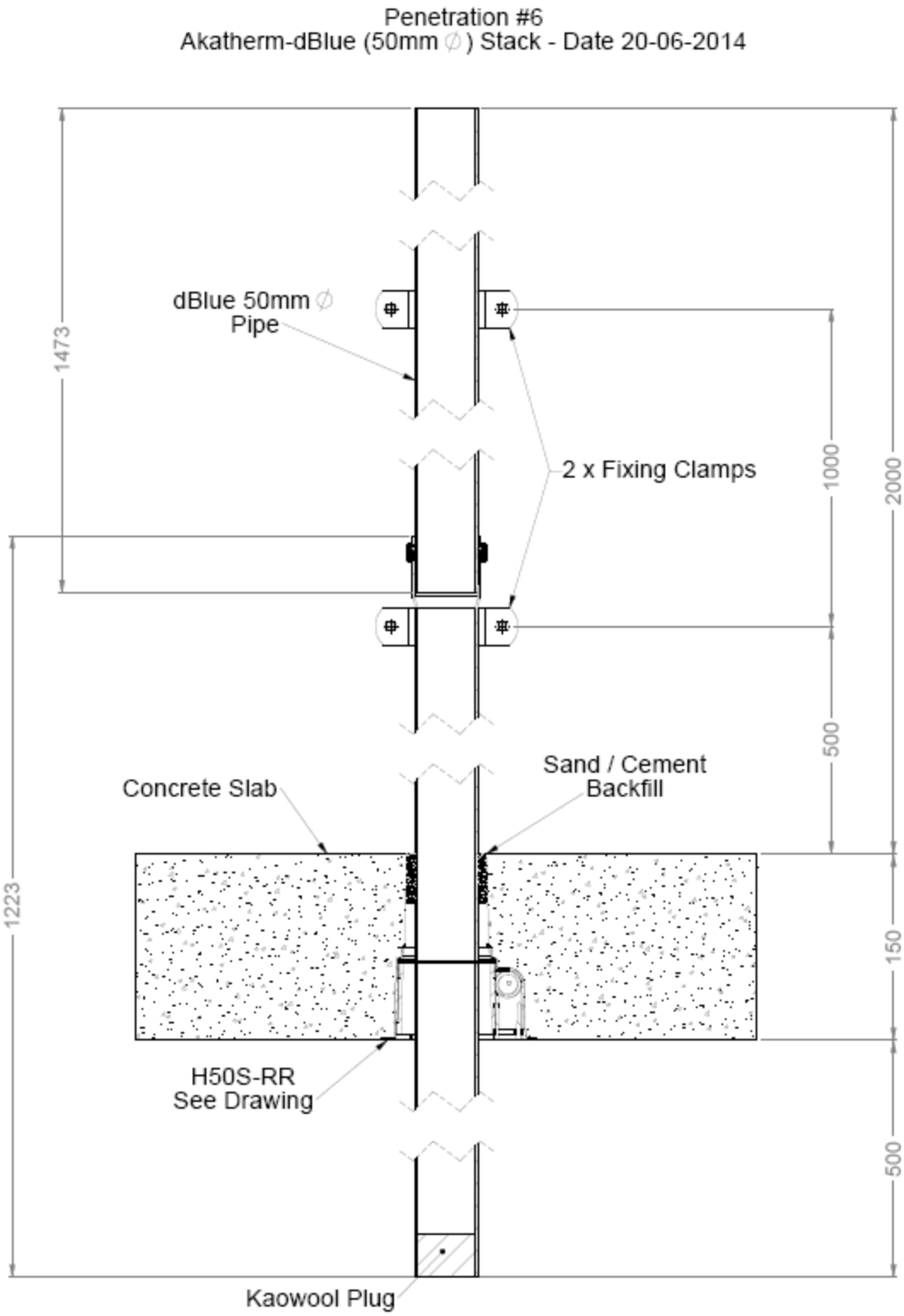
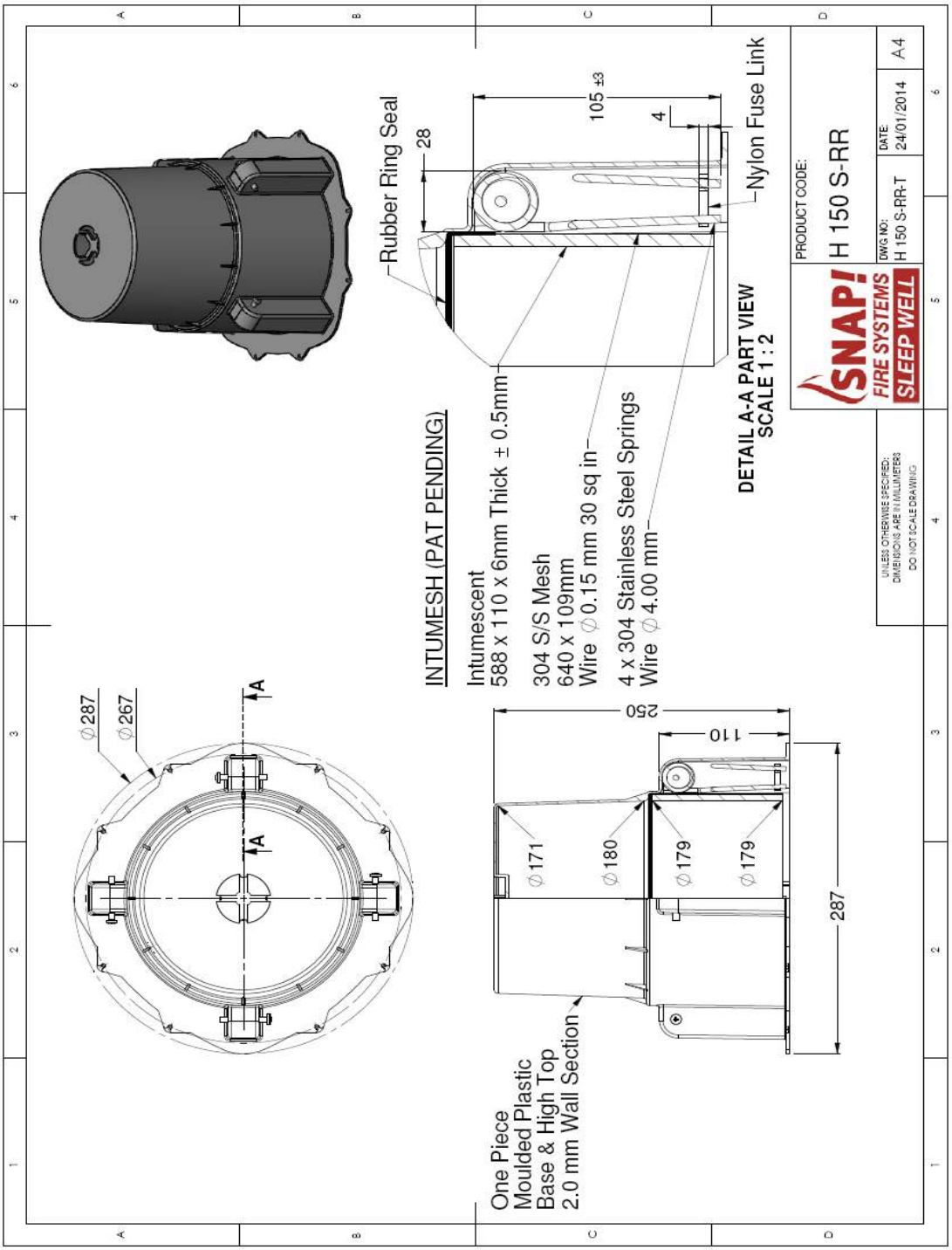


DRAWING TITLED "PENETRATION #6 – AKATHERM-DBLUE (50-MM OD) STACK" DATED 20 JUNE 2014, BY SNAP FIRE SYSTEMS PTY LTD

Appendix E – Specimen Drawings



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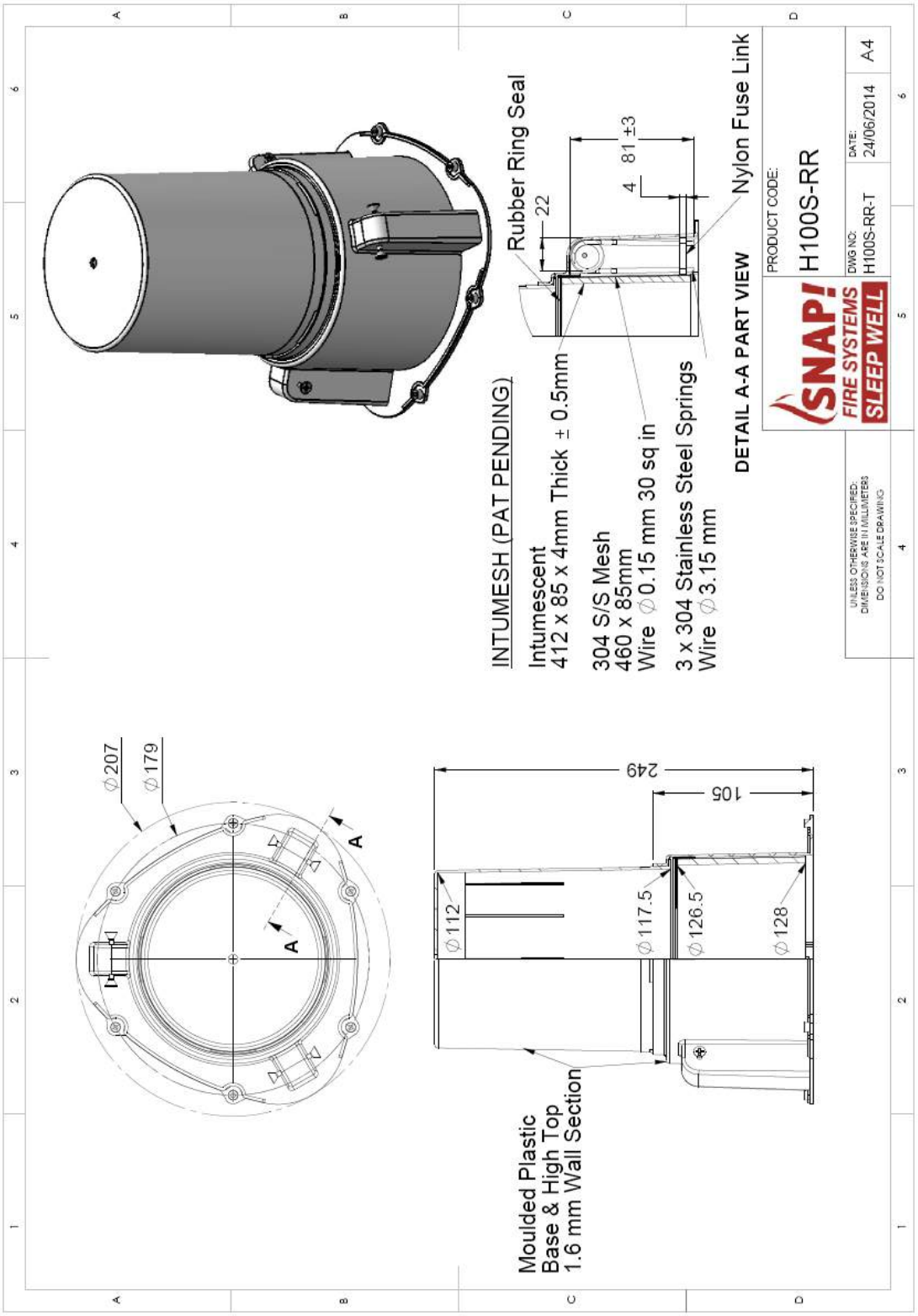

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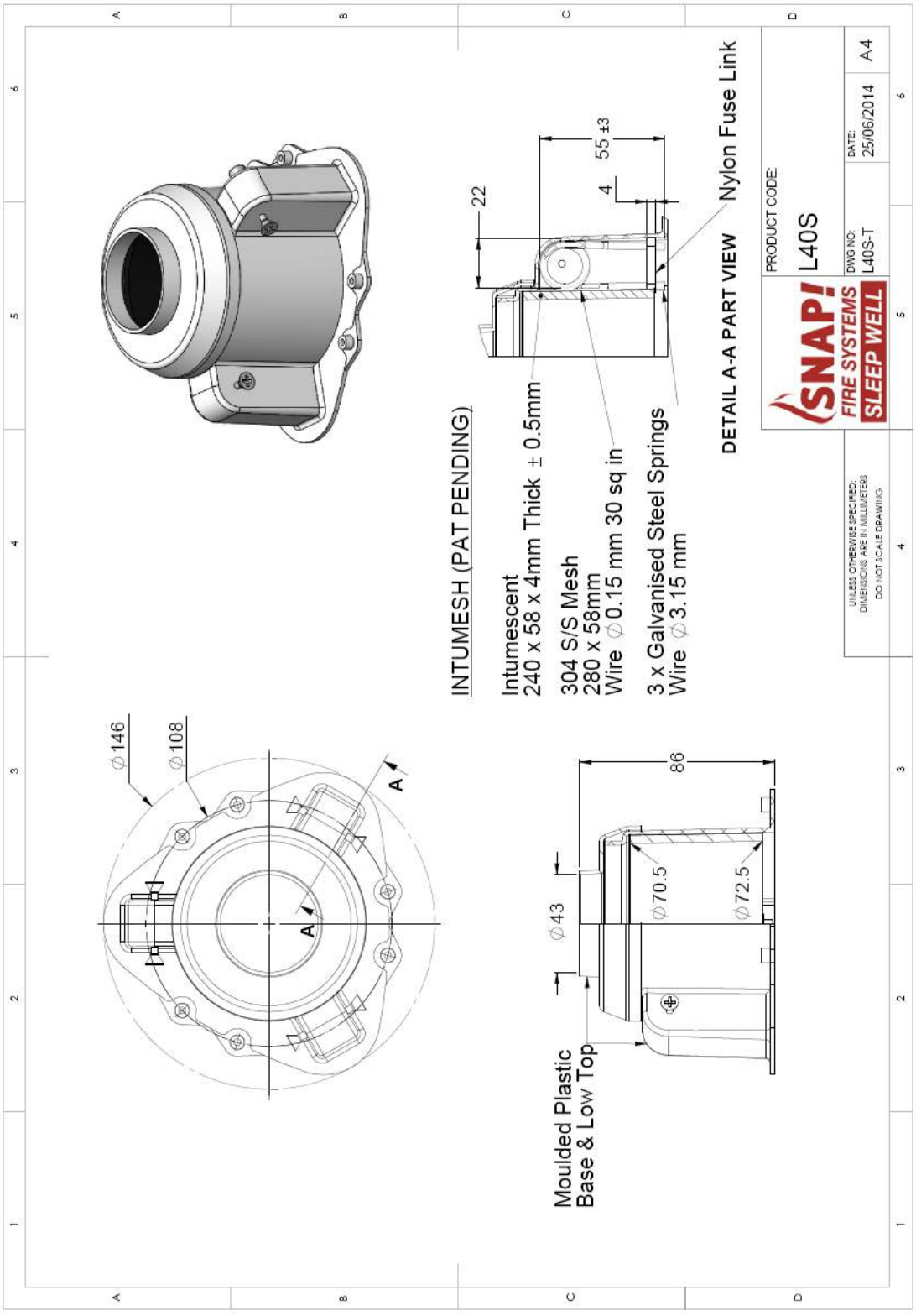
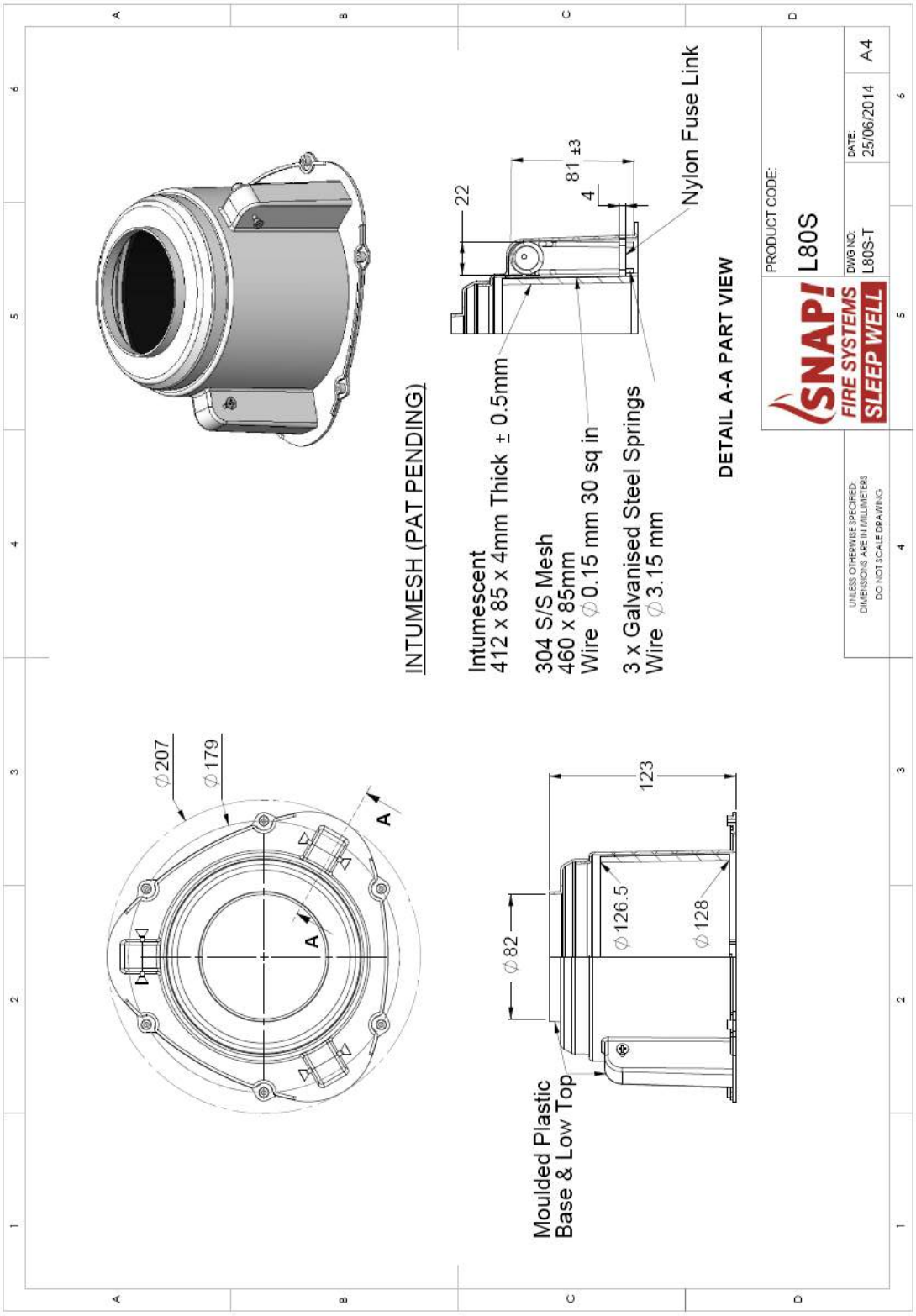


DRAWING NUMBERED L40S-T DATED 25 JUNE 2014, BY SNAP FIRE SYSTEMS PTY LTD



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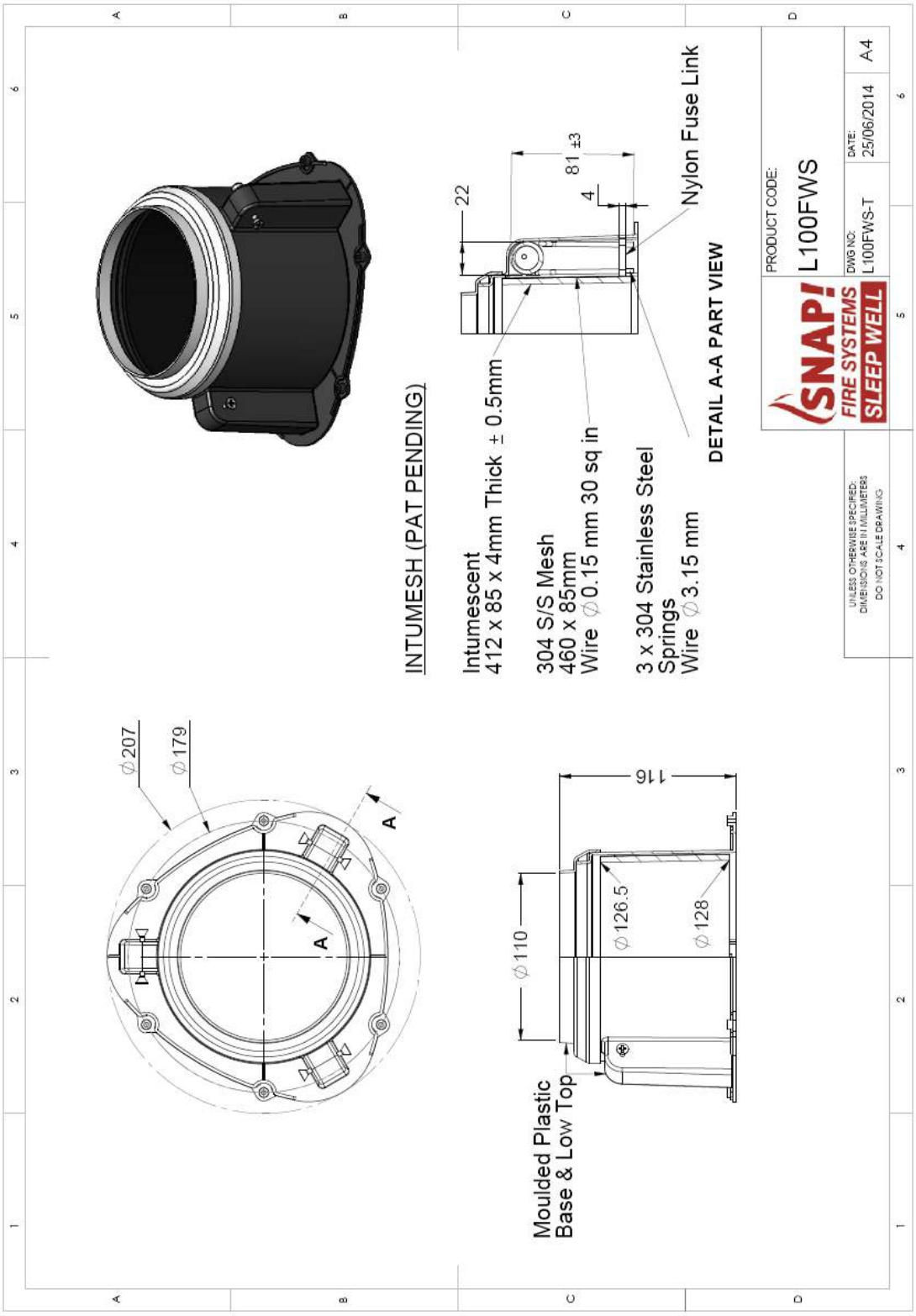

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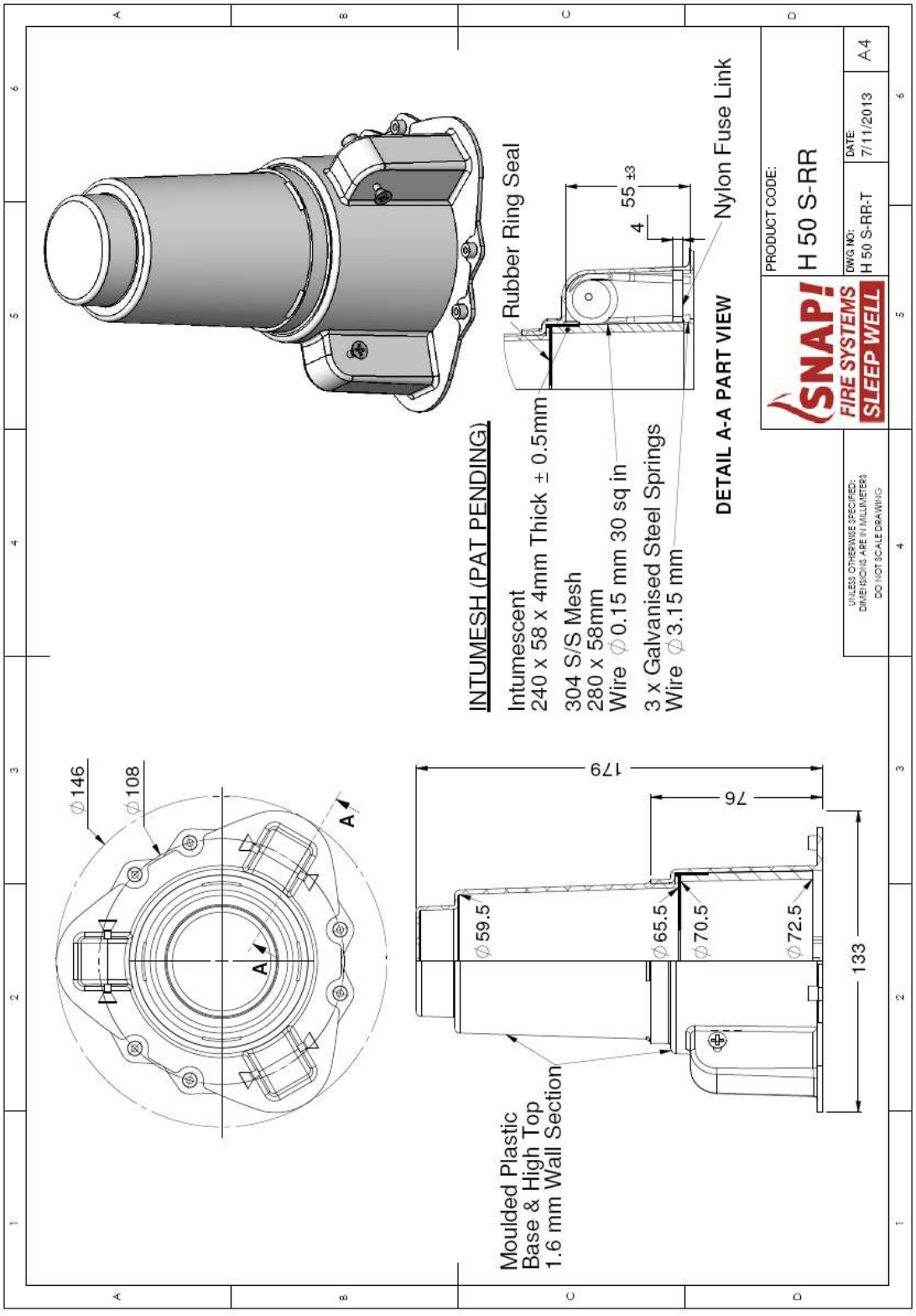

DRAWING NUMBERED H50 S-RR-T DATED 7 NOVEMBER 2013, BY SNAP FIRE SYSTEMS PTY LTD

Appendix F – Certificates

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Certificate of Test

No. 2570

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 1648.

Product Name: Penetration 1 – H150 S-RR cast-in fire collar protecting a 160-mm diameter dBlue pipe.

Description: The SNAP Cast-in H150 S-RR fire collar comprised a 2-mm thick polypropelene 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, 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 dBlue stack pipe, with a wall thickness of 6-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 – Akatherm-dBlue (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. The Akatherm dBlue pipes are stated to be constructed of a polypropylene inner layer (1.4 g/cm^3 density), a mineral-filled polypropylene middle layer and a polypropylene outer layer (1.2 g/cm^3 density).
On the unexposed face, the annular gap between the pipe and the slab was filled with Fullers Firesound sealant as shown in drawing titled "Penetration #2 – Akatherm-dBlue (110-mm OD) Stack" dated 20 June 2014, by Snap Fire Systems Pty Ltd.

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	153 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.

Testing Officer: Mario Lara-Ledermann Date of Test: 7 July 2014

Issued on the 1st day of September 2014 without alterations or additions.

B. Roddy

Brett Roddy
Manager, Fire Testing and Assessments

NATA	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. 2570

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

Certificate of Test

No. 2571

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 1648.

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

Description: The SNAP Cast-in H100 S-RR fire collar comprised a 1.6-mm thick polypropelene 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 stainless steel springs, 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 dBlue 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 "Penetration #2 – Akatherm-dBlue (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. The Akatherm dBlue pipes are stated to be constructed of a polypropylene inner layer (1.4 g/cm^3 density), a mineral-filled polypropylene middle layer and a polypropylene outer layer (1.2 g/cm^3 density).

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.

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	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: 7 July 2014

Issued on the 1st day of September 2014 without alterations or additions.

B. Roddy

Brett Roddy
Manager, Fire Testing and Assessments

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Certificate of Test

No. 2572

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 1648.

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

Description: The SNAP Cast-in L40S fire collar comprised a 1.6-mm thick polypropelene 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, 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 dBlue stack pipe, with a wall thickness of 1.8-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 "Penetration #3 – Akatherm-dBlue (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. The Akatherm dBlue pipes are stated to be constructed of a polypropylene inner layer (1.4 g/cm^3 density), a mineral-filled polypropylene middle layer and a polypropylene outer layer (1.2 g/cm^3 density).

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.

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	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: 7 July 2014

Issued on the 1st day of September 2014 without alterations or additions.

B. Roddy

Brett Roddy
Manager, Fire Testing and Assessments

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Certificate of Test

No. 2573

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 1648.

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

Description: The SNAP Cast-in L80S fire collar comprised a 1.6-mm thick polypropelene 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, 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 dBlue 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 "Penetration #4 – Akatherm-dBlue (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. The Akatherm dBlue pipes are stated to be constructed of a polypropylene inner layer (1.4 g/cm^3 density), a mineral-filled polypropylene middle layer and a polypropylene outer layer (1.2 g/cm^3 density).

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.

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	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: 7 July 2014

Issued on the 1st day of September 2014 without alterations or additions.

B. Roddy

Brett Roddy
Manager, Fire Testing and Assessments

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Certificate of Test

No. 2574

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 1648.

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

Description: The SNAP Cast-in L100FWS fire collar comprised a 1.6-mm thick polypropelene 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, 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.

T he penetrating service comprised a 110-mm dBlue 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 dBlue floor waste gully was connected to the penetrating pipe with a glad nut within the collar, supported by 2 x M10 HKD clamps fixed to the concrete slab as shown in drawing titled "Penetration #5 – Akatherm-dBlue (110-mm OD) Floorwaste" dated 20 June 2014, by Snap Fire Systems Pty Ltd. On the exposed end, the pipe was capped with a Kaowool Plug. The Akatherm dBlue pipes are stated to be constructed of a polypropylene inner layer (1.4 g/cm^3 density), a mineral-filled polypropylene middle layer and a polypropylene outer layer (1.2 g/cm^3 density).
The trap was filled with water before the start of the test to the level shown in drawing titled "Penetration #5 – Akatherm-dBlue (110-mm OD) Floorwaste" dated 20 June 2014, by Snap Fire Systems Pty Ltd.

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	6 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/240/0. 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: 7 July 2014

Issued on the 1st day of September 2014 without alterations or additions.

B. Roddy

Brett Roddy
Manager, Fire Testing and Assessments

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Certificate of Test

No. 2575

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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 1648.

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

Description: The SNAP Cast-in H50 S-RR fire collar comprised a 1.6-mm thick polypropelene 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, with nylon fuse links and a 280-mm x 58-mm stainless steel mesh as shown in drawing numbered H50 S-RR-T dated 7 November 2013, by SNAP Fire Systems Pty Ltd.
The penetrating service comprised a 50-mm dBlue stack pipe, with a wall thickness of 2.5-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 – Akatherm-dBlue (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.
The Akatherm dBlue pipes are stated to be constructed of a polypropylene inner layer (1.4 g/cm^3 density), a mineral-filled polypropylene middle layer and a polypropylene outer layer (1.2 g/cm3 density).
On the unexposed face, the annular gap between the pipe and slab was sealed with sand and cement backfill.

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	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: 7 July 2014

Issued on the 1st day of September 2014 without alterations or additions.

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Brett Roddy
Manager, Fire Testing and Assessments

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References

The following informative documents are referred to in this Report:

AS 1530.4-2005	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.

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FOR FURTHER INFORMATION

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