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

Test Report

Author: Mario Lara-Ledermann
Report number: FSP 1673
Date: 28 April 2015

Client: Snap Fire Systems Pty Ltd

Inquiries should be address to:

Fire Testing and Assessments

Infrastructure Technologies
14 Julius Avenue
North Ryde, NSW 2113
Telephone +61 2 9490 5444

Author

Infrastructure Technologies
14 Julius Avenue
North Ryde, NSW 2113
Telephone +61 2 9490 5500

The Client

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	28/04/2015	CSIRO/SNAP	FSP 1673

Report Authorization:

AUTHOR	REVIEWED BY	AUTHORISED BY
Mario Lara-Ledermann	Brett Roddy	Brett Roddy
		
28 April 2015	28 April 2015	28 April 2015

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Excerpts of the Report may not be published.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.

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 1673

1 Introduction

1.1 Identification of specimen

The sponsor identified the specimen as Snap Cast-in Fire Collars protecting a 150-mm thick concrete slab penetrated by four (4) floor wastes and one (1) stack pipe.

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 4456/3807

1.7 Test date

The fire-resistance test was conducted on 29 October 2014.

2 Description of specimen

2.1 General

The specimen comprised an 1150-mm x 1150-mm x 150-mm thick reinforced concrete slab penetrated by four (4) floor waste systems and one (1) stack pipe protected by cast-in and retrofit Snap Fire System fire collars. The pipes are stated to be manufactured in accordance with AS/NSZ 1260.

For the purpose of the test, the specimens were referenced as Penetrations 1, 2, 3, 4 and 5. Only three (3) specimens are included in this report.

Penetration 3 – H 50S cast-in fire collar + LP50R retrofitted fire collar protecting a 56-mm diameter Polyvinyl Chloride (PVC) pipe incorporating a floor waste

The SNAP Cast-in H 50S 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 intumescent material. The closing mechanism comprised three galvanised steel springs, nylon fuse links and a 280-mm x 58-mm stainless steel mesh, as shown in drawing numbered H 50 S-T, dated 7 November 2013, by SNAP Fire Systems. The collar was cast in a 150-mm diameter hole in the slab filled with Morgan “Moral Coolcast” grade 110 LW-K.

The SNAP LP50R retrofitted fire collar comprised a 0.75-mm steel casing with a 69-mm inner diameter and a 203-mm diameter base flange. The 62-mm high collar casing incorporated a 255-mm x 58-mm x 4-mm thick intumescent material. The closing mechanism comprised three stainless steel springs, nylon fuse links and a 260-mm x 58-mm stainless steel mesh, as shown in drawing numbered LP50R-T, dated 14 January 2015, by SNAP Fire Systems. The collar was fixed to the underside of the slab with Powers PBZ0635 fasteners as shown in drawing titled “Penetration #3 H50 S + LP50R on Floor Waste”, dated 29 October 2014, by Snap Fire Systems Pty Ltd.

The penetrating service comprised a 56-mm OD PVC pipe, with a wall thickness of 2.2-mm fitted through the H 50 S and LP 50 R Snap fire collars. The floor waste system was fitted with a chromed brass floor waste grate. A 35-mm thick cement screed was laid on top of the concrete slab and finished flush with the floor grate. On the exposed side of the slab, a 56-mm OD PVC gully trap was connected to the penetrating pipe, supported by a M10 HKD clamp fixed to the concrete slab. On the exposed face, the gully trap was capped using a PVC end cap.

The floor waste gully was charged with water to the level shown in drawing titled “Penetration #3 H50 S + LP50R on Floor Waste”, dated 29 October 2014, by Snap Fire Systems Pty Ltd.

Penetration 4 – H 100S cast-in fire collar + LP100R retrofitted fire collar protecting a 110-mm diameter Polyvinyl Chloride (PVC-SC) pipe incorporating a floor waste

The SNAP Cast-in H 100S 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 intumescent material. The closing mechanism comprised three galvanised steel springs, nylon fuse links and a 460-mm x 85-mm stainless steel mesh, as shown in drawing numbered H 100 S-T, dated 24 June 2014, by SNAP Fire Systems. The collar was cast in a 220-mm diameter hole in the slab filled with Morgan “Moral Coolcast” grade 110 LW-K.

The SNAP LP100R retrofitted fire collar comprised a 0.95-mm steel casing with a 118-mm inner diameter and a 257-mm diameter base flange. The 62-mm high collar casing incorporated a 400-mm x 57-mm x 6-mm thick intumescent material. The closing mechanism comprised three stainless steel springs, nylon fuse links and a 415-mm x 120-mm stainless steel mesh, as shown in drawing numbered LP100R-T, dated 4 November 2014, by SNAP Fire Systems. The collar was fixed to the underside of the slab with Powers PBZ0635 fasteners as shown in drawing titled "Penetration #4 H100 S + LP100R on Floor Waste", dated 29 October 2014, by Snap Fire Systems Pty Ltd.

The penetrating service comprised a 110-mm OD PVC sandwich construction pipe, with a wall thickness of 1.6-mm fitted through the H 100 S and LP 100 R Snap fire collars. The floor waste system was fitted with a chromed brass floor waste grate. A 35-mm thick cement screed was laid on top of the concrete slab and finished flush with the floor grate. On the exposed side of the slab, a nominal 100-mm OD PVC gully trap was connected to the penetrating pipe, supported by an M10 HKD clamp fixed to the concrete slab. On the exposed face, the gully trap was capped using a PVC end cap.

The floor waste gully was charged with water to the level shown in drawing titled "Penetration #4 H100 S + LP100R on Floor Waste", dated 29 October 2014, by Snap Fire Systems Pty Ltd.

Penetration 5 – 110R retrofitted fire collar protecting a 110-mm diameter Polyvinyl Chloride (PVC-SC) pipe

The SNAP 110R retrofitted fire collar comprised a 0.75-mm steel casing with a 127-mm inner diameter and a 214-mm diameter base flange. The 62-mm high collar casing incorporated three layers of 403-mm x 58-mm wide x 2.5-mm thick intumescent material. Between the intumescent layers, 58-mm wide stainless steel mesh was installed as shown in drawing numbered 110R-T, dated 4 November 2014, by SNAP Fire Systems.

The penetrating service comprised a 110-mm OD PVC sandwich construction pipe, with a wall thickness of 3.8-mm fitted through the collar's sleeve. The pipe projected vertically, 2000-mm above the concrete slab. The pipe was supported at 500-mm and 1000-mm from the unexposed face of the concrete slab. On the exposed side of the slab, the penetrating pipe was supported by Powers PBZ0635 Fastener fixed to the concrete slab. On the exposed face, the pipe was capped using a PVC end cap.

On the exposed face, the slab comprised a 150-mm diameter x 50-mm deep core resulting in a gap of 7-mm between the slab and the collar. The void between the pipe and the slab was filled with Fullers Firesouncd as show in drawing title "Penetration #5 100 Retro on Stack", dated 29 October 2014, by Snap Fire Systems Pty Ltd.

On the unexposed face, the gap between the pipe and the slab was filled with 2.5-mm bead of Fullers Firesound as show in drawing title "Penetration #5 100 Retro on Stack", dated 29 October 2014, by Snap Fire Systems Pty Ltd.

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.

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 numbered “Penetration #3 H50 S + LP50R on Floor Waste”, dated 29 October 2014, by Snap Fire Systems Pty Ltd.

Drawing numbered “Penetration #4 H100 S + LP100R on Floor Waste”, dated 29 October 2014, by Snap Fire Systems Pty Ltd.

Drawing numbered “Penetration #5 100 Retro on Stack”, dated 29 October 2014, by Snap Fire Systems Pty Ltd.

Drawing numbered LP 50R-T, dated 14 January 2015, by Snap Fire Systems Pty Ltd.

Drawing numbered H 50 S-T, dated 7 November 2013, by Snap Fire Systems Pty Ltd.

Drawing numbered LP 100R-T, dated 4 November 2014, by Snap Fire Systems Pty Ltd.

Drawing numbered H 100S-T, dated 24 June 2014, by Snap Fire Systems Pty Ltd.

Drawing numbered 110R-T, dated 4 November 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
1 minute -	Smoke is observed at the base of Penetration 5.
4 minutes -	Cotton wool pad test applied to Penetration 4 (floor waste) – no ignition.
5 minutes -	Distortion of plastic is noted at base of Penetration 5 (stack pipe).
6 minutes -	The hob of Penetration 3 is now approximately 20-mm above the slab. Penetrations 3 and 4 are all fluing smoke.
7 minutes -	Smoke is observed from the furnace flues.
11 minutes -	Penetration 4 continue to flue smoke.
12 minutes -	Penetration 5 has deformed to a height of 600-mm above the slab.
16 minutes -	A small amount of smoke is visible from Penetration 4. No fluing is visible from Penetration 5.
40 minutes -	Hob of Penetration 4 approximately 2-mm above the slab.
53 minutes -	Small amount of smoke is visible from Penetration 3.

120 minutes - Penetration 3 is fluing smoke. Hob of Penetration 4 is now level with slab. Hob of Penetration 3 above slab (on tilt) – see photograph # 4.

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 3.

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

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

8.5 Performance

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

Penetration 3 – H 50S cast-in fire collar + LP50R retrofitted fire collar protecting a 56-mm diameter Polyvinyl Chloride (PVC) pipe incorporating a floor waste

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

Penetration 4 – H 100S cast-in fire collar + LP100R retrofitted fire collar protecting a 110-mm diameter Polyvinyl Chloride (PVC-SC) pipe incorporating a floor waste

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

Penetration 5 – 110R retrofitted fire collar protecting a 110-mm diameter Polyvinyl Chloride (PVC-SC) 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 3	-	-/240/240;
Penetration 4	-	-/240/240; and
Penetration 5	-	-/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 step.	S1
	On slab 25-mm from step.	S2
	On step 25-mm from grate.	S3
	On step 25-mm from grate.	S4
	On grate	S5
Penetration 2	On slab 25-mm from step.	S6
	On slab 25-mm from step.	S7
	On step 25-mm from grate.	S8
	On step 25-mm from grate.	S9
	On grate	S10
Penetration 3	On slab 25-mm from step.	S11
	On slab 25-mm from step.	S12
	On step 25-mm from grate.	S13
	On step 25-mm from grate.	S14
	On grate	S15
Penetration 4	On slab 25-mm from step.	S16
	On slab 25-mm from step.	S17
	On step 25-mm from grate.	S18
	On step 25-mm from grate.	S19
	On grate	S20
Penetration 5	On slab 25-mm from pipe.	S21
	On slab 25-mm from pipe.	S22
	On pipe 25-mm from slab.	S23
	On pipe 25-mm from slab.	S24

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

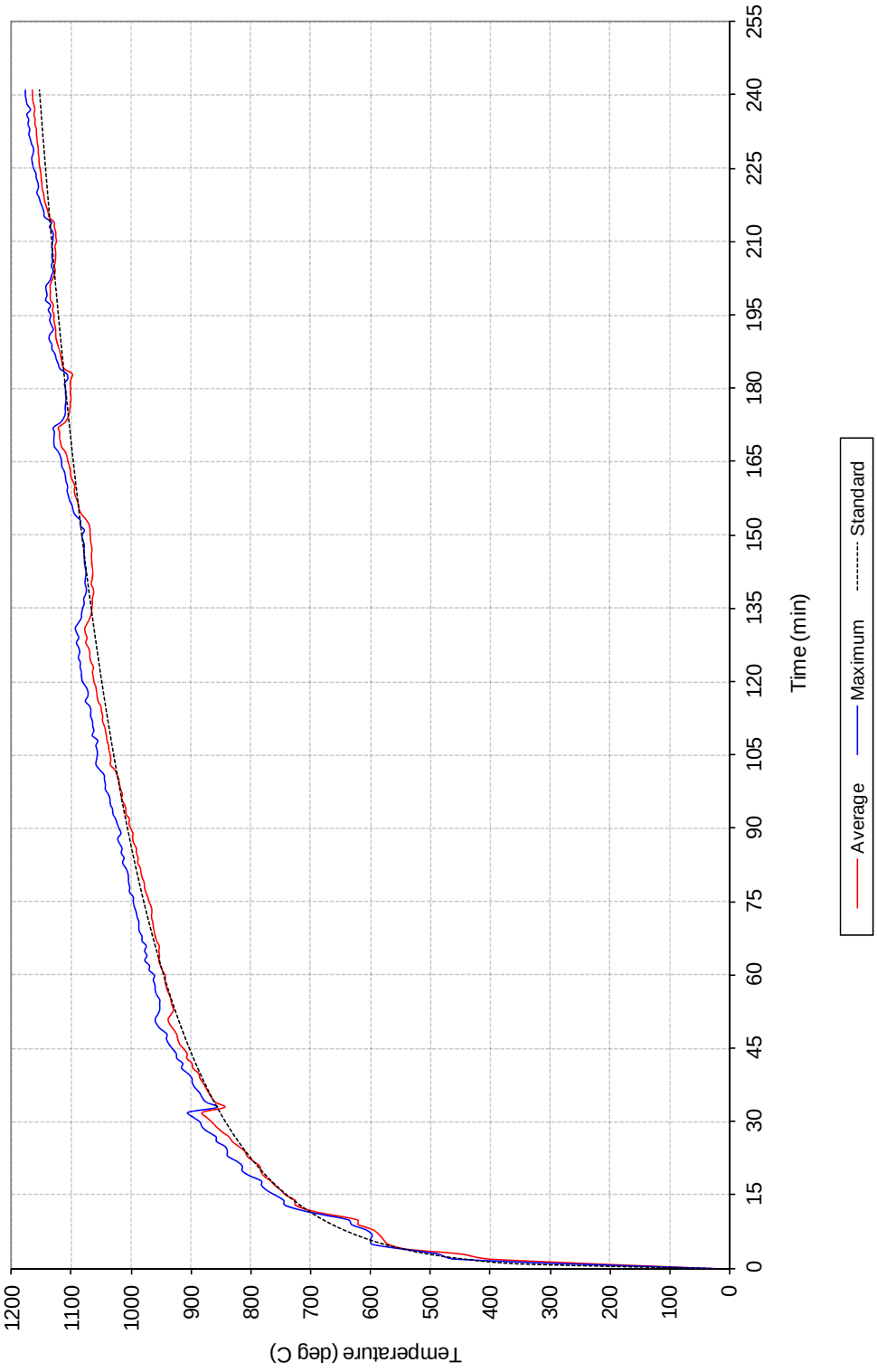


FIGURE 1 – FURNACE TEMPERATURE

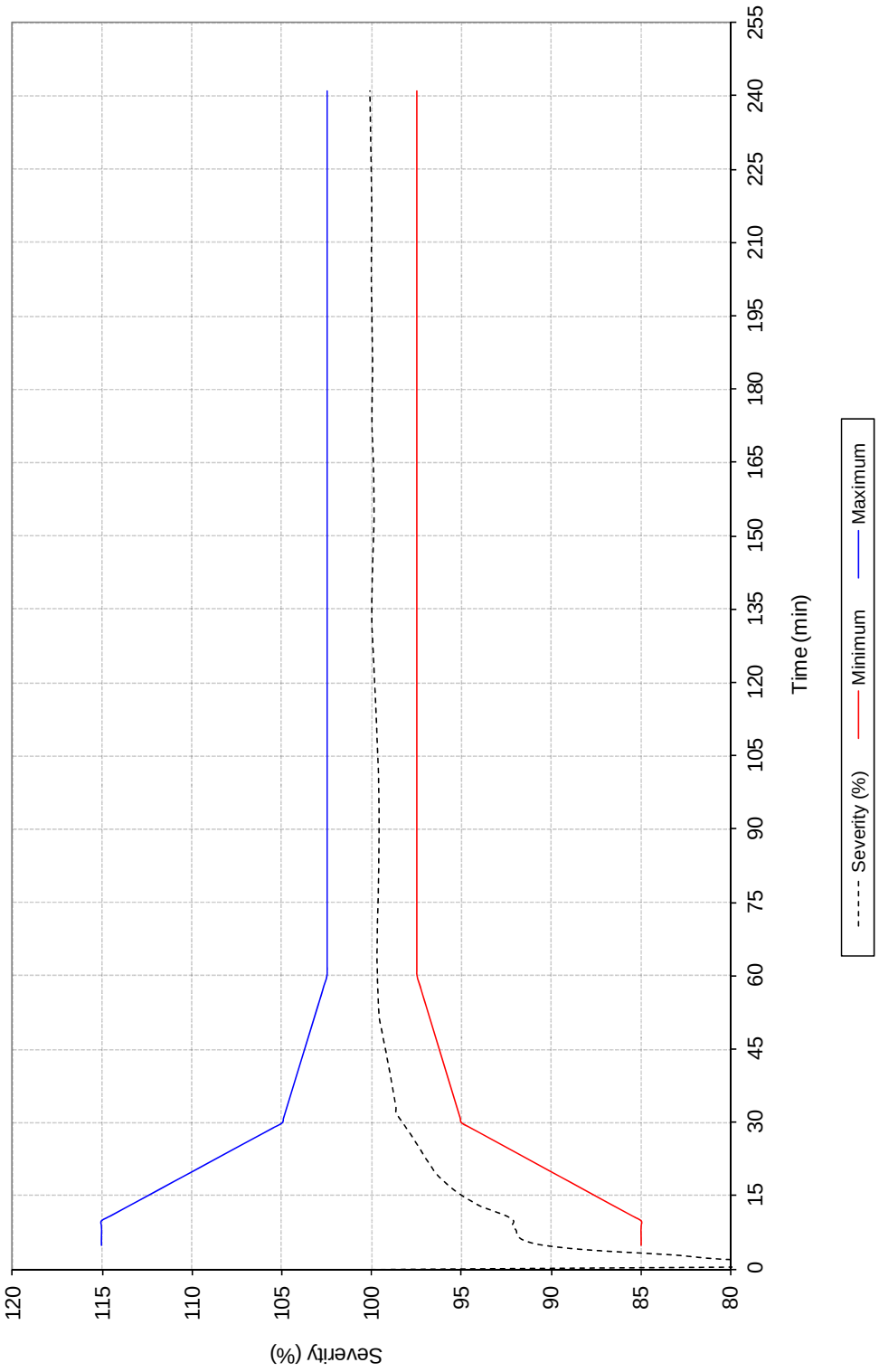


FIGURE 2 – FURNACE SEVERITY

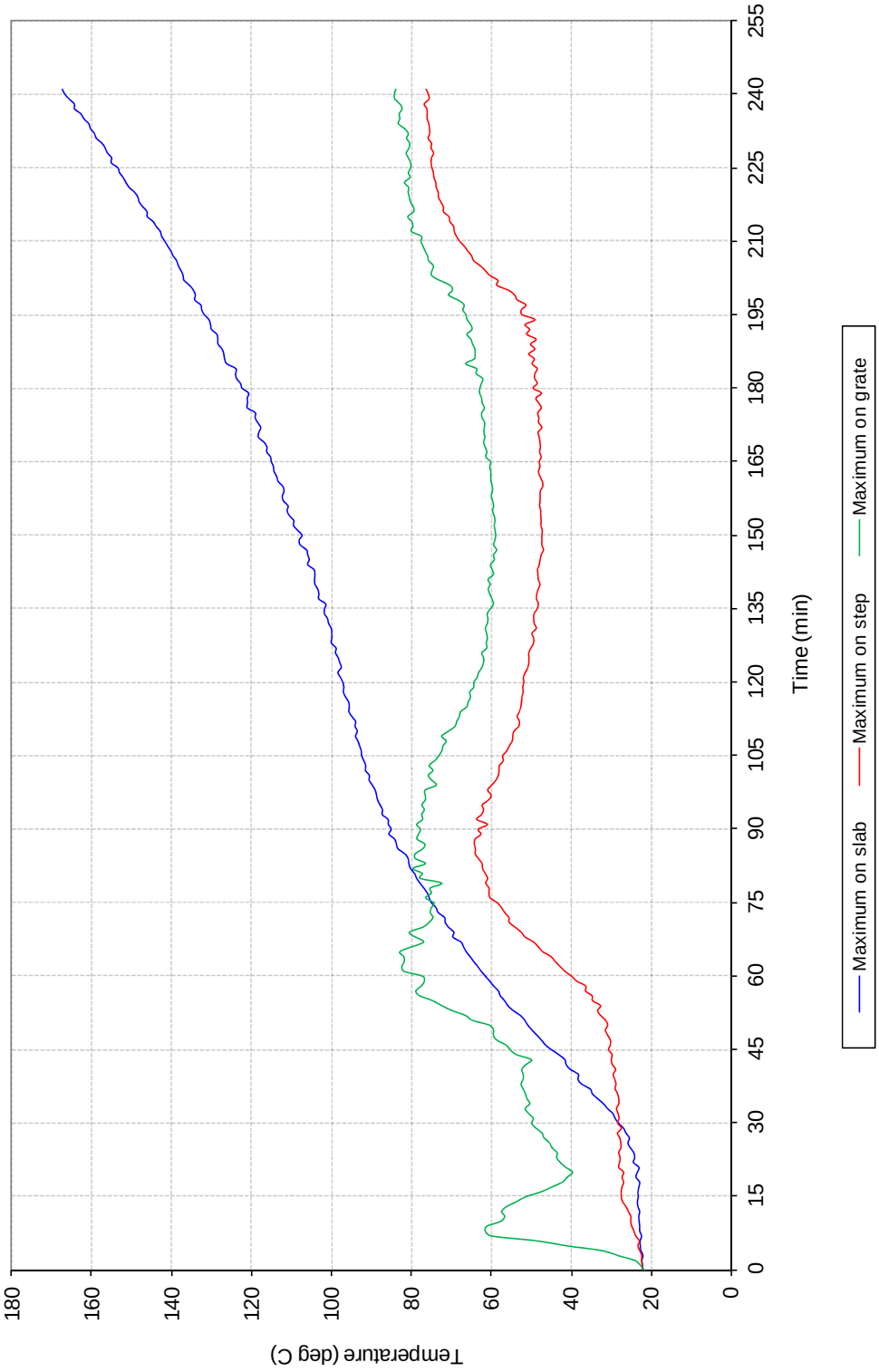


FIGURE 3 – SPECIMEN TEMPERATURE – ASSOCIATED WITH PENETRATION 3

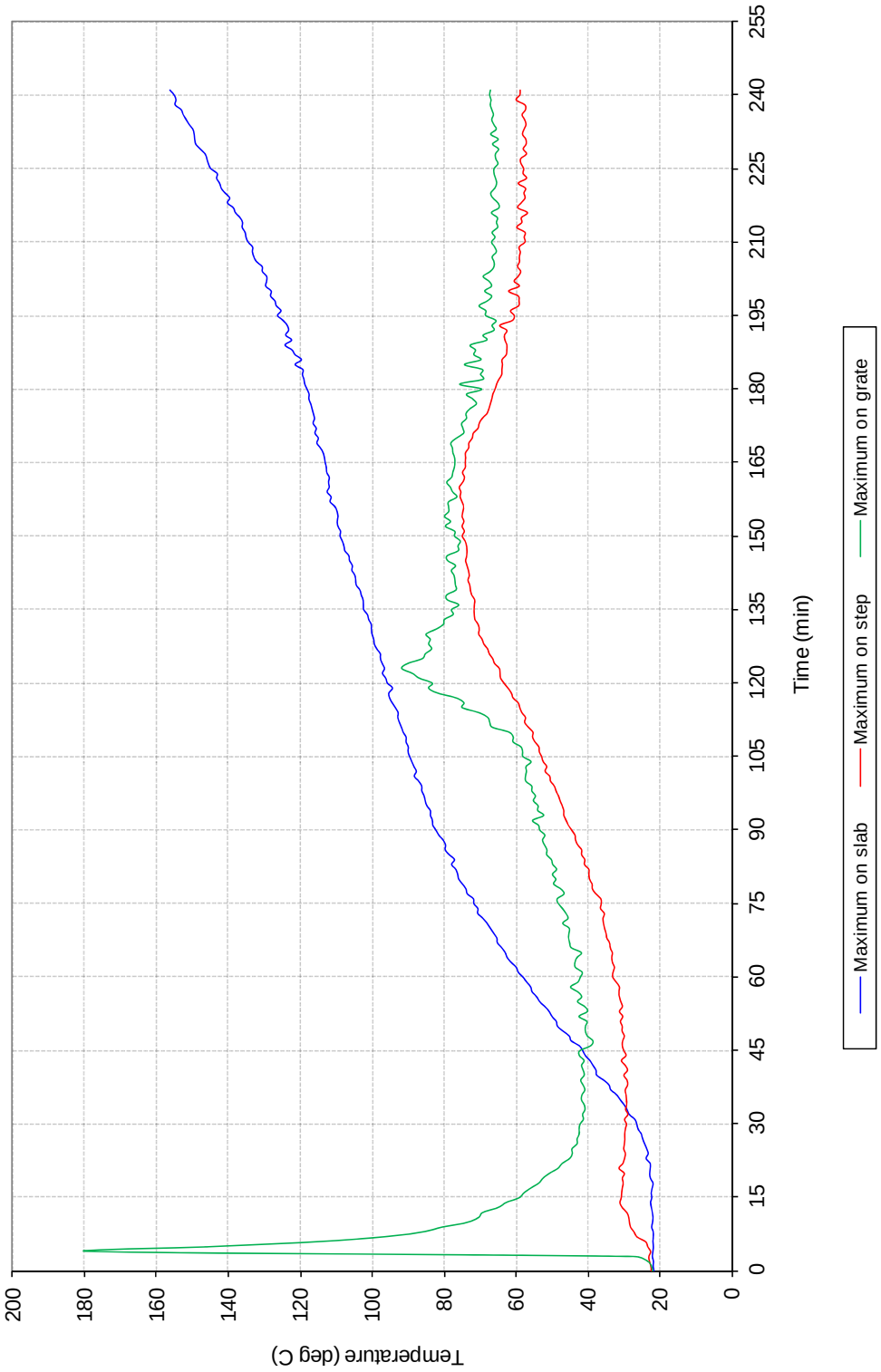


FIGURE 4 – SPECIMEN TEMPERATURE – ASSOCIATED WITH PENETRATION 4

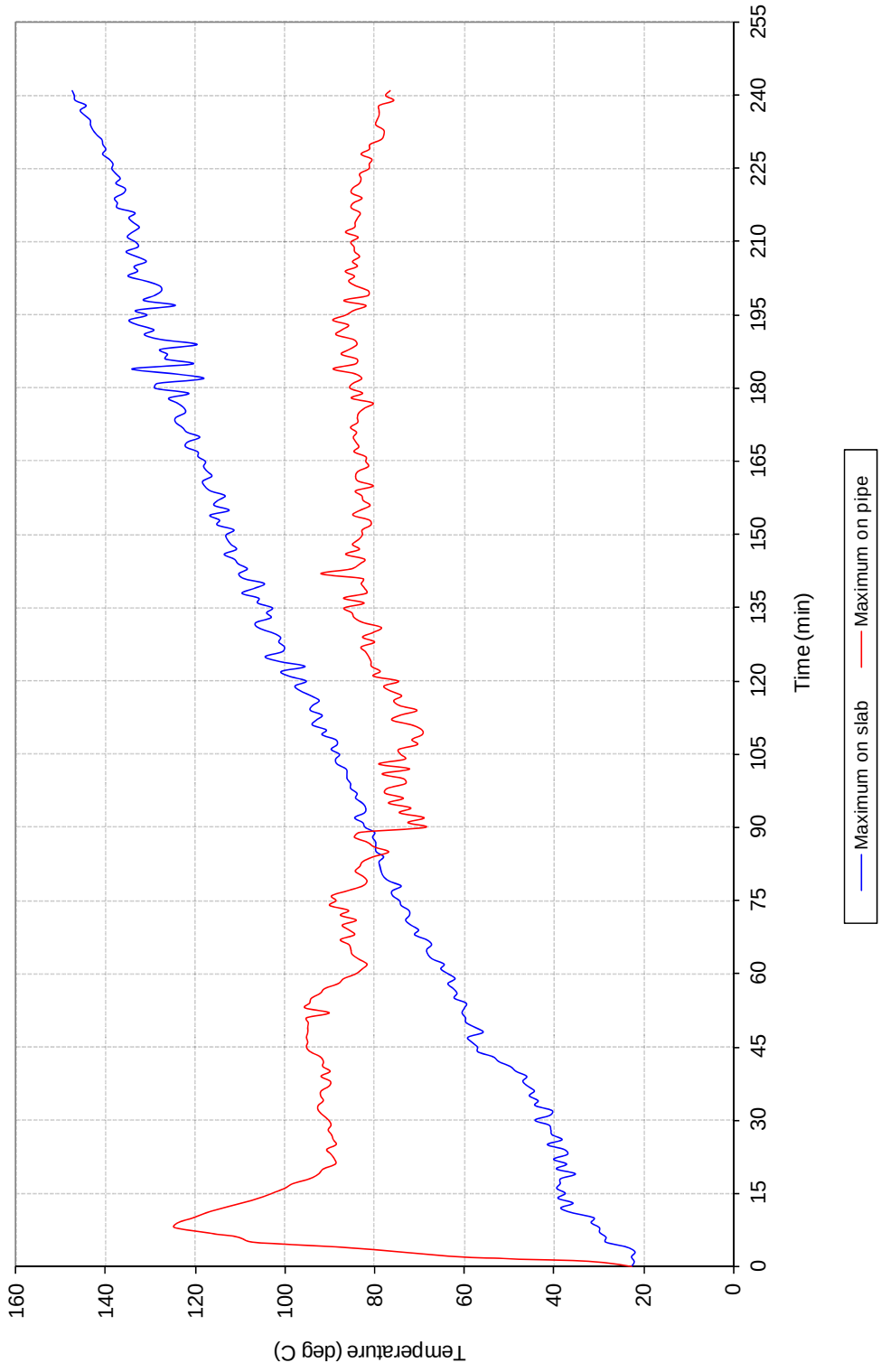
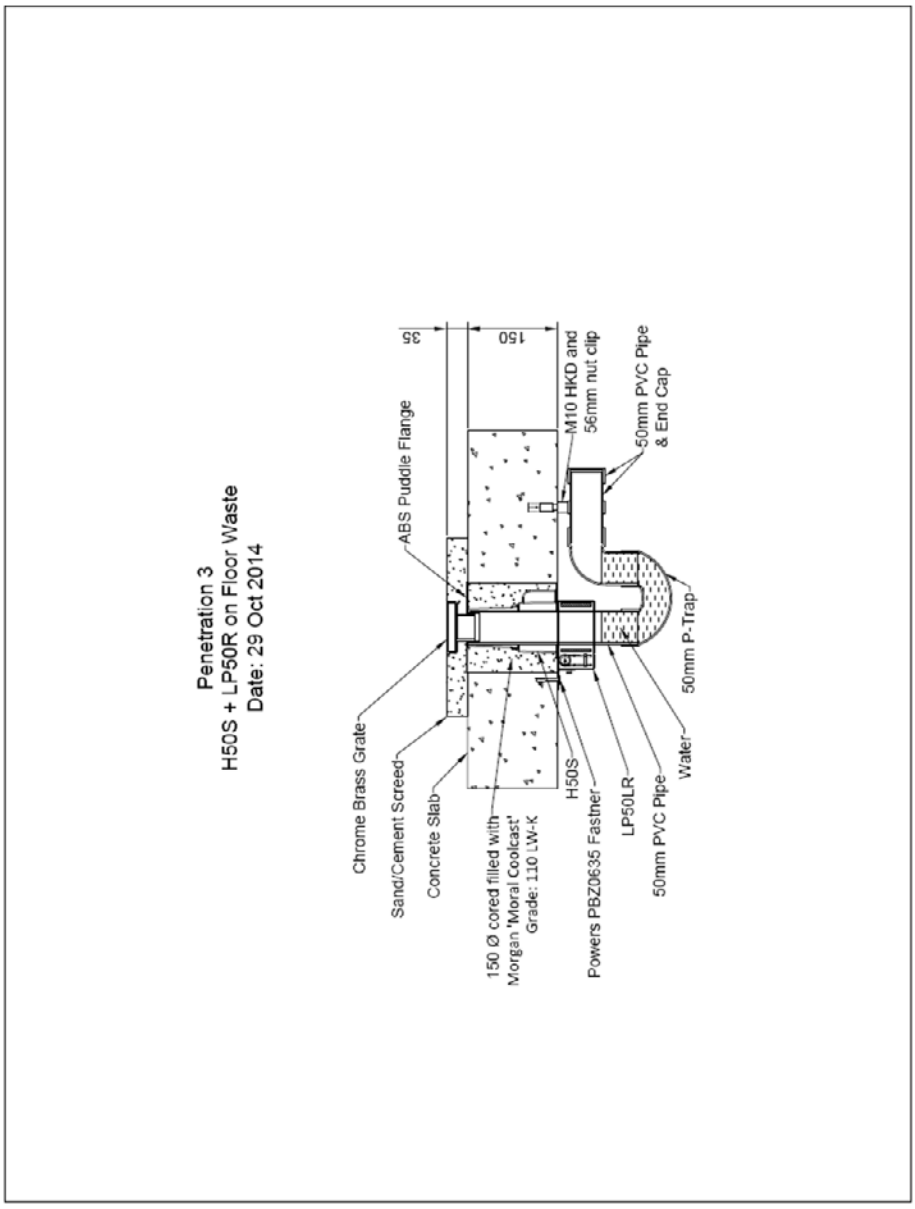
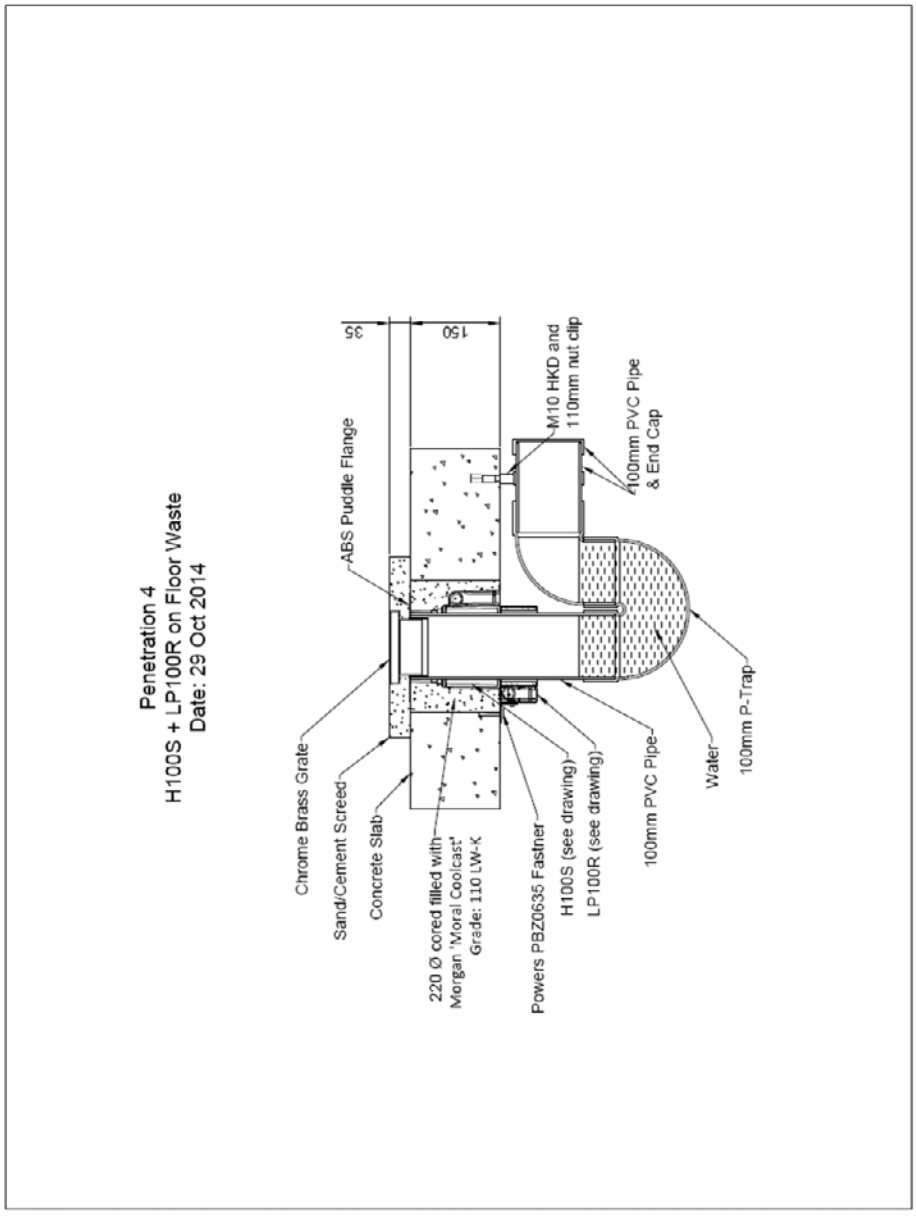


FIGURE 5 – SPECIMEN TEMPERATURE – ASSOCIATED WITH PENETRATION 5

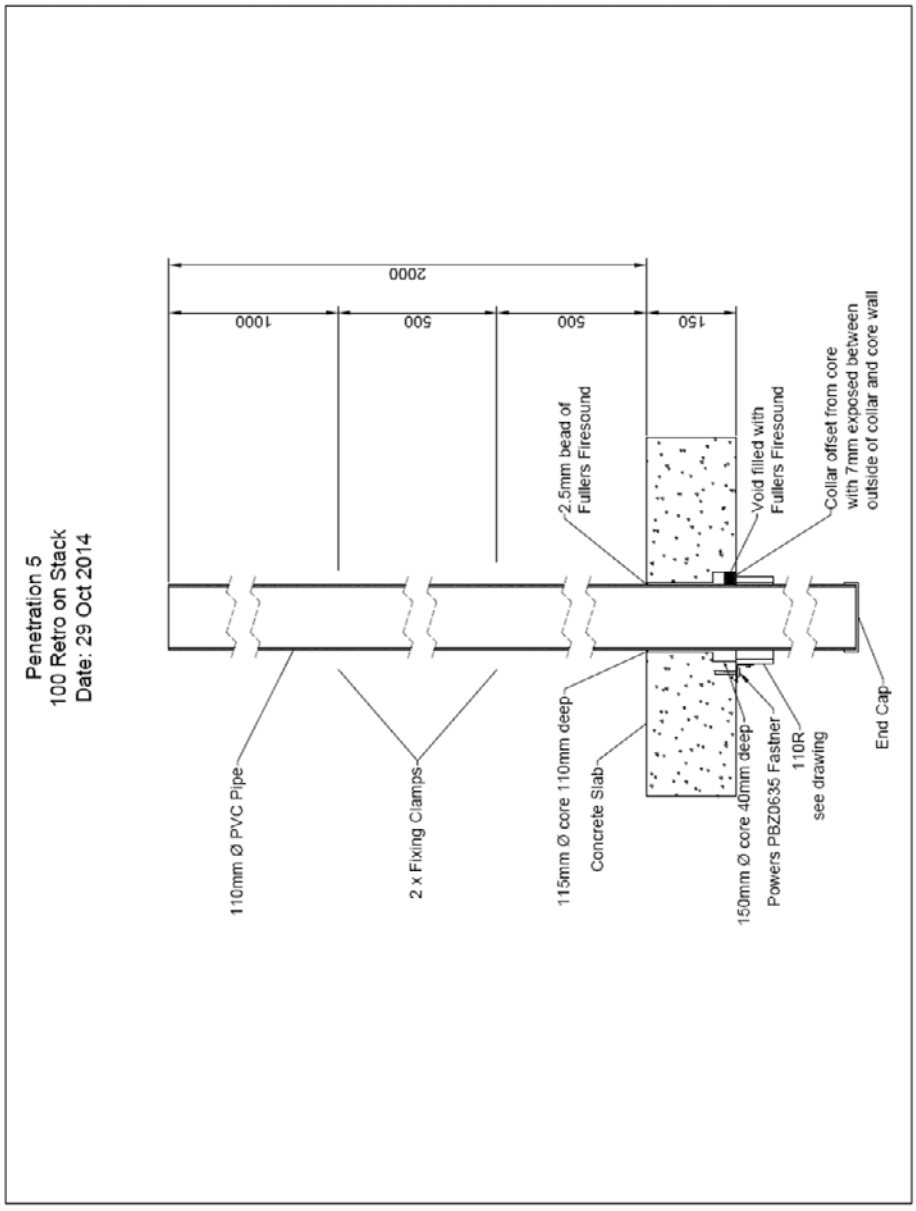
Appendix D – Installation drawings



DRAWING TITLED "PENETRATION #3 H50 S + LP50R ON FLOOR WASTE", DATED 29 OCTOBER 2014, BY SNAP FIRE SYSTEMS PTY LTD.

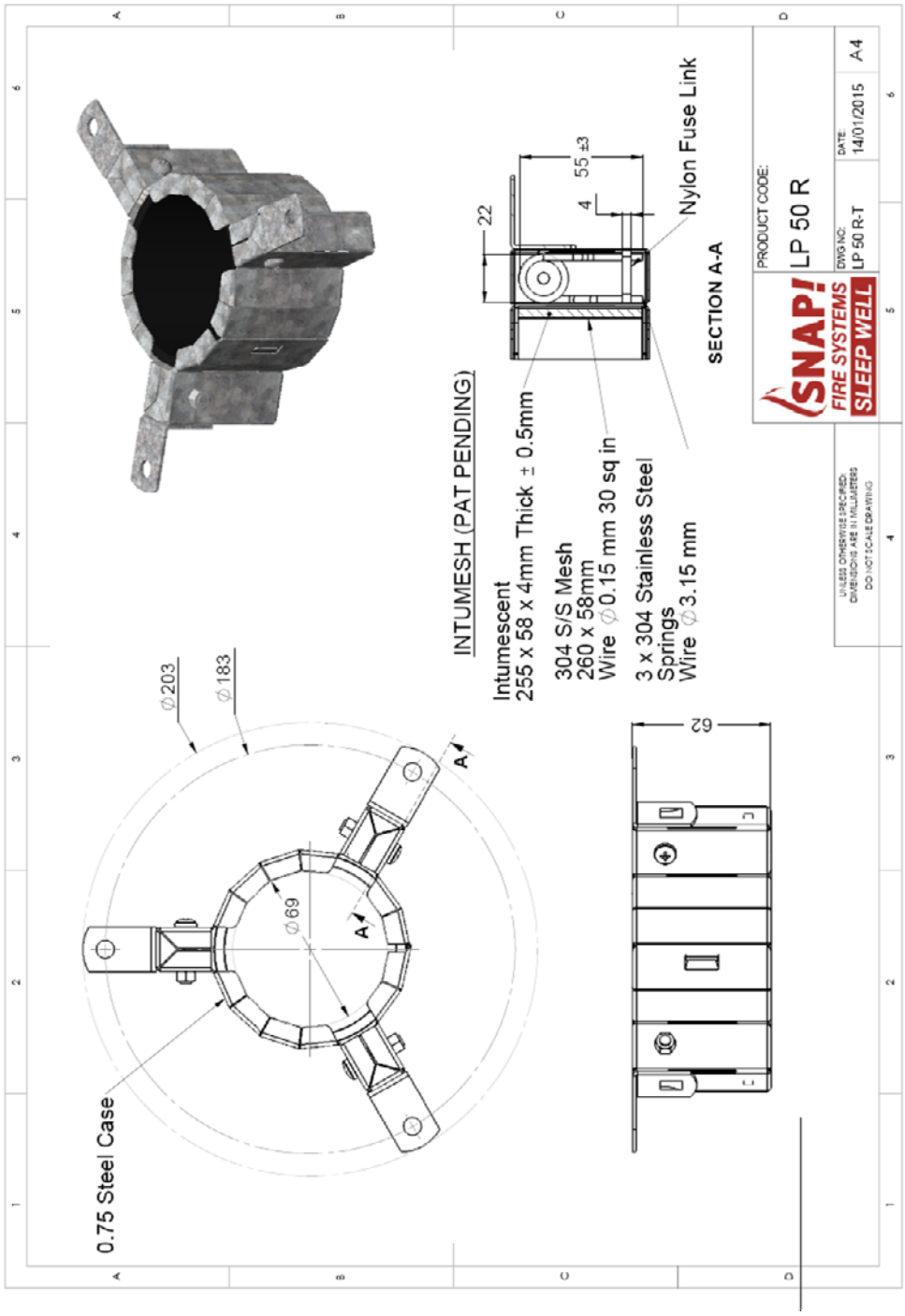


DRAWING TITLED "PENETRATION #4 H100 S + LP100R ON FLOOR WASTE", DATED 29 OCTOBER 2014, BY SNAP FIRE SYSTEMS PTY LTD.

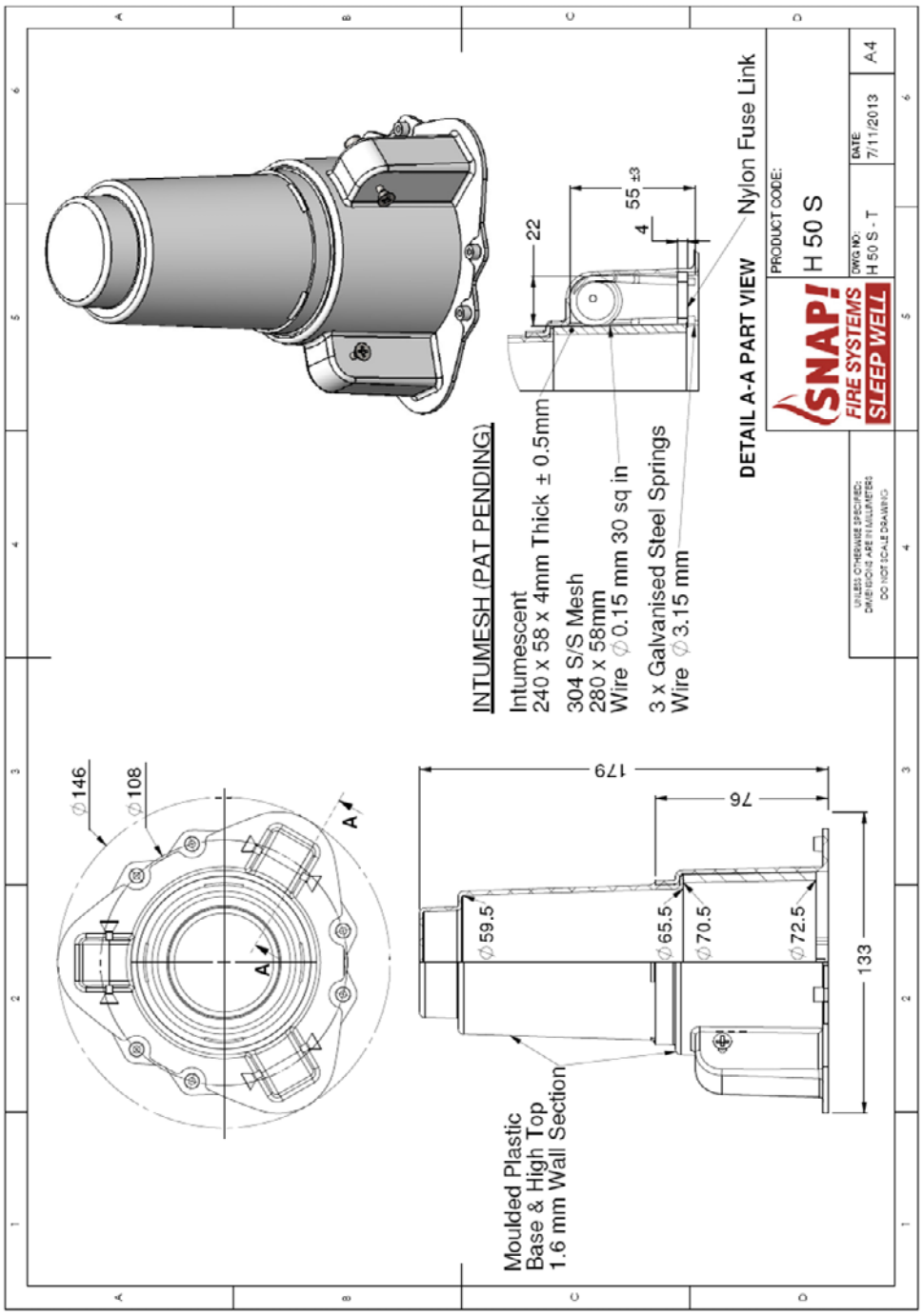


DRAWING TITLED "PENETRATION #5 100 RETRO ON STACK", DATED 29 OCTOBER 2014, BY SNAP FIRE SYSTEMS PTY LTD.

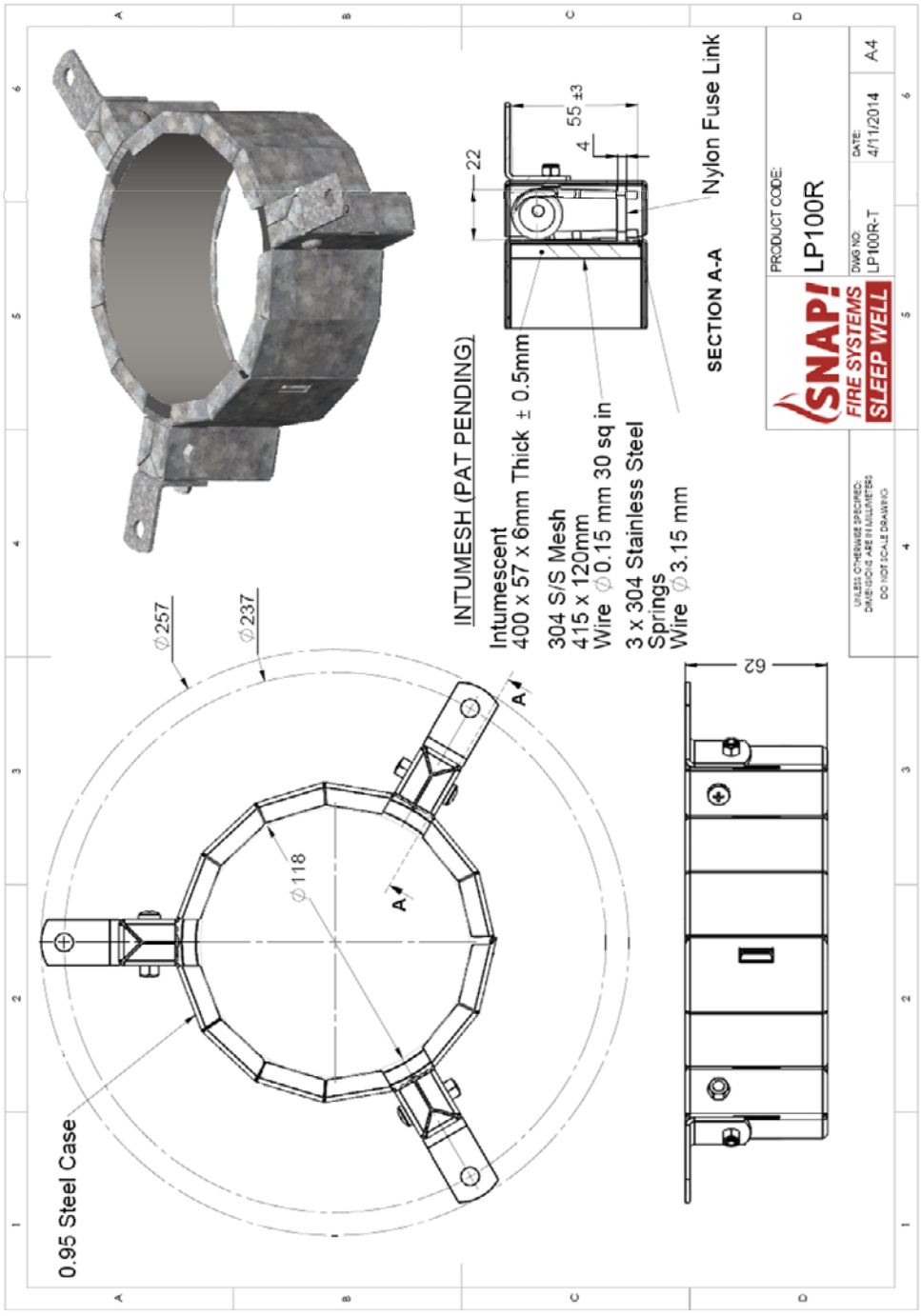
Appendix E – Specimen Drawings



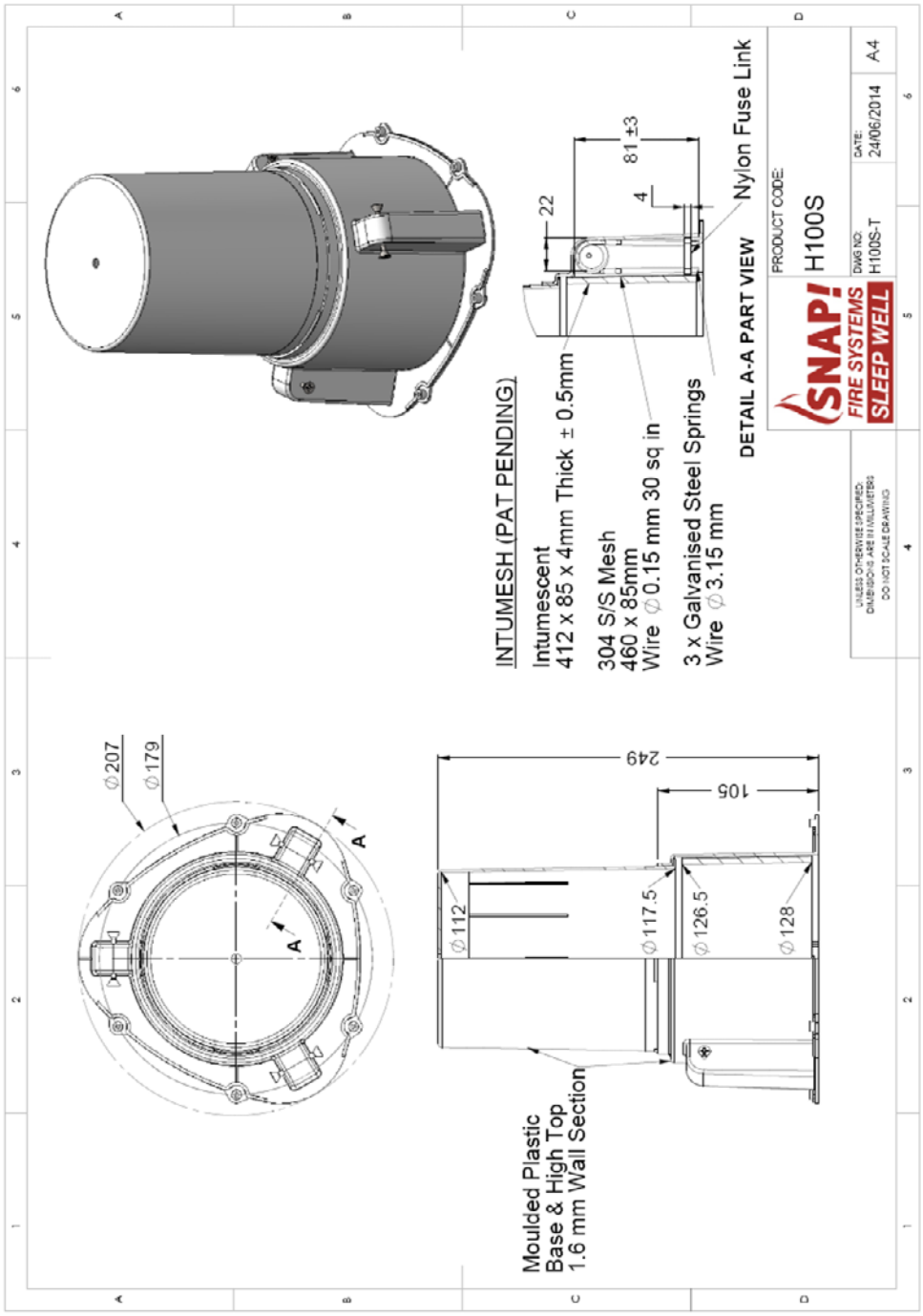
DRAWING NUMBERED LP 50R-T, DATED 14 JANUARY 2015, BY SNAP FIRE SYSTEMS PTY LTD.



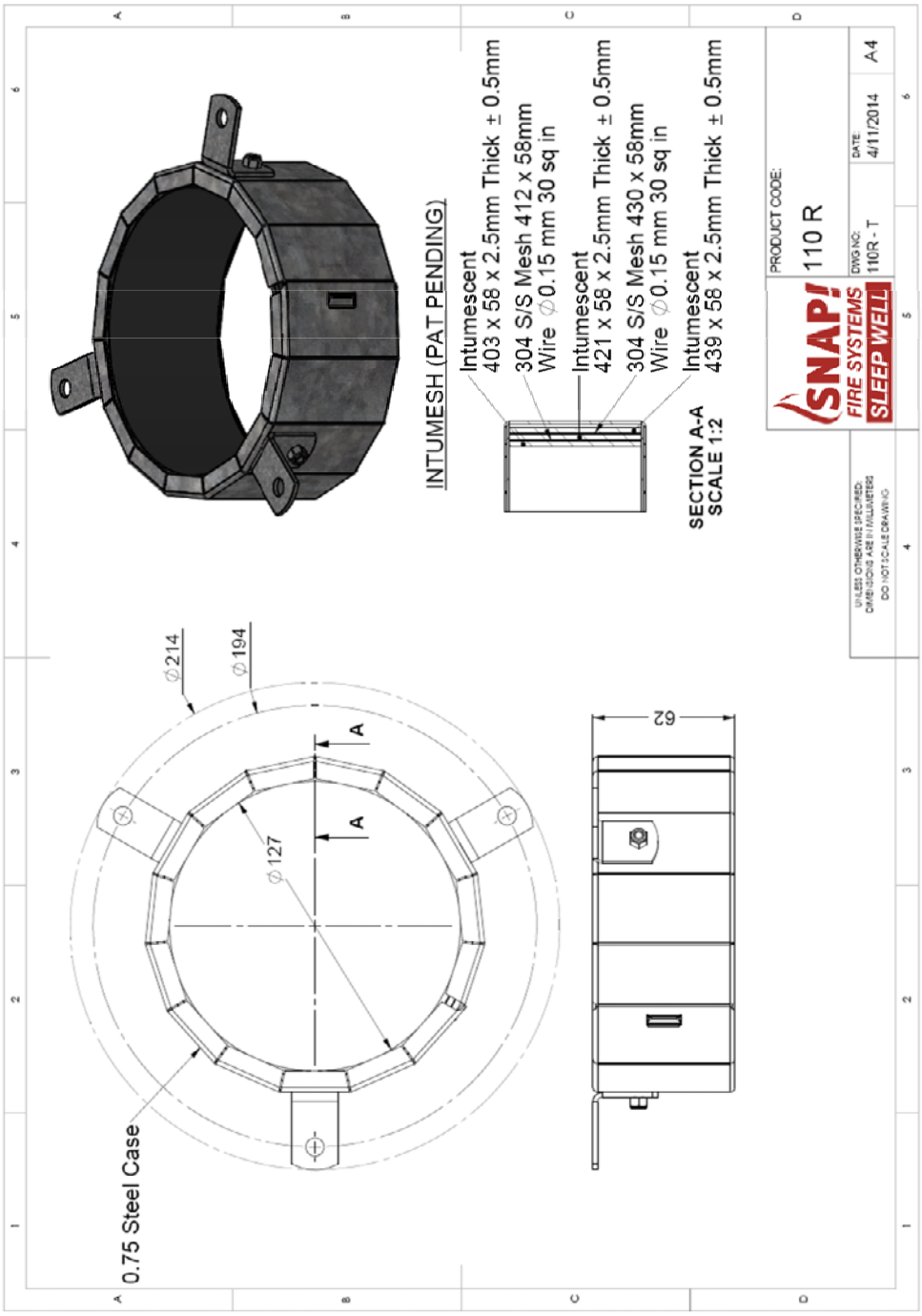
DRAWING NUMBERED H 50 S-T, DATED 7 NOVEMBER 2013, BY SNAP FIRE SYSTEMS PTY LTD.



DRAWING NUMBERED LP 100R-T, DATED 4 NOVEMBER 2014, BY SNAP FIRE SYSTEMS PTY LTD.



DRAWING NUMBERED H 100S-T, DATED 24 JUNE 2014, BY SNAP FIRE SYSTEMS PTY LTD.



DRAWING NUMBERED 110R-T, DATED 4 NOVEMBER 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. 2632
- COPY OF CERTIFICATE OF TEST – NO. 2633
- COPY OF CERTIFICATE OF TEST – NO. 2634

INFRASTRUCTURE TECHNOLOGIES
www.csiro.au

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

Certificate of Test

No. 2632

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 1673.

Product Name: Penetration 3 – H 50S cast-in fire collar + LP50R retrofitted fire collar protecting a 56-mm diameter Polyvinyl Chloride (PVC) pipe incorporating a floor waste

Description: The SNAP Cast-in H 50S 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 intumescent material. The closing mechanism comprised three galvanised steel springs, nylon fuse links and a 280-mm x 58-mm stainless steel mesh, as shown in drawing numbered H 50 S-T, dated 7 November 2013, by SNAP Fire Systems. The penetrating service comprised a 56-mm OD PVC pipe, with a wall thickness of 2.2-mm fitted through the H 50 S and LP 50 R Snap fire collars. The floor waste system was fitted with a chromed brass floor waste grate. A 35-mm thick cement screed was laid on top of the concrete slab and finished flush with the floor grate. On the exposed side of the slab, a 56-mm OD PVC gully trap was connected to the penetrating pipe, supported by a M10 HKD clamp fixed to the concrete slab. On the exposed face, the gully trap was capped using a PVC end cap. The floor waste gully was charged with water to the level shown in drawing titled "Penetration #3 H50 S + LP50R on Floor Waste", dated 29 October 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: 29 October 2014

Issued on the 28th day of April 2015 without alterations or additions.

B. Roddy

Brett Roddy
Manager, Fire Testing and Assessments

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

INFRASTRUCTURE TECHNOLOGIES
www.csiro.au

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

Certificate of Test

No. 2633

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 1673.

Product Name: Penetration 4 – H 100S cast-in fire collar + LP100R retrofitted fire collar protecting a 110-mm diameter Polyvinyl Chloride (PVC-SC) pipe incorporating a floor waste

Description: The SNAP Cast-in H 100S 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 intumescent material. The closing mechanism comprised three galvanised steel springs, nylon fuse links and a 460-mm x 85-mm stainless steel mesh, as shown in drawing numbered H 100 S-T, dated 24 June 2014, by SNAP Fire Systems. The collar was cast in a 220-mm diameter hole in the slab filled with Morgan "Moral Coolcast" grade 110 LW-K.

The penetrating service comprised a 110-mm OD PVC sandwich construction pipe, with a wall thickness of 1.6-mm fitted through the H 100 S and LP 100 R Snap fire collars. The floor waste system was fitted with a chromed brass floor waste grate. A 35-mm thick cement screed was laid on top of the concrete slab and finished flush with the floor grate. On the exposed side of the slab, a nominal 100-mm OD PVC gully trap was connected to the penetrating pipe, supported by an M10 HKD clamp fixed to the concrete slab. On the exposed face, the gully trap was capped using a PVC end cap.

The floor waste gully was charged with water to the level shown in drawing titled "Penetration #4 H100 S + LP100R on Floor Waste", dated 29 October 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: 29 October 2014

Issued on the 28th day of April 2015 without alterations or additions.

B. Roddy

Brett Roddy
Manager, Fire Testing and Assessments

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

INFRASTRUCTURE TECHNOLOGIES
www.csiro.au

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

Certificate of Test

No. 2634

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 1673.

Product Name: Penetration 5 – 110R retrofitted fire collar protecting a 110-mm diameter Polyvinyl Chloride (PVC-SC) pipe

Description: The SNAP 110R retrofitted fire collar comprised a 0.75-mm steel casing with a 127-mm inner diameter and a 214-mm diameter base flange. The 62-mm high collar casing incorporated three layers of 403-mm x 58-mm wide x 2.5-mm thick intumescent material. Between the intumescent layers, 58-mm wide stainless steel mesh was installed as shown in drawing numbered 110R-T, dated 4 November 2014, by SNAP Fire Systems. The penetrating service comprised a 110-mm OD PVC sandwich construction pipe, with a wall thickness of 3.8-mm fitted through the collar's sleeve. The pipe projected vertically, 2000-mm above the concrete slab. The pipe was supported at 500-mm and 1000-mm from the unexposed face of the concrete slab. On the exposed side of the slab, the penetrating pipe was supported by Powers PBZ0635 Fastener fixed to the concrete slab. On the exposed face, the pipe was capped using a PVC end cap. On the exposed face, the slab comprised a 150-mm diameter x 50-mm deep core resulting in a gap of 7-mm between the slab and the collar. The void between the pipe and the slab was filled with Fullers Firesouncd as show in drawing title "Penetration #5 100 Retro on Stack", dated 29 October 2014, by Snap Fire Systems Pty Ltd. On the unexposed face, the gap between the pipe and the slab was filled with 2.5-mm bead of Fullers Firesound as show in drawing title "Penetration #5 100 Retro on Stack", dated 29 October 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: 29 October 2014

Issued on the 28th day of April 2015 without alterations or additions.

B. Roddy

Brett Roddy
Manager, Fire Testing and Assessments

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

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