

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

Test Report

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Date: 3 August 2017

Client: IG6 Pty Ltd as trustee for the IG6 IP Trust

Commercial-in-confidence




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

Sponsored Investigation No. FSP 1830

1 Introduction

1.1 Identification of specimen

The sponsor identified the specimen as five (5) retrofit Fire Collars protecting a 150-mm thick concrete floor slab penetrated by four (4) floor wastes and one (1) stack Pipe.

1.2 Sponsor

IG6 Pty Ltd as trustee for the IG6 IP Trust
3 Skirmish Court
Victoria Point Qld 4165

1.3 Manufacturer

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

1.4 Test standard

Australian Standard 1530, Methods for fire tests on building materials, components and structures, Part 4-2014, 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 4671/4101

1.7 Test date

The fire-resistance test was conducted on 26 April 2017.

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 wastes and one (1) Vinidex pipe protected by retrofitted Snap Fire Systems fire collars.

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

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

For the purpose of the test, the specimens were referenced as Penetrations 1, 2, 3, 4, and 5. Two (2) specimens are included in this report (Penetration 2 and 3). Documents containing a complete description of each specimen were supplied by the sponsor and are retained on file.

Penetration 2 – LP100R-D Retrofit collar protecting a nominal 110-mm Mueller High Density Polyethylene (HDPE) Pipe and Floorwaste

The SNAP Retrofit LP100R-D collar comprised a 0.95-mm thick steel casing with a 122-mm inner diameter and a 195-mm x 195-mm square base flange. The 65-mm high collar casing incorporated a layer of 418-mm x 59-mm x 5-mm thick Intumescent material. The closing mechanism comprised 4 x 304 stainless steel springs bound with black nylon fuse link and a 316 stainless steel mesh measuring 415 x 120-mm as shown in drawing numbered LP100R-D-T dated 10 February 2017, by Snap Fire Systems Pty Ltd. One collar was fixed to the underside of the slab using 30 x 5-mm concrete screws.

The penetrating service comprised a 110-mm diameter HDPE pipe with a wall thickness of 4.7-mm fitted through the collar's sleeve. The floor waste system was fitted with a chrome brass grate. A 35-mm thick sand/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 HDPE P-Trap was connected to the penetrating pipe, supported by a steel strap and nut clip secured to the slab with 30 x 5-mm concrete screw. On the exposed face, the gully trap was capped using a HDPE End Cap.

The floor waste gully was charged with water to the level shown in drawing titled "Test Slab S-17-B Penetration # 2 110-mm HDPE Pipe – LP100R-D - Floorwaste, dated 20 May 2017, by Snap Fire Systems Pty Ltd.

Penetration 3 – H100S-RR collar protecting a nominal 80-mm Polyvinyl Chloride (PVC) Pipe incorporating a floorwaste and a fitting inside the collar

The SNAP H100S-RR collar comprised a 1.6-mm thick polypropylene casing with a 126.5-mm inner diameter and a 213-mm base flange. The 250-mm high collar casing incorporated a layer of 412-mm x 85-mm x 4-mm thick Intumescent material. The closing mechanism comprised 3 x galvanised steel springs bound with a natural nylon fuse links and 304 stainless steel mesh measuring 460 x 85-mm as shown in drawing numbered H100S-RR dated 29 September 2016, by Snap Fire Systems Pty Ltd.

The penetrating service comprised a 80-mm diameter PVC pipe and an 80-mm PVC coupling with a total wall thickness of 6-mm fitted through the collar's sleeve. The pipe projected vertically, 2000-mm away from the unexposed face of the wall and approximately 500-mm into the furnace chamber. The pipe was supported at nominally 500-mm and 1500-mm from the unexposed face of the wall by two support clamps spaced apart at nominally 1000-mm. The pipe was open at the unexposed end and capped on the exposed end with an 80-mm PVC pipe cap.

On the unexposed side of the slab, there was a 20-mm wide and 10-mm deep bead of non-fire rated roof and gutter silicone sealant around the base of the pipe.

2.2 Dimensions

The overall dimension of the concrete slab was 1150-mm wide x 1150-mm long x 150-mm thick, to suit the opening in the specimen containing frame.

2.3 Orientation

The reinforced concrete slab was placed horizontally on top of the furnace chamber, and subjected to fire exposure from the underside.

2.4 Conditioning

The concrete slab was left to cure for a period longer than 30 days.

3 Documentation

The following documents were supplied or referenced by the sponsor as a complete description of the specimen and should be read in conjunction with this report:

Drawing numbered LP100R-D-T dated 10 February 2017, by Snap Fire Systems Pty Ltd.

Drawing numbered H100S-RR dated 29 September 2016, by Snap Fire Systems Pty Ltd.

Test Slab S-17-B Penetration # 2 110-mm HDPE Pipe – LP100R-D - Floorwaste, dated 21 May 2017, by Snap Fire Systems Pty Ltd.

Test Slab S-17-B Penetration # 3 80-mm PVC – H100S-RR – Stack w Fitting inside Collar, dated 20 May 2017, 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 1530.4-2014 and was heated by combustion of a mixture of natural gas and air.

4.2 Temperature

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

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

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

4.3 Measurement system

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

5 Ambient temperature

The temperature of the test area was 16°C at the commencement of the test.

6 Departure from standard

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

7 Termination of test

The test was terminated at 241 minutes by the agreement with the sponsor.

8 Test results

8.1 Critical observations

The following observations were made during the fire-resistance test:

Time	Observation
6 minutes	- Smoke is being emitted from Penetration # 2. Cotton wool pad test applied. No ignition.
8 minutes	- Smoke from Penetration # 2 has diminished.
23 minutes	- Steam is being emitted from the grout side joint at the base of Penetration # 3.
36 minutes	- Smoke is being emitted from Penetration # 2.
81 minutes	- Small amount of smoke is being emitted from Penetration # 2.
155 minutes	- Smoke is intensifying from Penetration # 2 .
213 minutes	- Penetration # 3 is fluing slightly .
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 2.

Figure 4 shows the curve of maximum temperature versus time associated with Penetration 3.

8.5 Performance

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

Penetration 2 – LP100R-D Retrofit collar protecting a nominal 110-mm Mueller High Density Polyethylene (HDPE) Pipe and Floorwaste

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

Penetration 3 – H100S-RR collar protecting a nominal 80-mm Polyvinyl Chloride (PVC) Pipe incorporating a floorwaste and a fitting inside the collar

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

This report details methods of construction, the test conditions and the results obtained when the specific element of construction described herein was tested following the procedure outlined in this standard. Any significant variation with respect to size, constructional details, loads, stresses, edge or end conditions, other than those allowed under the field of direct application in the relevant test method, is not covered by this report.

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

9 Fire-resistance level (FRL)

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

Penetration 2 -	-/240/240
Penetration 3 -	-/240/240

For the purposes of AS 1530.4-2014 the results of these fire tests may be used to directly assess fire hazard, but it should be noted that a single test method will not provide a full assessment of fire hazard under all fire conditions.

10 Field of direct application of test results

The results of the fire test contained in this test report are directly applicable, without reference to the testing authority, to similar constructions where one or more changes listed in Clause 10.11 of AS 1530.4-2014, have been made provided no individual component is removed or reduced.

11 Tested by



Heherson Alarde
Testing Officer

Appendices

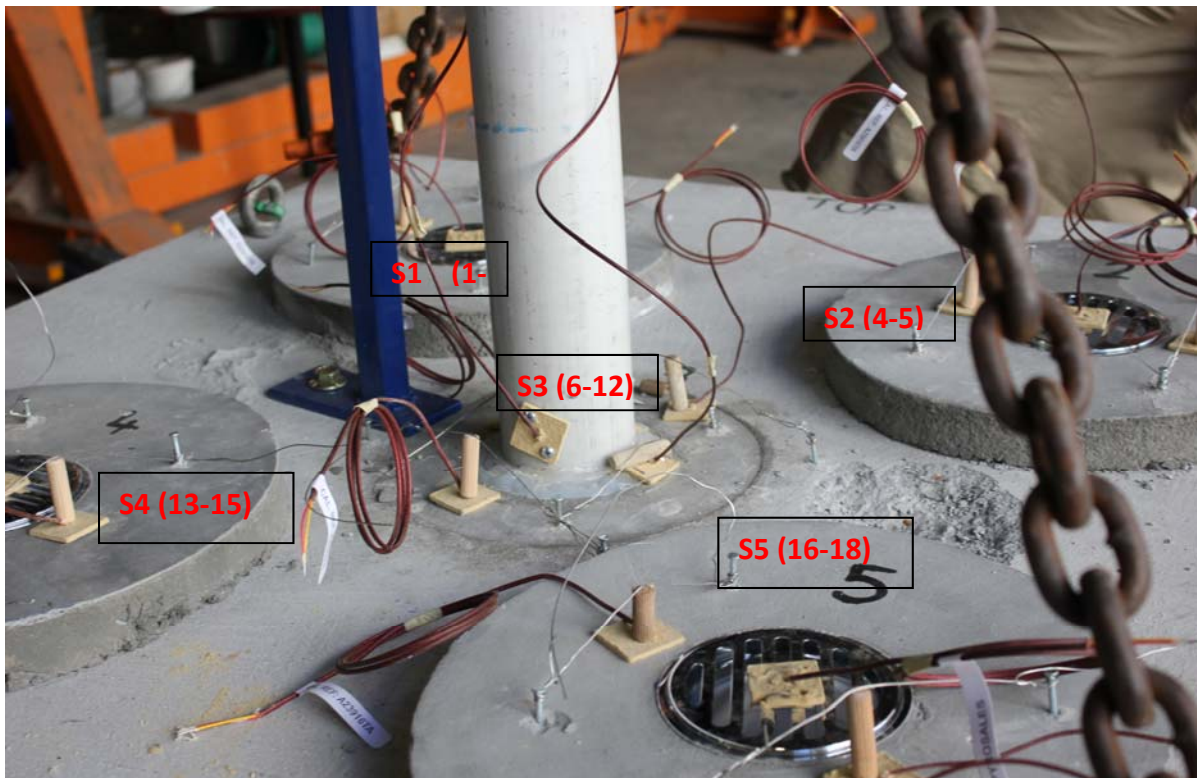
Appendix A – Measurement location

Measurement Location		
Group location	T/C Position	T/C designation
Specimen		
Penetration 2 – LP100R-D Retrofit collar protecting a nominal 110-mm Mueller High Density Polyethylene (HDPE) Pipe and Floorwaste	On step, 25-mm from the grate	S4
	On step, 25-mm from the grate	S5
Penetration 3 – H100S-RR collar protecting a nominal 80-mm Polyvinyl Chloride (PVC) Pipe incorporating a floorwaste and a fitting inside the collar	On step, 25-mm from the pipe	S6
	On step, 25-mm from the pipe	S7
	On sealant	S9
	On sealant	S10
	On pipe – 25-mm from sealant	S11
	On pipe – 25-mm from sealant	S12

Appendix B – Photographs



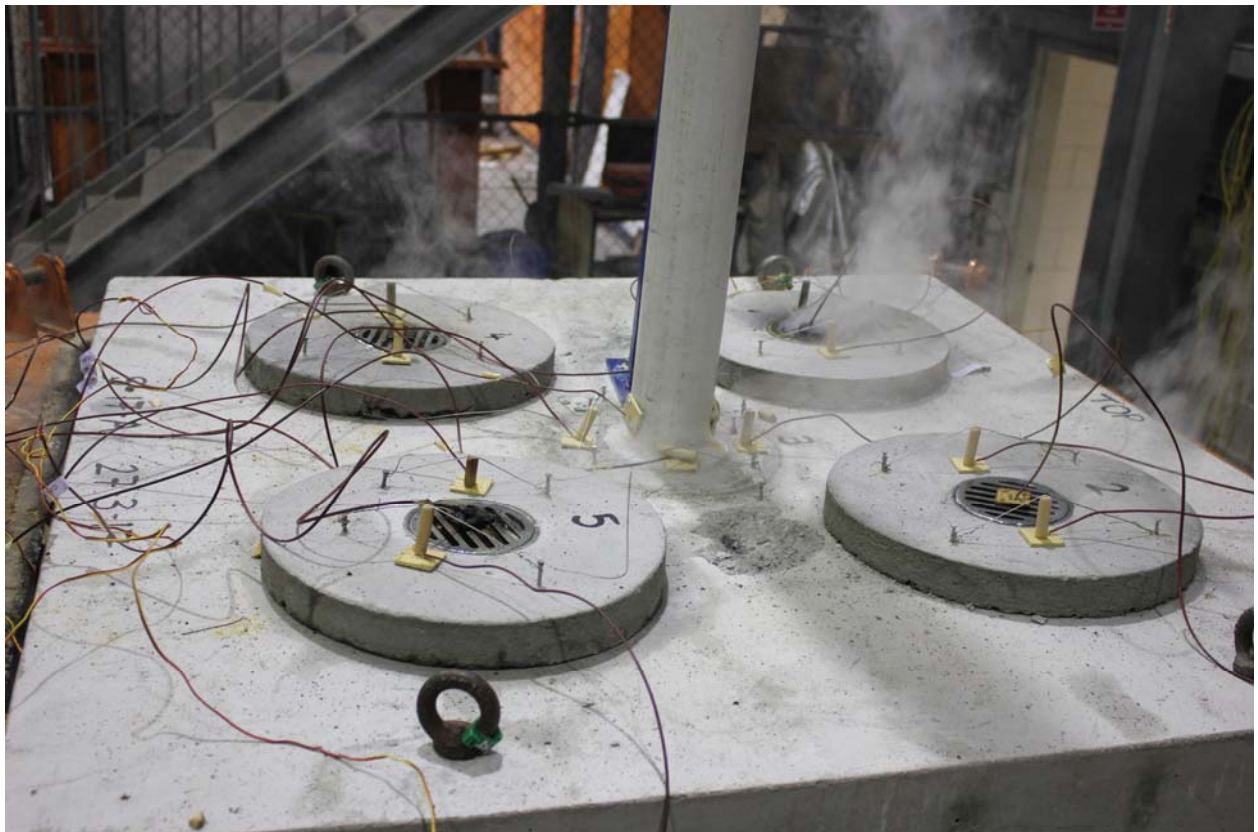
PHOTOGRAPH 1 – EXPOSED FACE OF SPECIMENS PRIOR TO TESTING



PHOTOGRAPH 2 – UNEXPOSED FACE OF SPECIMENS PRIOR TO TESTING



PHOTOGRAPH 3 – SPECIMENS AFTER 60 MINUTES OF TESTING



PHOTOGRAPH 4 – SPECIMENS AFTER 120 MINUTES OF TESTING



PHOTOGRAPH 5 – SPECIMENS AFTER 180 MINUTES OF TESTING



PHOTOGRAPH 6 – UNEXPOSED FACED OF SPECIMEN AT CONCLUSION OF TESTING



PHOTOGRAPH 7 – EXPOSED FACE OF SPECIMENS AT CONCLUSION OF TESTING

Appendix C – Furnace Temperature

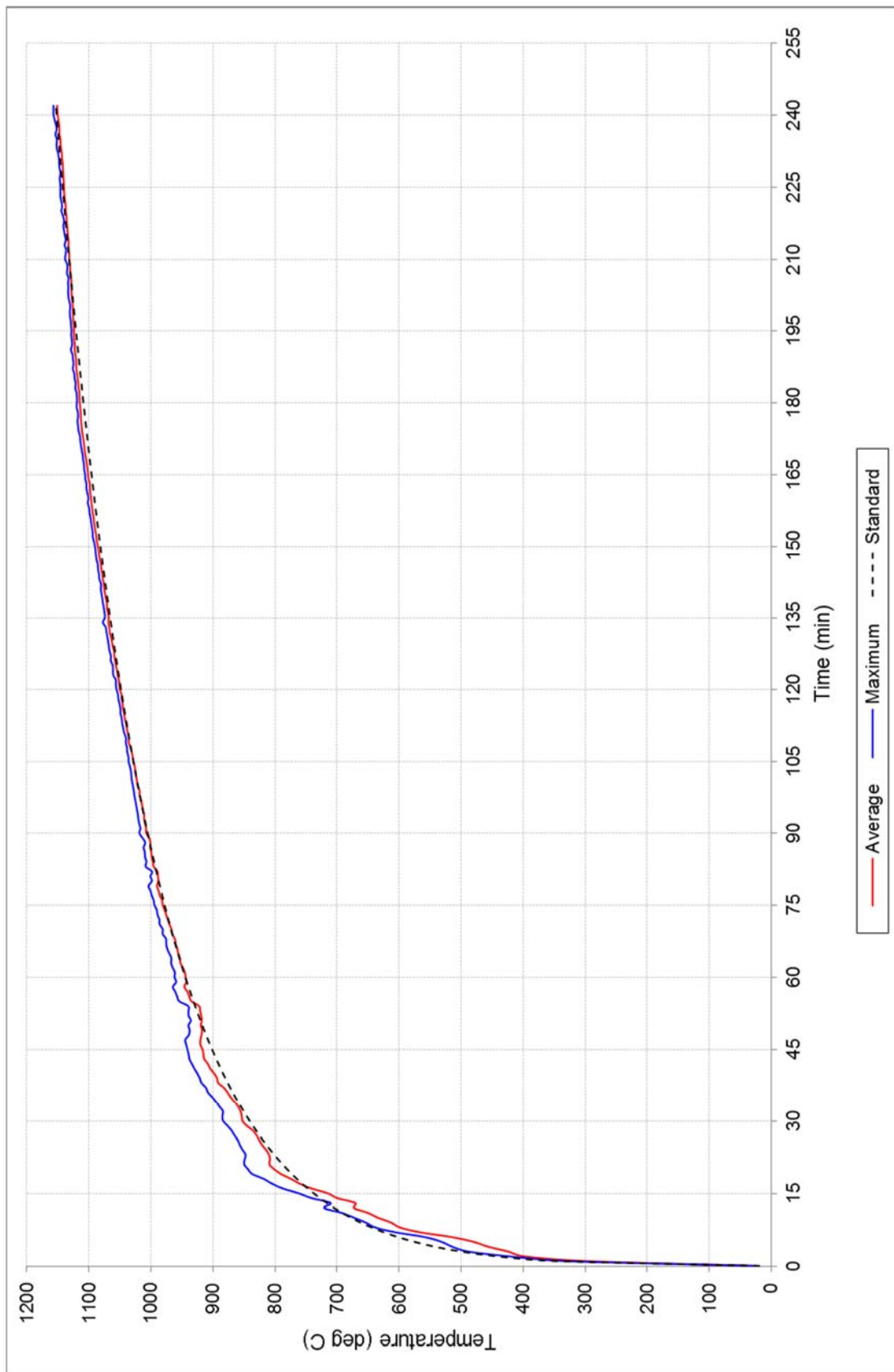


FIGURE 1 – FURNACE TEMPERATURE

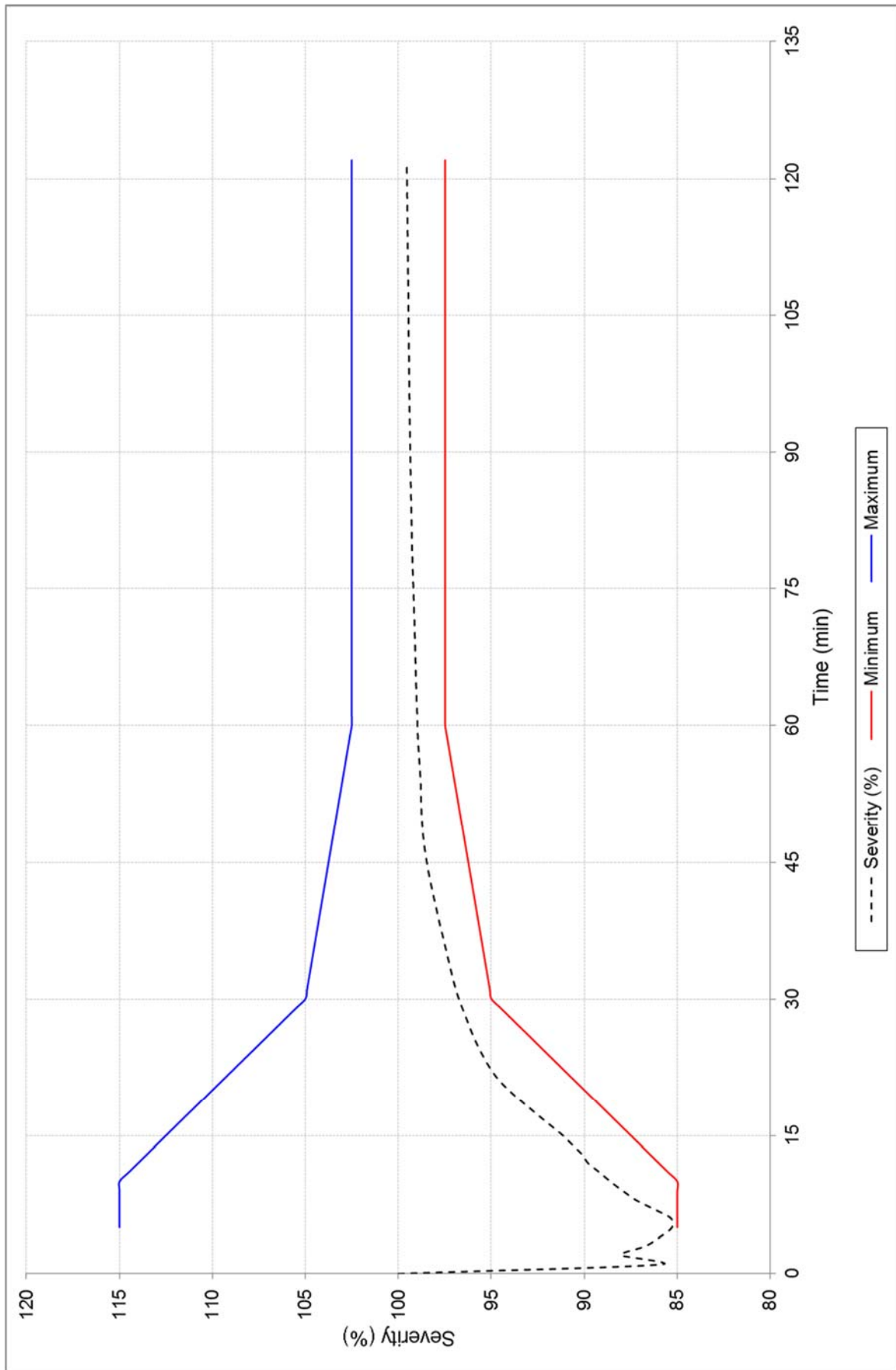


FIGURE 2 – FURNACE SEVERITY

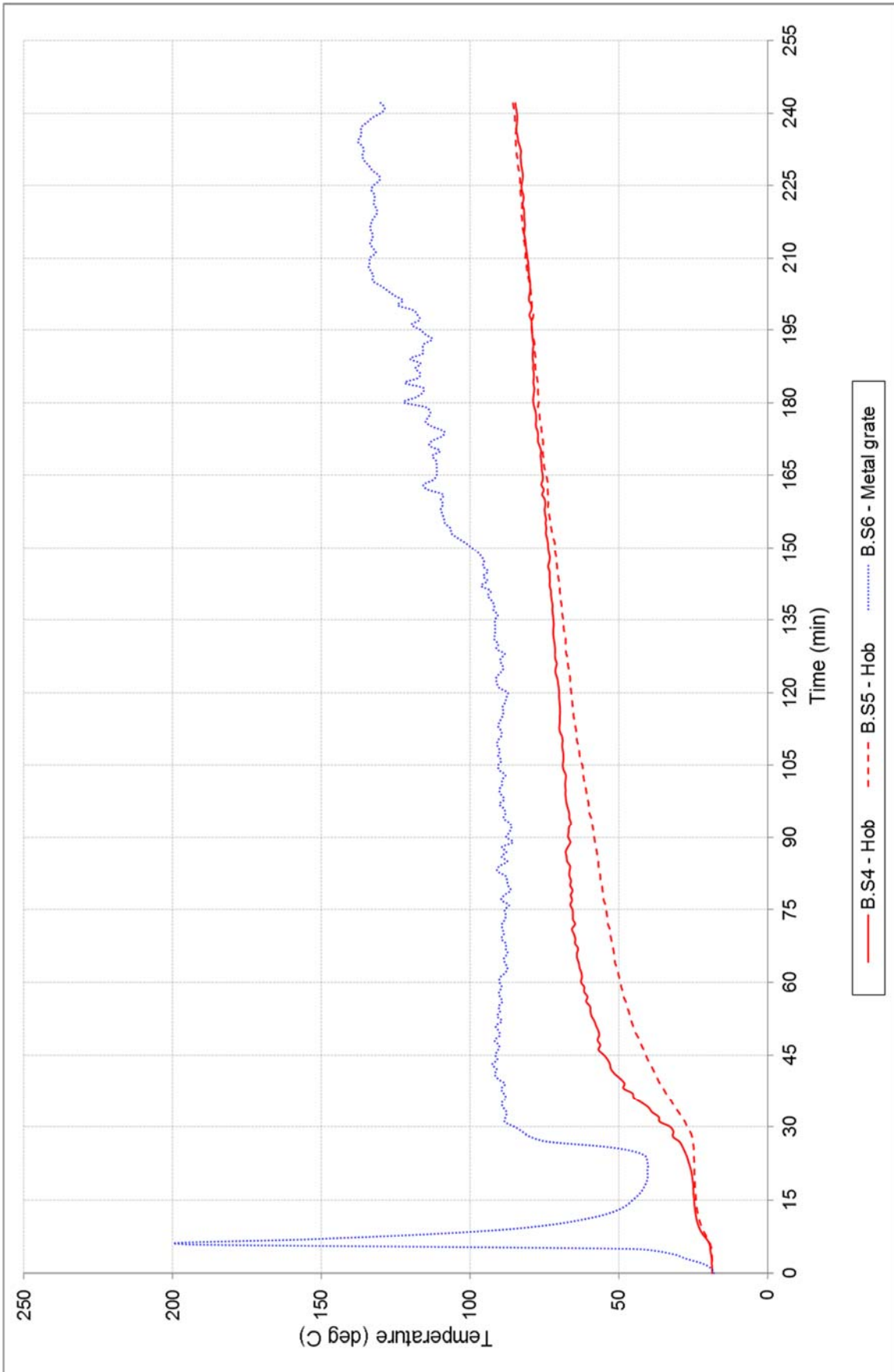


FIGURE 3 – SPECIMEN TEMPERATURE – ASSOCIATED WITH PENETRATION # 2

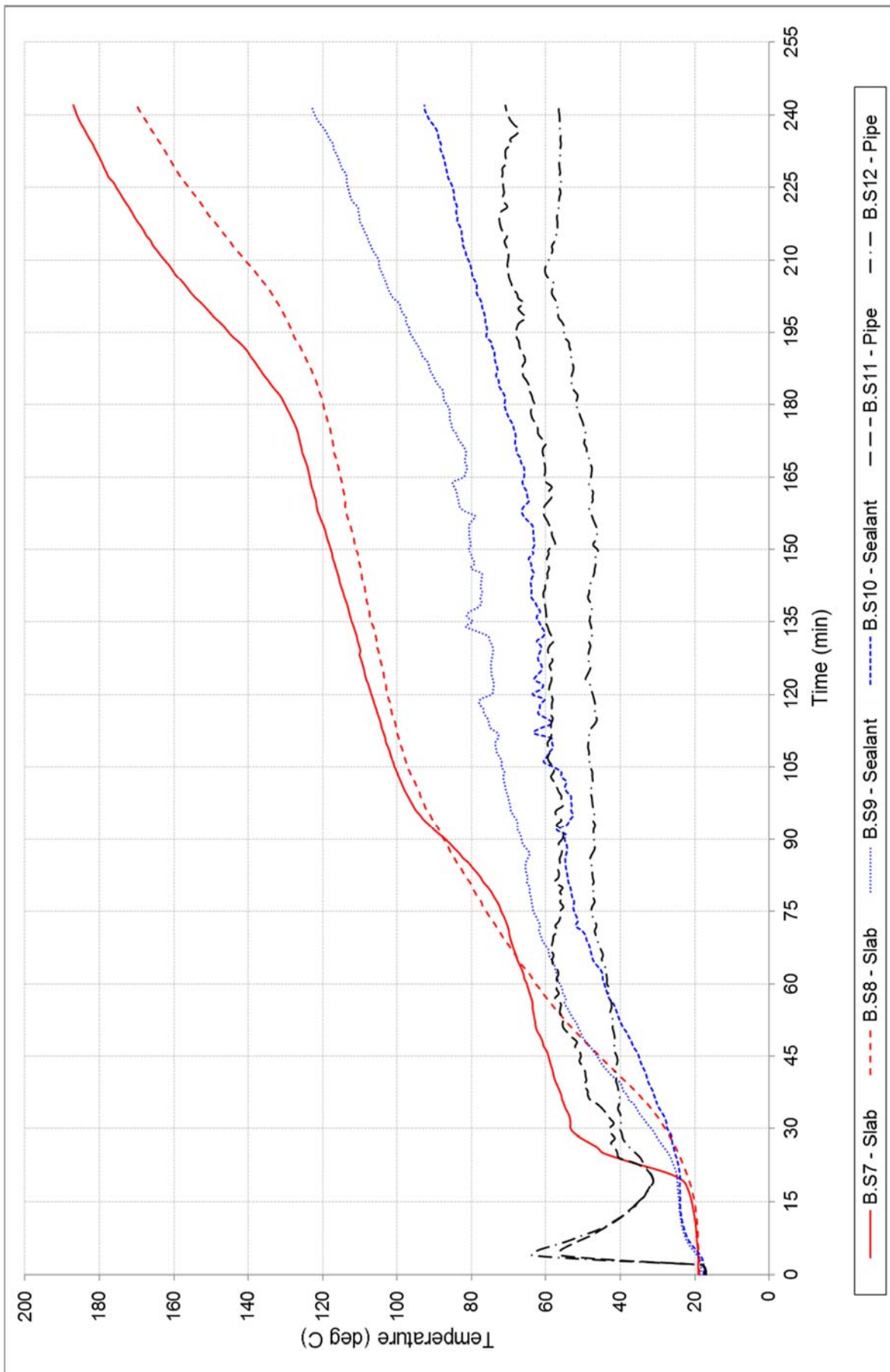
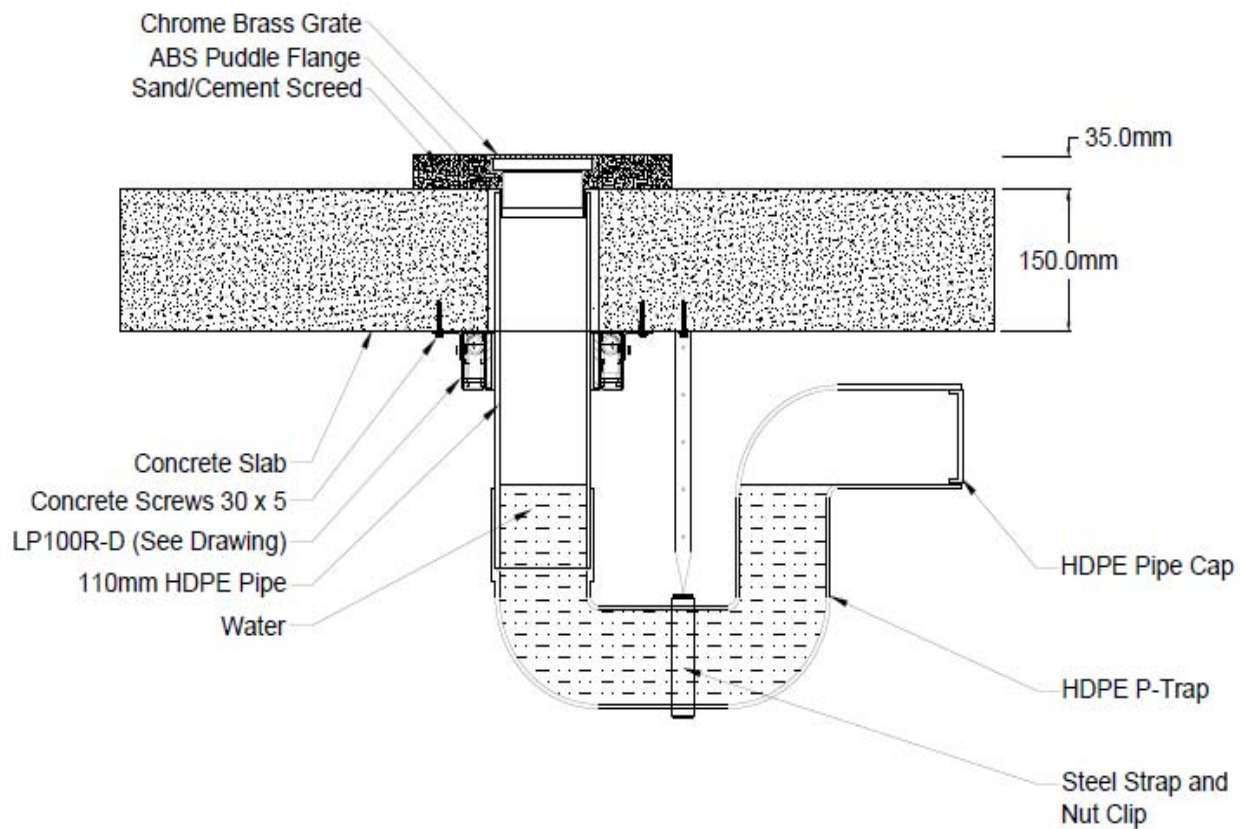


FIGURE 4 – SPECIMEN TEMPERATURE – ASSOCIATED WITH PENETRATION # 3

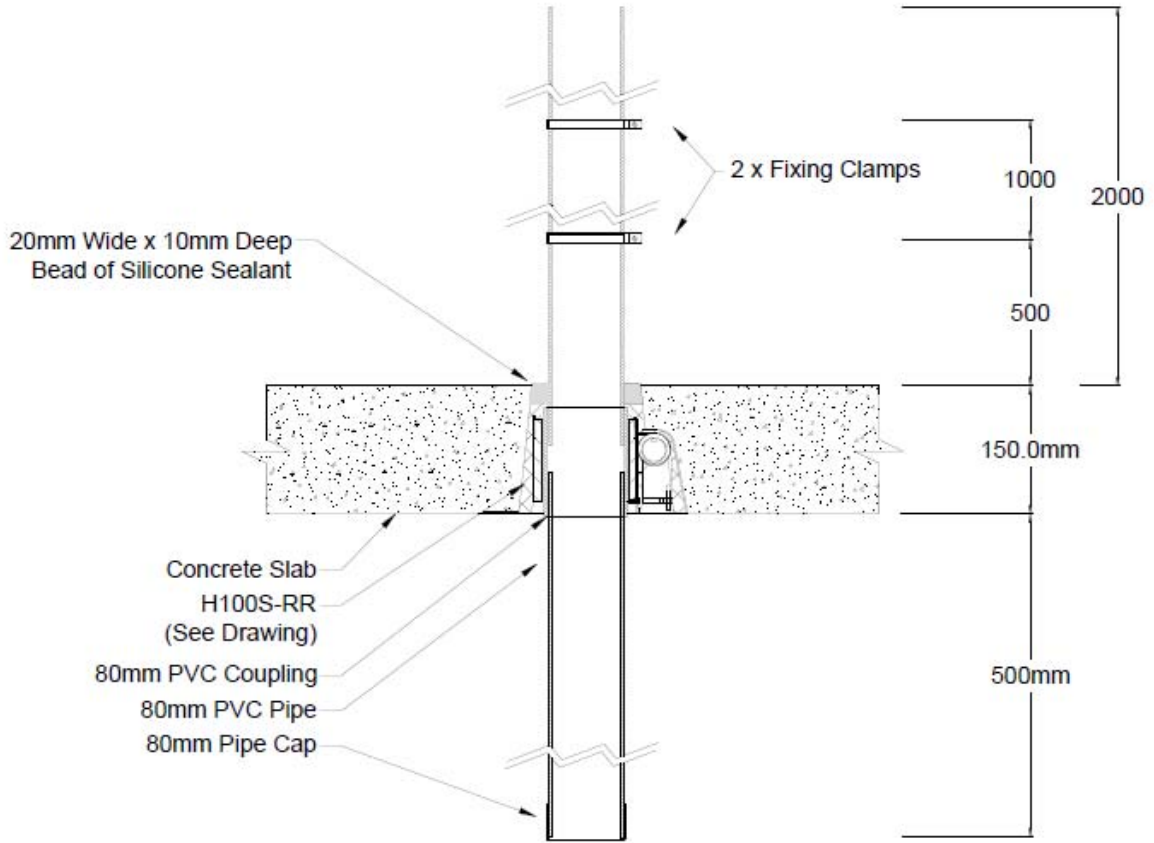
Appendix D – Installation drawings

Test Slab S-17-B Penetration # 2
110mm HDPE Pipe – LP100R-D - Floorwaste
Date 20 MAY 2017



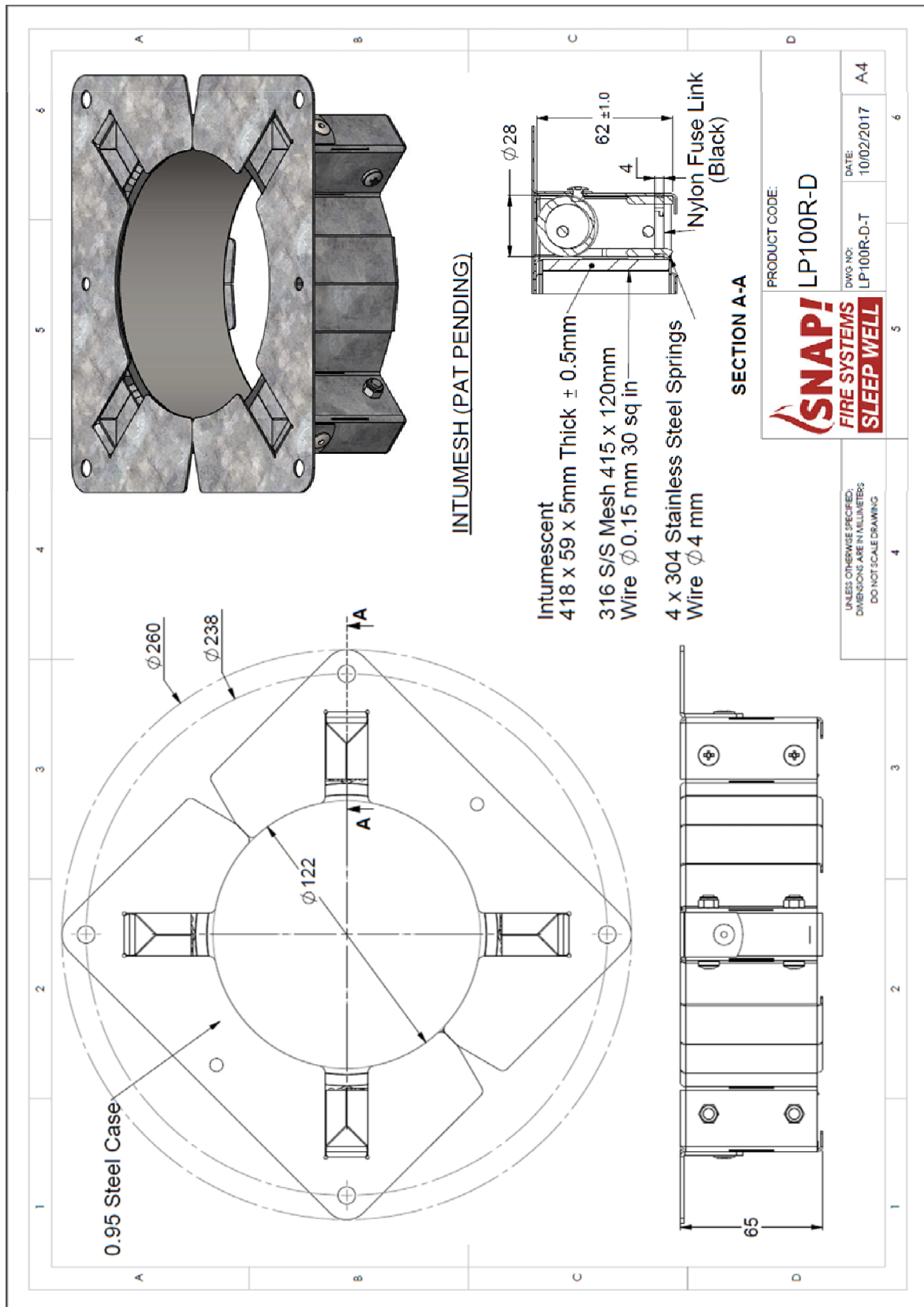
DRAWING TITLED "TEST SLAB S-17-B PENETRATION # 2 110-MM HDPE PIPE – LP100R-D - FLOORWASTE, DATED 21 MAY 2017, BY SNAP FIRE SYSTEMS PTY LTD."

Test Slab S-17-B Penetration # 3
80mm PVC - H100S-RR
Stack w Fitting Inside Collar
Date: 20 MAY 2017

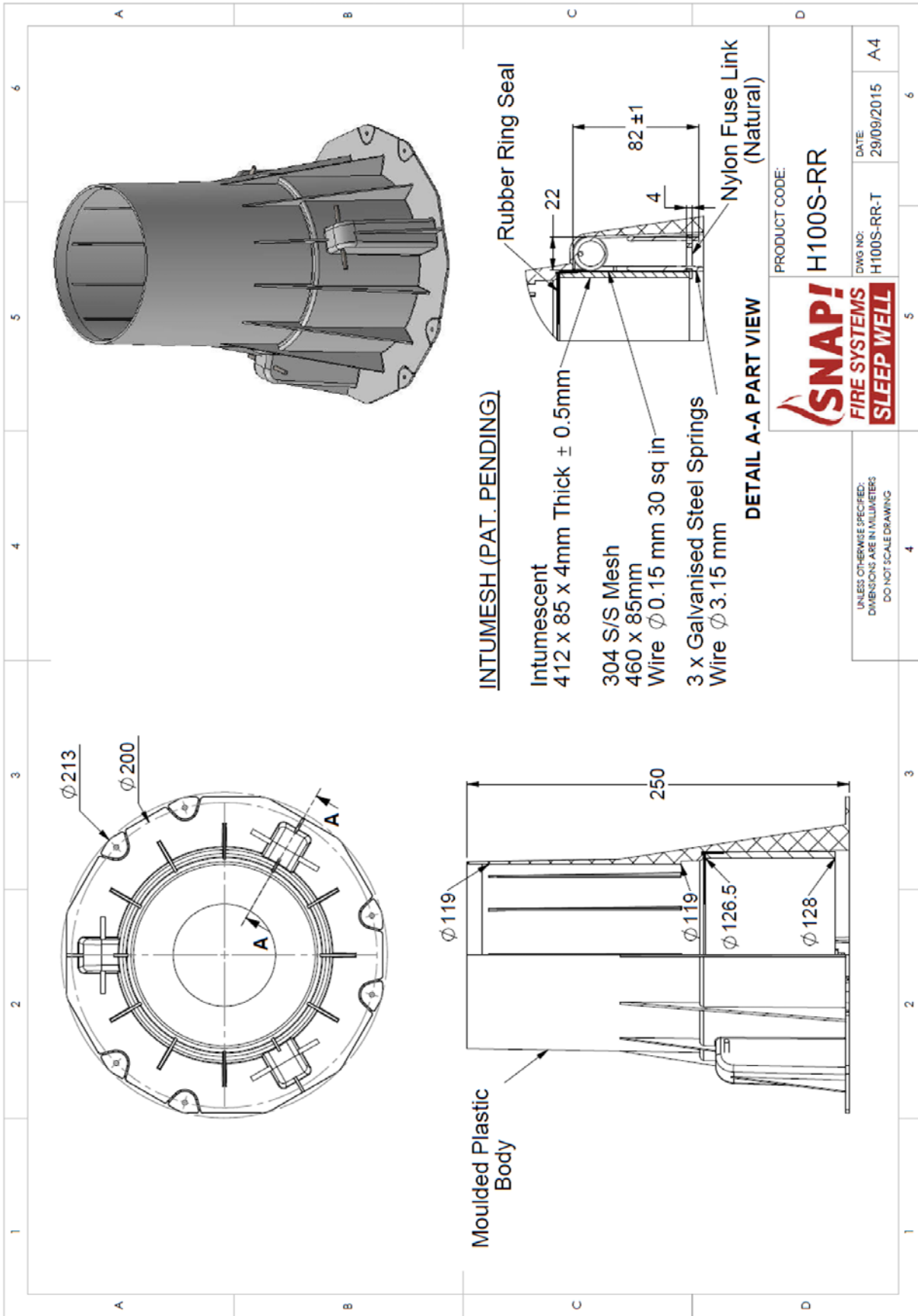


DRAWING TITLED "TEST SLAB S-17-B PENETRATION # 3 80-MM PVC – H100S-RR – STACK W FITTING INSIDE COLLAR, DATED 20 MAY 2017, BY SNAP FIRE SYSTEMS PTY LTD."

Appendix E – Specimen Drawings



DRAWING NUMBERED LP100R-D-T DATED 10 FEBRUARY 2017, BY SNAP FIRE SYSTEMS PTY LTD.



PRODUCT CODE:
H100S-RR

DWG NO: H100S-RR-T	DATE: 29/09/2015
A4	

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN MILLIMETERS
DO NOT SCALE DRAWING

DRAWING NUMBERED H100S-RR DATED 29 SEPTEMBER 2016, BY SNAP FIRE SYSTEMS PTY LTD.

Appendix F – Certificates

INFRASTRUCTURE TECHNOLOGIES www.csiro.au		
14 Julius Avenue, North Ryde NSW 2113 PO Box 52, North Ryde NSW 1670, Australia T (02) 9490 5444 • ABN 41 687 119 230		
<h2>Certificate of Test</h2>		No. 2986
This is to certify that the element of construction described below was tested by CSIRO Infrastructure Technologies in accordance with Australian Standard 1530, Methods for fire tests on building materials, components and structures, Part 4 Fire-resistance tests of elements of construction, 2014 on behalf of:		
IG6 Pty Ltd as trustee for the IG6 IP Trust 3 Skirmish Court Victoria Point Qld 4165		
A full description of the test specimen and the complete test results are detailed in the Division's Sponsored Investigation report numbered FSP 1830.		
Product Name:	Penetration 2 – LP100R-D Retrofit collar protecting a nominal 110-mm Mueller High Density Polyethylene (HDPE) Pipe and Floorwaste	
Description:	The specimen comprised an 1150-mm x 1150-mm x 150-mm thick reinforced concrete slab penetrated by a nominal 110-mm Mueller High Density Polyethylene (HDPE) Pipe and Floorwaste protected by LP100R-D Retrofit collar. The SNAP Retrofit LP100R-D collar comprised a 0.95-mm thick steel casing with a 122-mm inner diameter and a 195-mm x 195-mm square base flange. The 65-mm high collar casing incorporated a layer of 418-mm x 59-mm x 5-mm thick Intumescent material. The closing mechanism comprised 4 x 304 stainless steel springs bound with black nylon fuse link and a 316 stainless steel mesh measuring 415 x 120-mm as shown in drawing numbered LP100R-D-T dated 10 February 2017, by Snap Fire Systems Pty Ltd. One collar was fixed to the underside of the slab using 30 x 5-mm concrete screws. The penetrating service comprised a 110-mm diameter HDPE pipe with a wall thickness of 4.7-mm fitted through the collar's sleeve. The floor waste system was fitted with a chrome brass grate. A 35-mm thick sand/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 HDPE P-Trap was connected to the penetrating pipe, supported by a steel strap and nut clip secured to the slab with 30 x 5-mm concrete screw. On the exposed face, the gully trap was capped using a HDPE End Cap. The floor waste gully was charged with water to the level shown in drawing titled "Test Slab S-17-B Penetration # 2 110-mm HDPE Pipe – LP100R-D - Floorwaste, dated 20 May 2017, 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.		
For the purposes of AS 1530.4-2014 the results of these fire tests may be used to directly assess fire hazard, but it should be recognized that a single test method will not provide a full assessment of fire hazard under all fire conditions. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.		
Testing Officer:	Heherson Alarde	Date of Test: 26 April 2017
Issued on the 3 rd day of August 2017 without alterations or additions.		
		
Brett Roddy Manager, Fire Testing and Assessments		
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Certificate of Test

No. 2987

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

IG6 Pty Ltd as trustee for the IG6 IP Trust
 3 Skirmish Court
 Victoria Point Qld 4165

A full description of the test specimen and the complete test results are detailed in the Division's Sponsored Investigation report numbered FSP 1830.

Product Name: Penetration 3 – H100S-RR collar protecting a nominal 80-mm Polyvinyl Chloride (PVC) Pipe incorporating a floorwaste and a fitting inside the collar

Description: The specimen comprised an 1150-mm x 1150-mm x 150-mm thick reinforced concrete slab penetrated by a nominal 80-mm Polyvinyl Chloride (PVC) Pipe incorporating a floorwaste and a fitting inside the collar protected by a H100S-RR collar. The SNAP H100S-RR collar comprised a 1.6-mm thick polypropylene casing with a 126.5-mm inner diameter and a 213-mm base flange. The 250-mm high collar casing incorporated a layer of 412-mm x 85-mm x 4-mm thick Intumescent material. The closing mechanism comprised 3 x galvanised steel springs bound with a natural nylon fuse links and 304 stainless steel mesh measuring 460 x 85-mm as shown in drawing numbered H100S-RR dated 29 September 2016, by Snap Fire Systems Pty Ltd. The penetrating service comprised a 80-mm diameter PVC pipe and an 80-mm PVC coupling with a total wall thickness of 6-mm fitted through the collar's sleeve. The pipe projected vertically, 2000-mm away from the unexposed face of the wall and approximately 500-mm into the furnace chamber. The pipe was supported at nominally 500-mm and 1500-mm from the unexposed face of the wall by two support clamps spaced apart at nominally 1000-mm. The pipe was open at the unexposed end and capped on the exposed end with an 80-mm PVC pipe cap. On the unexposed side of the slab, there was a 20-mm wide and 10-mm deep bead of non-fire rated roof and gutter silicone sealant around the base of the pipe.

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.

For the purposes of AS 1530.4-2014 the results of these fire tests may be used to directly assess fire hazard, but it should be recognized that a single test method will not provide a full assessment of fire hazard under all fire conditions. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.

Testing Officer: Heherson Alarde Date of Test: 26 April 2017

Issued on the 3rd day of August 2017 without alterations or additions.

Brett Roddy
 Manager, Fire Testing and Assessments

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References

The following informative documents are referred to in this Report:

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

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

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