

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

## Test Report

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**Report number:** FSP 1692  
**Date:** 26 October 2015  
  
**Client:** Snap Fire Systems Pty Ltd

Commercial-in-confidence

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AUTHOR	REVIEWED BY	AUTHORISED BY
Mario Lara-Ledermann	Brett Roddy	Brett Roddy
		
26 October 2015	26 October 2015	26 October 2015

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

## Sponsored Investigation No. FSP 1692

## 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 two (2) stack pipes and one (1) floor waste.

### 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 4473/3837

### 1.7 Test date

The fire-resistance test was conducted on 9 February 2015.

## 2 Description of specimen

### 2.1 General

The specimen comprised an 1150-mm x 1150-mm x 150-mm thick reinforced concrete slab penetrated by two (2) stack pipes and one (1) floor waste protected by retrofit Snap Fire System fire collars. The pipes are stated to be manufactured in accordance with AS/NZS 1260: 2009 'PVC-U pipes and fittings for drain, waste and vent application' and AS/NZS 5065: 2005 'Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications'.

For the purpose of the test, the specimens were referenced as Penetrations 1, 2 and 3. Only one (1) specimen is included in this report (Penetration 3).

#### Penetration # 3 – HP250 R retrofitted fire collar protecting a 250-mm diameter High Density Polyethylene (HDPE) stack pipe

The SNAP retrofitted HP250 R collar comprised a 0.95-mm steel casing with a 279-mm inner diameter and a 460-mm diameter base flange. The 184-mm high collar casing incorporated two strips of Intumesh intumescent material, 910-mm x 179-mm x 12-mm thick and 958-mm x 179-mm x 2.5-mm thick. The closing mechanism comprised five stainless steel springs, with nylon fuse links, and a 949-mm x 179-mm 304 stainless steel mesh located in between the intumescent strips as shown in drawing numbered HP 250 R-T dated 7 January 2015, by Snap Fire Systems Pty Ltd.

The penetrating service comprised a 250-mm diameter High Density Polyethylene (HDPE) stack pipe, with a wall thickness of 7.25-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 5 brackets with Steel Wedge Anchors fixed to the concrete slab. On the exposed face, the pipe was capped using a Kaowool plug.

On the unexposed face, the gap between the pipe and the slab was filled with a bead of Fullers Firesound as show in drawing titled "Penetration #3 – HDPE 250-mm stack", dated 13 April 2015, 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 titled “Penetration #3 – HDPE 250-mm stack”, dated 13 April 2015, by Snap Fire Systems Pty Ltd.

Drawing numbered HP250R-T, dated 7 January 2015, by Snap Fire Systems Pty Ltd.

## 4 Equipment

### 4.1 Furnace

The furnace had a nominal opening of 1000-mm x 1000-mm for attachment of vertical or horizontal specimens.

The furnace was lined with refractory bricks and materials with the thermal properties as specified in AS 1530.4-2005 and was heated by combustion of a mixture of natural gas and air.

### 4.2 Temperature

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

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

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

### 4.3 Measurement system

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

## 5 Ambient temperature

The temperature of the test area was 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 230 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
5 minutes -	Smoke is fluing from Penetration 3.
8 minutes -	Smoke fluing from Penetration # 3 has decreased.
230 minutes -	Flaming is observed on the unexposed face of Penetration # 2. Flames have spread – affecting Penetration # 3. 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.



## 8.5 Performance

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

Penetration # 3 – HP250 R retrofitted fire collar protecting a 250-mm diameter High Density Polyethylene (HDPE) stack pipe

Structural adequacy	-	not applicable
Integrity	-	no failure at 180 minutes
Insulation	-	no failure at 180 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      -      -/180/180

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

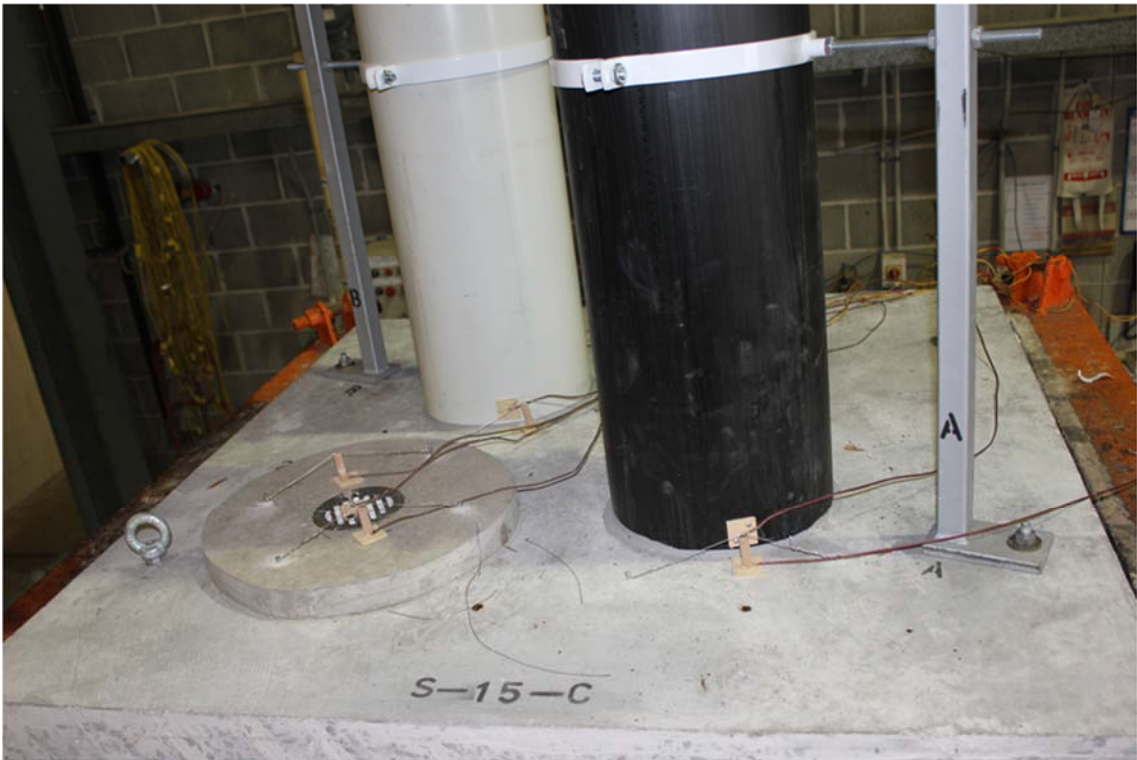
## Appendix A – Measurement location

Measurement Location		
Group location	T/C Position	T/C designation
Specimen		
Penetration 1	On slab – 25-mm from the pipe.	S1
	On slab – 25-mm from the pipe.	S2
	On pipe – 25-mm from the slab.	S3
	On pipe – 25-mm from the slab.	S4
Penetration 2	On grate.	S5
	On step – 25-mm from the grate.	S6
	On step – 25-mm from the grate.	S7
Penetration 3	On slab – 25-mm from the pipe.	S8
	On slab – 25-mm from the pipe.	S9
	On pipe – 25-mm from the slab.	S10
	On pipe – 25-mm from the slab.	S11

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**

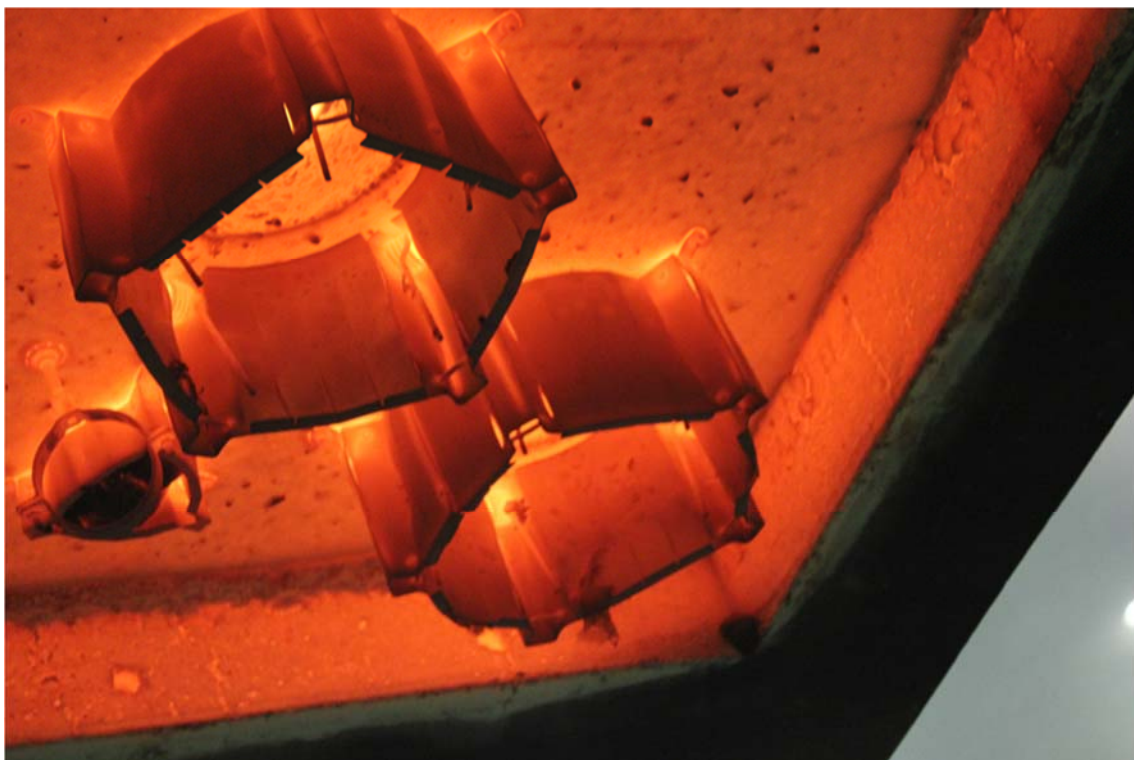


**PHOTOGRAPH 4 – SPECIMENS AFTER 120 MINUTES OF TESTING**





**PHOTOGRAPH 5 – SPECIMENS AFTER 180 MINUTES OF TESTING**



**PHOTOGRAPH 6 – EXPOSED FACE OF SPECIMENS AT CONCLUSION OF TESTING**

Appendix C – Furnace Temperature

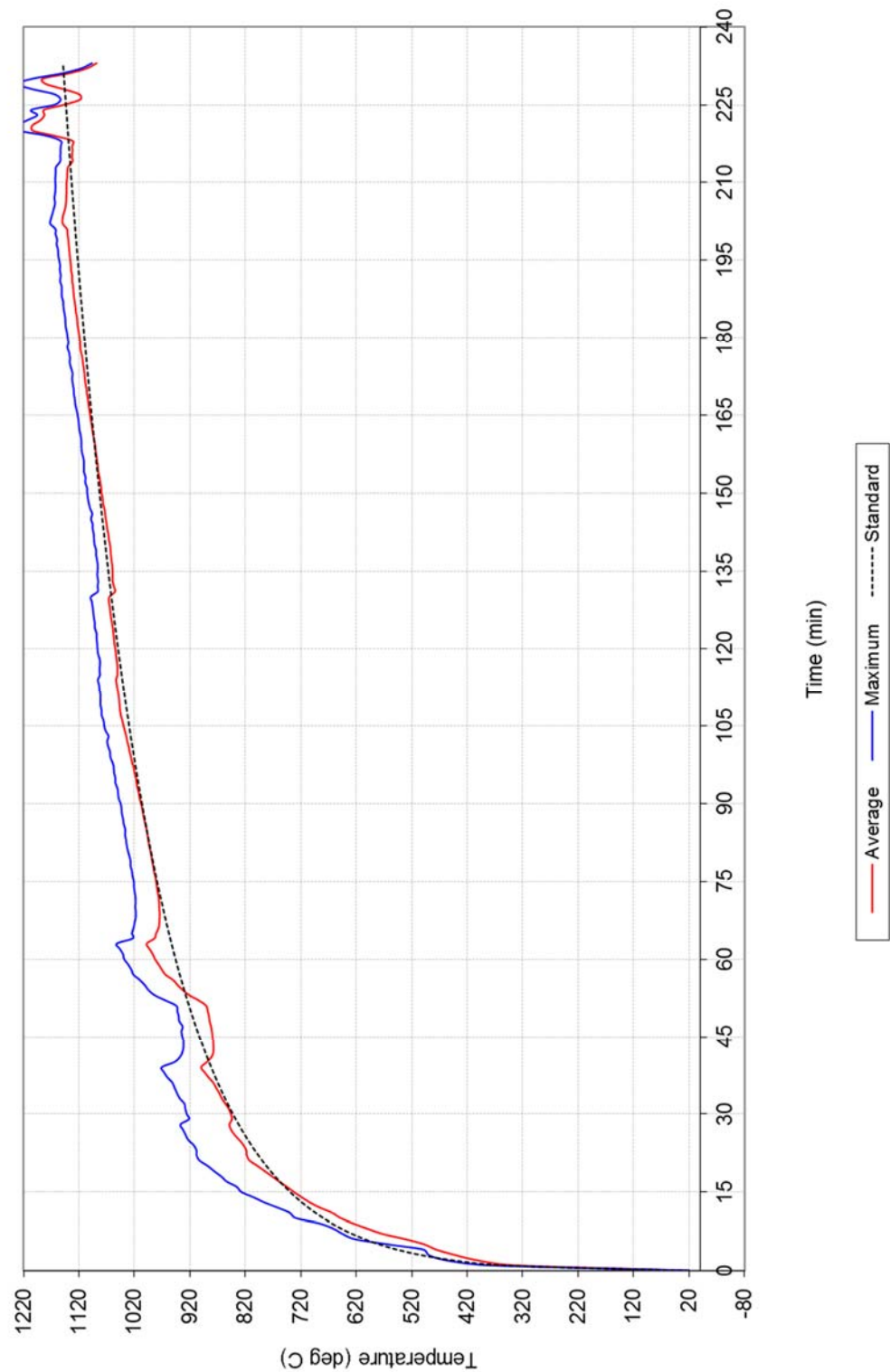


FIGURE 1 – FURNACE TEMPERATURE

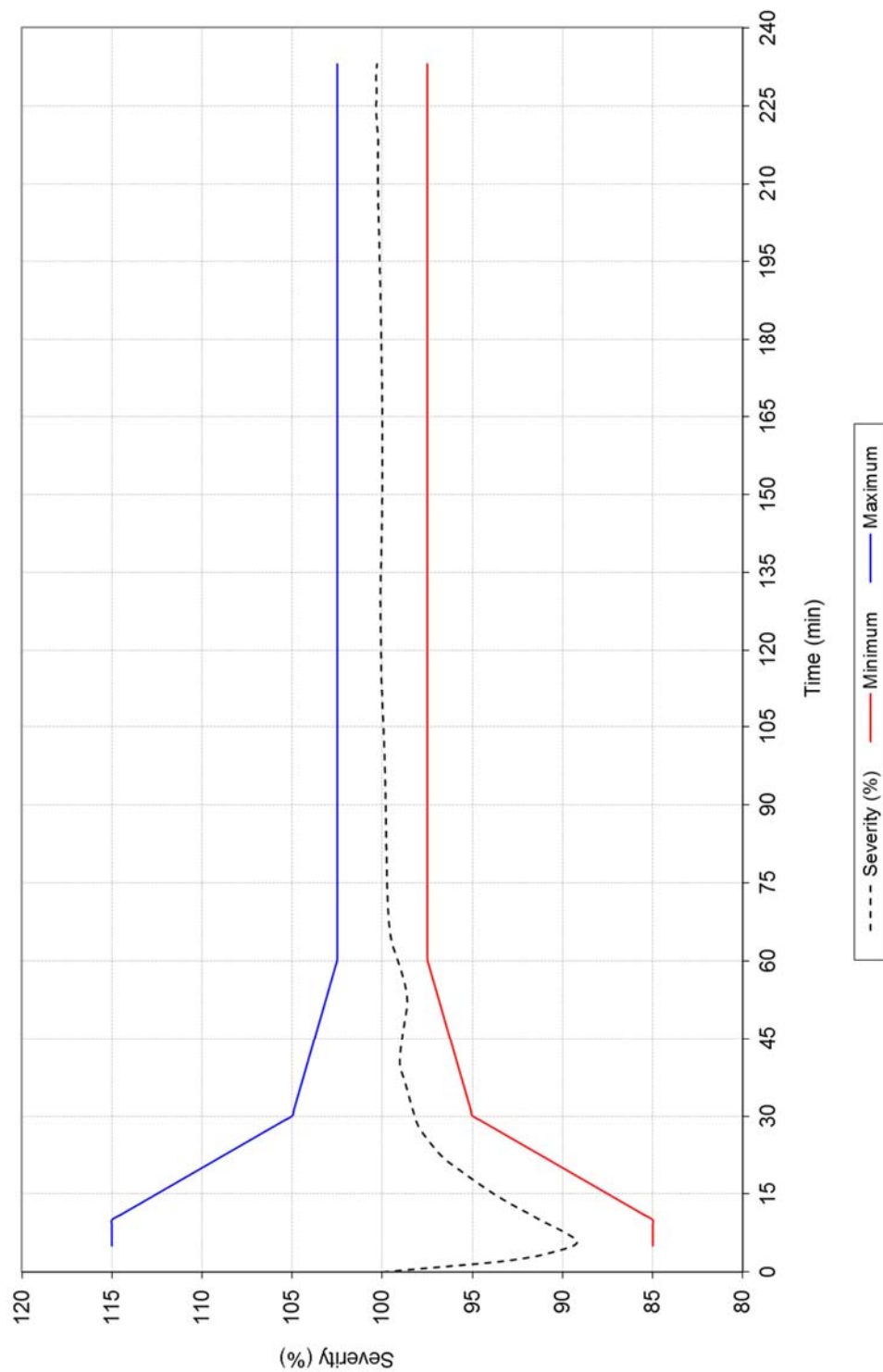


FIGURE 2 – FURNACE SEVERITY

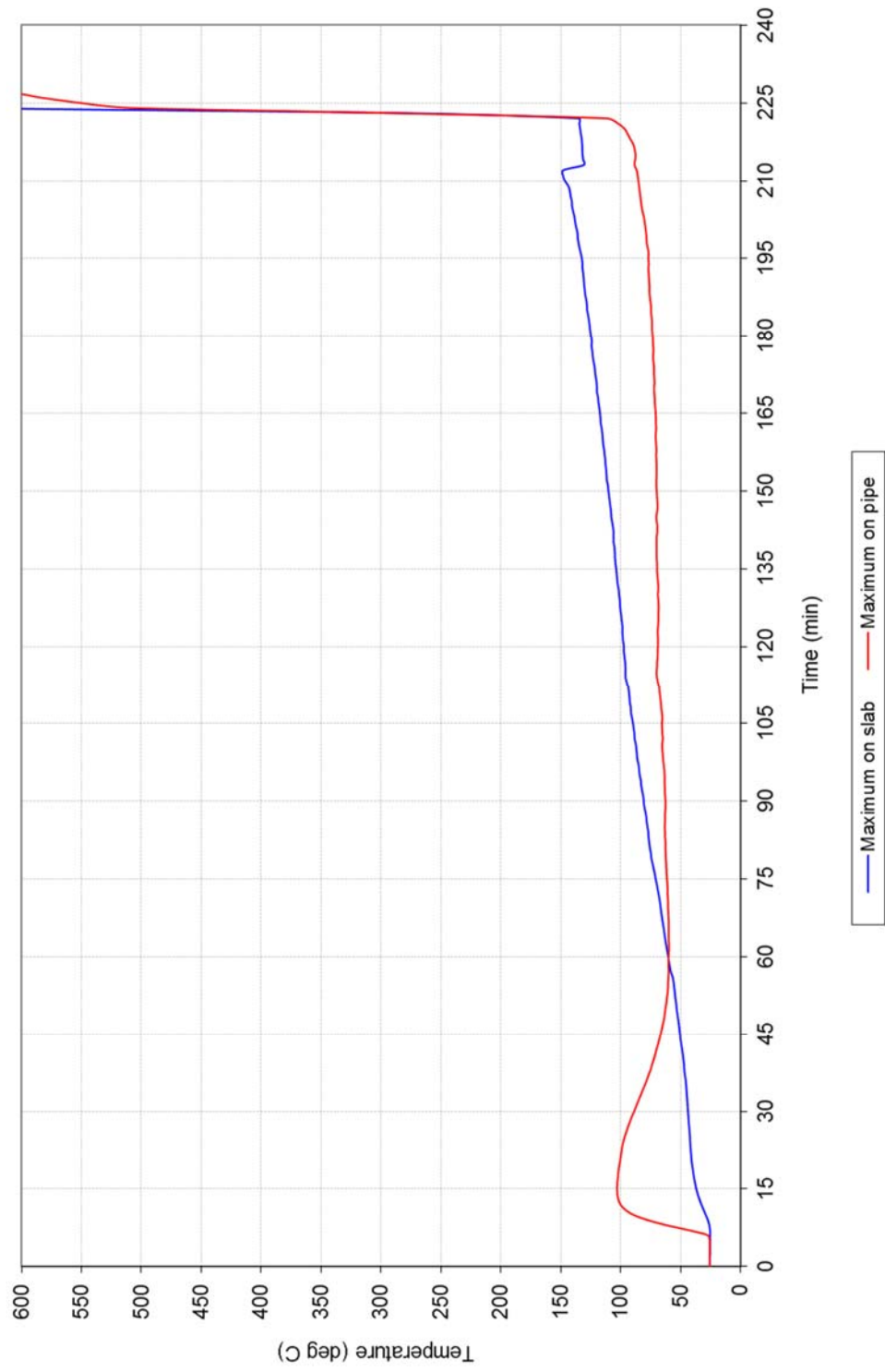
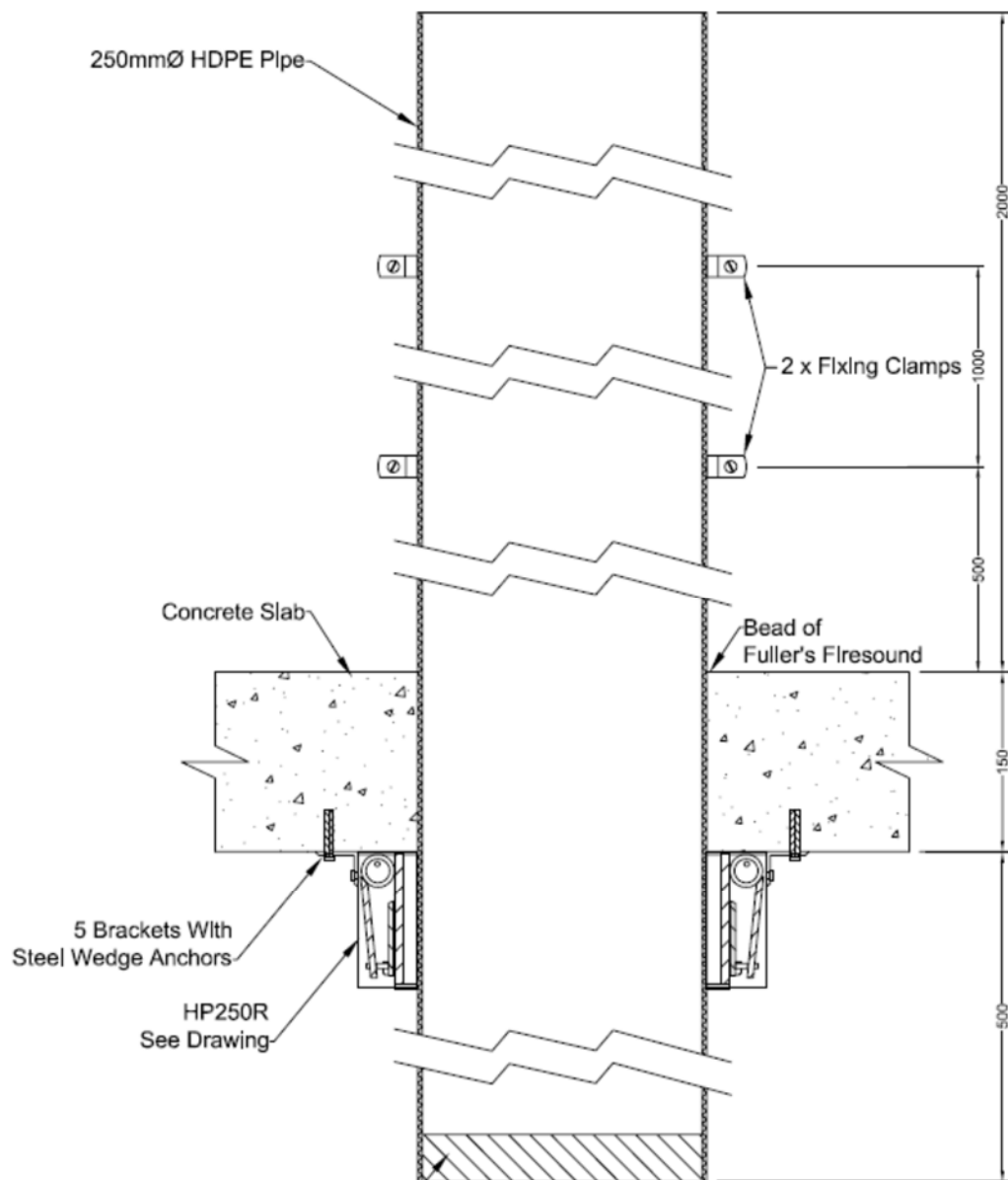


FIGURE 3 – SPECIMEN TEMPERATURE – ASSOCIATED WITH PENETRATION 3



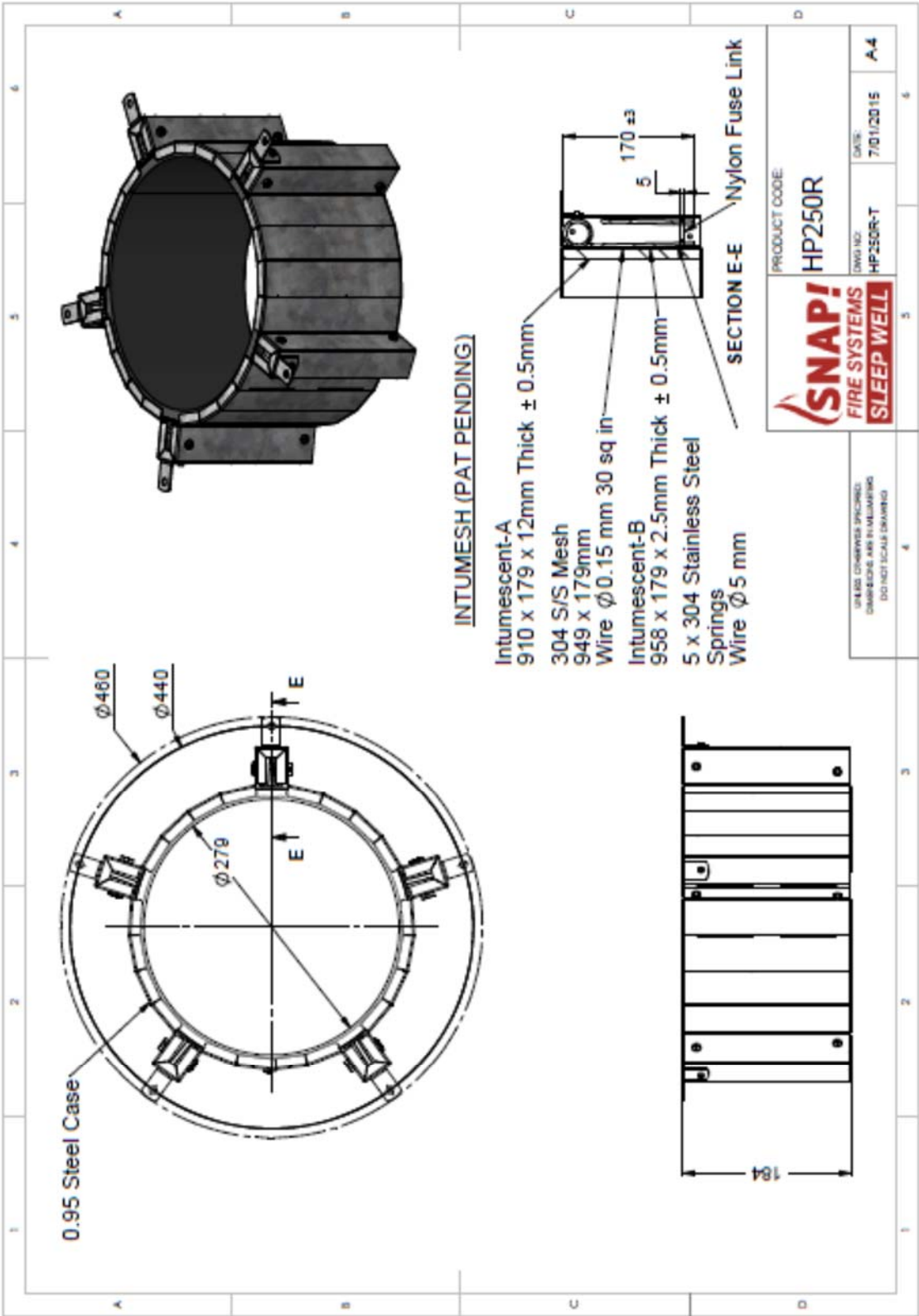
## Appendix D – Installation drawings

PENETRATION # 3  
HDPE 250-MM STACK  
13 APR 2015






DRAWING NUMBERED "PENETRATION #3 – HDPE 250-MM STACK", DATED 13 APRIL 2015, BY SNAP FIRE SYSTEMS PTY LTD.

Appendix E – Specimen Drawings



## Appendix F – Certificate(s)

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		
<h3>Certificate of Test</h3>		No. 2656
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<p>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:</p>		
<p>Snap Fire Systems Pty Ltd Unit 2/160 Redland Bay Road CAPALABA QLD</p>		
<p>A full description of the test specimen and the complete test results are detailed in the Division's Sponsored Investigation report numbered FSP 1692.</p>		
Product Name:	Penetration # 3 – HP250 R retrofitted fire collar protecting a 250-mm diameter High Density Polyethylene (HDPE) stack pipe	
Description:	<p>The SNAP retrofitted HP250 R collar comprised a 0.95-mm steel casing with a 279 mm inner diameter and a 460-mm diameter base flange. The 184-mm high collar casing incorporated two strips of Intumesh intumescent material, 910 mm x 179 mm x 12-mm thick and 958 mm x 179 mm x 2.5-mm thick. The closing mechanism comprised five stainless steel springs, with nylon fuse links, and a 949 mm x 179-mm 304 stainless steel mesh located in between the intumescent strips as shown in drawing numbered HP 250 R-T dated 7 January 2015, by Snap Fire Systems Pty Ltd. The penetrating service comprised a 250-mm diameter High Density Polyethylene (HDPE) stack pipe, with a wall thickness of 7.25-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 5 brackets with Steel Wedge Anchors fixed to the concrete slab. On the exposed face, the pipe was capped using a Kaowool plug. On the unexposed face, the gap between the pipe and the slab was filled with a bead of Fullers Firesound as show in drawing titled "Penetration #3 – HDPE 250-mm stack", dated 13 April 2015, by Snap Fire Systems Pty Ltd.</p>	
Structural Adequacy	not applicable	
Integrity	no failure at 180 minutes	
Insulation	no failure at 180 minutes	
<p>and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/180/180. The FRL is applicable for exposure to the fire from the same direction as tested.</p>		
<p>This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.</p>		
Testing Officer:	Mario Lara-Ledermann	Date of Test: 9 February 2015
<p>Issued on the 26<sup>th</sup> day of October 2015 without alterations or additions.</p>		
<p> Brett Roddy Manager, Fire Testing and Assessments</p>		
	<p>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</p>	

COPY OF CERTIFICATE OF TEST – NO. 2656

# 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.
AS/NZS 1260: 2009	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.

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