



Fire-resistance test on retrofit fire collars protecting a plasterboard wall penetrated by services

Test Report

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Client: IG6 Pty Ltd

Commercial-in-confidence



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Fire-resistance test on retrofit fire collars protecting a plasterboard wall penetrated by services

Sponsored Investigation No. FSP 2237

1 Introduction

1.1 Identification of specimen

The sponsor identified the specimen as retrofit fire collars protecting a steel framed plasterboard wall penetrated by an unplasticized polyvinyl chloride (uPVC) pipe and two PE100 high-density polyethylene (HDPE) pipes.

1.2 Sponsor

IG6 Pty Ltd
1343 Wynnum Road
Tingalpa QLD 4173
Australia

1.3 Manufacturer

Snap Fire Systems Pty Ltd
1343 Wynnum Road
Tingalpa QLD 4173
Australia

1.4 Test standard

Australian Standard 1530, Methods for fire tests on building materials, components and structures, Part 4-2014, Fire-resistance tests for elements of construction.

Section 10: Service penetrations and control joints

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 5127/4710

1.7 Test date

The fire-resistance test was conducted on 30 September 2021.

2 Description of specimen

2.1 General

The wall system comprised a 116-mm thick plasterboard lined, steel framed wall comprising two layers of 13-mm thick Boral Firestop plasterboard on each side of 64-mm deep metal studs, (Boral reference SB120.1) with an established FRL of -/120/120 as detailed in Exova Warringtonfire report numbered 27211-00.

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

- AS/NZS 1477:2017: 'PVC pipes and fittings for pressure applications' and
- AS/NZS 4130:2018 'Polyethylene (PE) pipes for pressure applications.'

For the purpose of the test, the specimens are referenced as Specimen 1, 2, and 3. Specimen 1 is the subject of this report. Documents containing a complete description of each specimen were supplied by the sponsor and are retained on file.

Specimen 1 - SNAP 32R Retrofit fire collars protecting a DN25 PN12 uPVC pipe penetrating a 37-mm diameter aperture

The SNAP 32R Retrofit fire collar comprised a 0.75-mm steel casing with a 40 mm inner diameter and a 106-mm diameter base flange. The 32-mm high collar casing incorporated a closing mechanism which comprised two soft Intumesh intumescent strips lined within the internal circumference of the collar. The inner and outer strips were 4-mm thick x 26-mm wide x 135-mm long and 4-mm thick x 26-mm wide x 154-mm long, respectively. Between the strips was a layer of 316 stainless steel mesh 135 mm long x 25-mm wide with wire mesh diameter of 0.15-mm, as shown in drawing titled 'SNAP 32 Retro', dated 5 October 2017, by Snap Fire Systems Pty Ltd. One collar was fixed to each side of the plasterboard wall in a back-to-back configuration using three 10g x 38-mm course thread plasterboard screws.

The penetrating service comprised an Iplex DN 25 PN12 uPVC 33.8-mm outside diameter pipe, with a wall thickness of 2.1-mm, fitted through the collar's sleeve. The pipe penetrated the wall through a 37-mm diameter cut-out hole as shown in drawing titled 'Specimen #1, 25 PN12 PVC Pipe & 32R', dated 17 August 2021, by Snap Fire Systems Pty Ltd.

The pipe projected horizontally 2000-mm away from the unexposed face of the wall and 500-mm into the furnace chamber. The pipe was supported at nominally 500-mm and 1500-mm from the unexposed face of the plasterboard wall and was left open on the unexposed end and plugged with ceramic fibre (Superwool) on the exposed end.

2.2 Dimensions

The plasterboard wall was nominally 1150-mm wide x 1150-mm high x 116-mm thick.

2.3 Orientation

The plasterboard wall was placed vertically against the furnace chamber and subjected to fire exposure from one side only.

2.4 Conditioning

The specimen was delivered on 17 September 2021 and stored under standard laboratory atmospheric conditions until the test date.

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

The supporting wall construction and specimen installation was organised by the sponsor. 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:

Documents titled 'Plasterboard Fire and Acoustic Systems Australia', revision UB1231-SYS 12/18, by USG Boral Building Products Pty Ltd.

Drawing titled 'Test Wall W-21-A1 Layout', dated 29 July February 2021, by Snap Fire Systems Pty Ltd.

Drawing titled 'Specimen #1, 25 PN12 PVC Pipe & 32R', dated 17 August 2021, by Snap Fire Systems Pty Ltd.

Drawing titled 'SNAP 32 Retro', dated 5 October 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 20°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 121 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
0:40 minute	- Smoke is being emitted between the collar and the pipe at the base of Specimen 1.
2 minutes	- Smoke has started to flue from the end of the pipe of Specimen 1.
4 minutes	- Smoke has ceased fluing from the end of the pipe of Specimen 1.
11 minutes	- Smoke has ceased being emitted from between the pipe and collar at the base of Specimen 1.
55 minutes	- Light smoke has resumed fluing at the end of the pipe of Specimen 1.
61 minutes	- Smoke has ceased fluing from the end of the pipe of Specimen 1.
84 minutes	- Smoke has resumed fluing at the end of the pipe of Specimen 1.
121 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 temperature versus time associated with Specimen 1.

8.5 Performance

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

Specimen 1 - SNAP 32R Retrofit fire collars protecting a DN25 PN12 uPVC pipe penetrating a 37-mm diameter aperture.

Structural adequacy	-	not applicable
Integrity	-	no failure at 121 minutes
Insulation	-	no failure at 121 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 AS 1530.4. 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 specimen were as follows:

Specimen 1 -/120/120

The fire-resistance level is applicable when the system is exposed to fire from either direction.

The test was conducted on a wall system with an established FRL of -/120/120. The maximum FRL of any test specimen cannot exceed the FRL achieved by the wall system in which it was installed.

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 10.12 of AS 1530.4-2014, have been made provided no individual component is removed or reduced.

11 Tested by



Peter Gordon
Testing Officer

Appendices

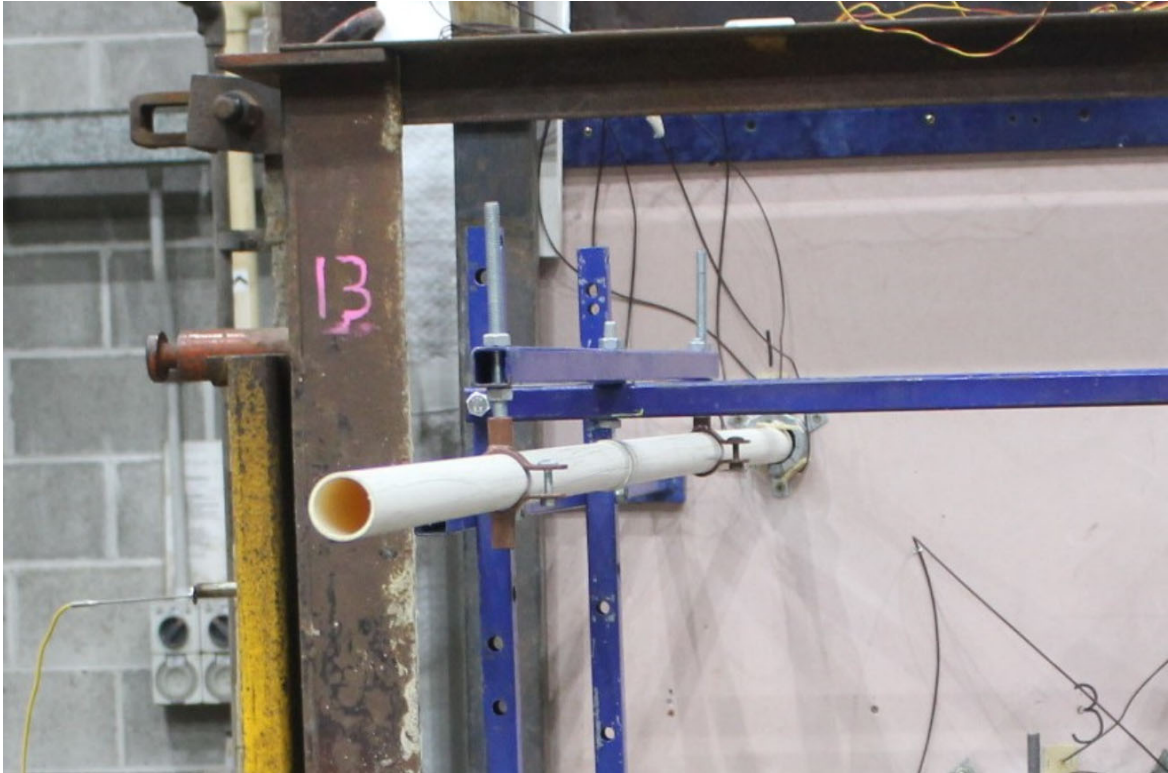
Appendix A – Measurement location

SPECIMEN	THERMOCOUPLE POSITION	DESIGNATION
Specimen 1 - SNAP 32R Retrofit fire collars protecting a DN25 PN12 uPVC pipe penetrating a 37-mm diameter aperture.	On P/B wall, 25 mm above of collar	S1
	On P/B wall, 25 mm right side of collar	S2
	On collar top right side	S3
	On collar bottom right side	S4
	On top left of pipe, 25-mm from collar	S5
	On bottom left of pipe, 25-mm from collar	S6
Rover		S20
Ambient		S21

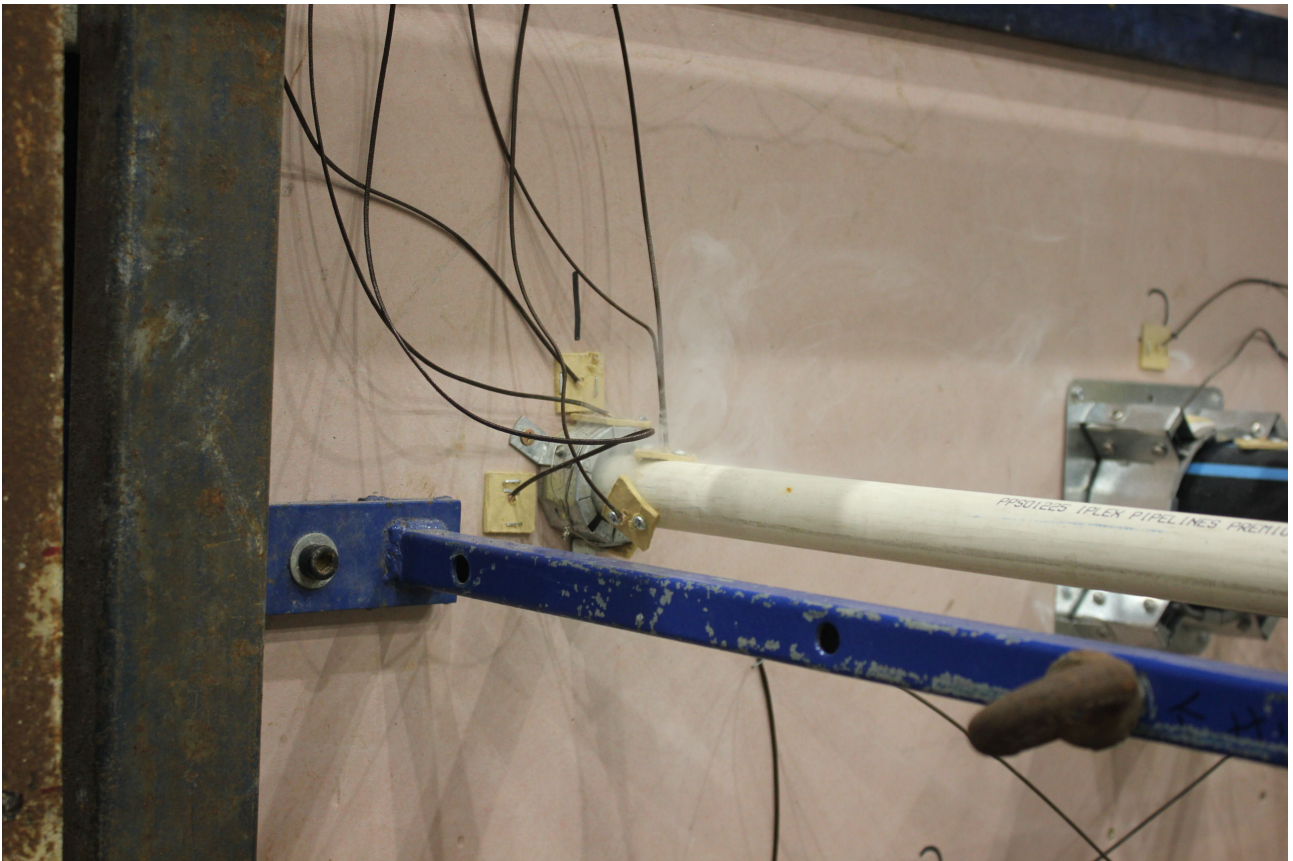
Appendix B – Photographs



PHOTOGRAPH 1 – EXPOSED FACE OF SPECIMEN 1 PRIOR TO TESTING



PHOTOGRAPH 2 – UNEXPOSED FACE OF SPECIMEN 1 PRIOR TO TESTING



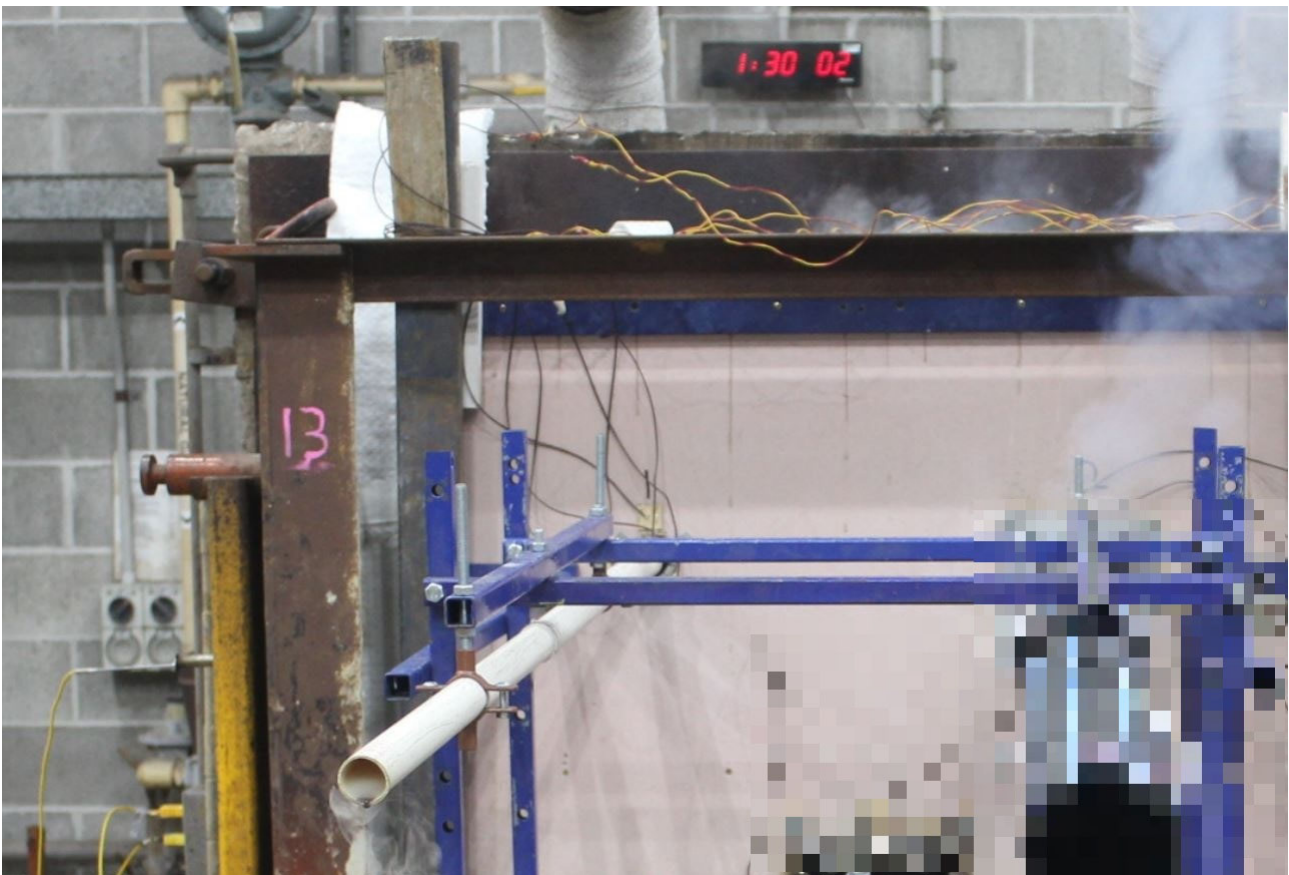
PHOTOGRAPH 3 – BASE OF SPECIMEN 1 AFTER 1 MINUTE OF TESTING



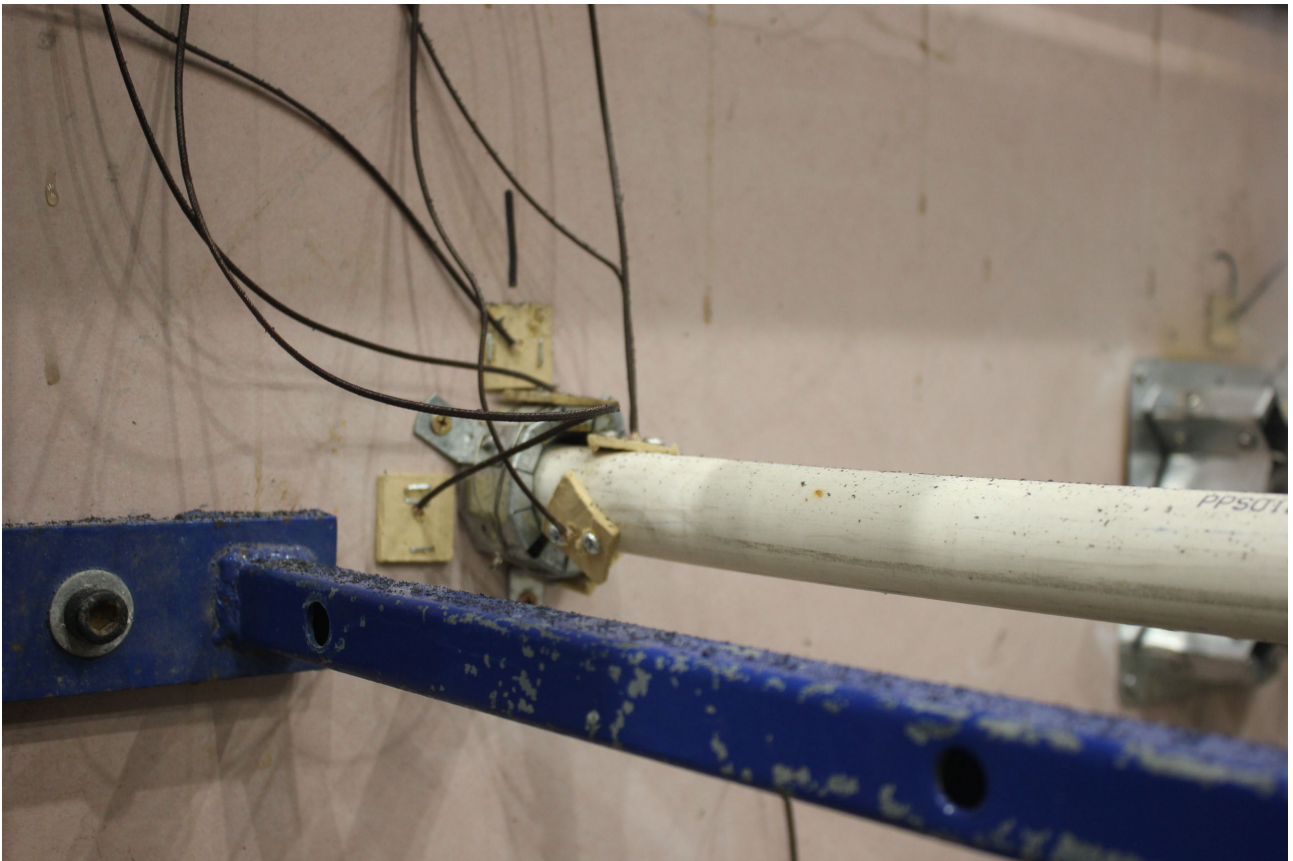
PHOTOGRAPH 4 – SPECIMEN 1 AFTER 30 MINUTES OF TESTING



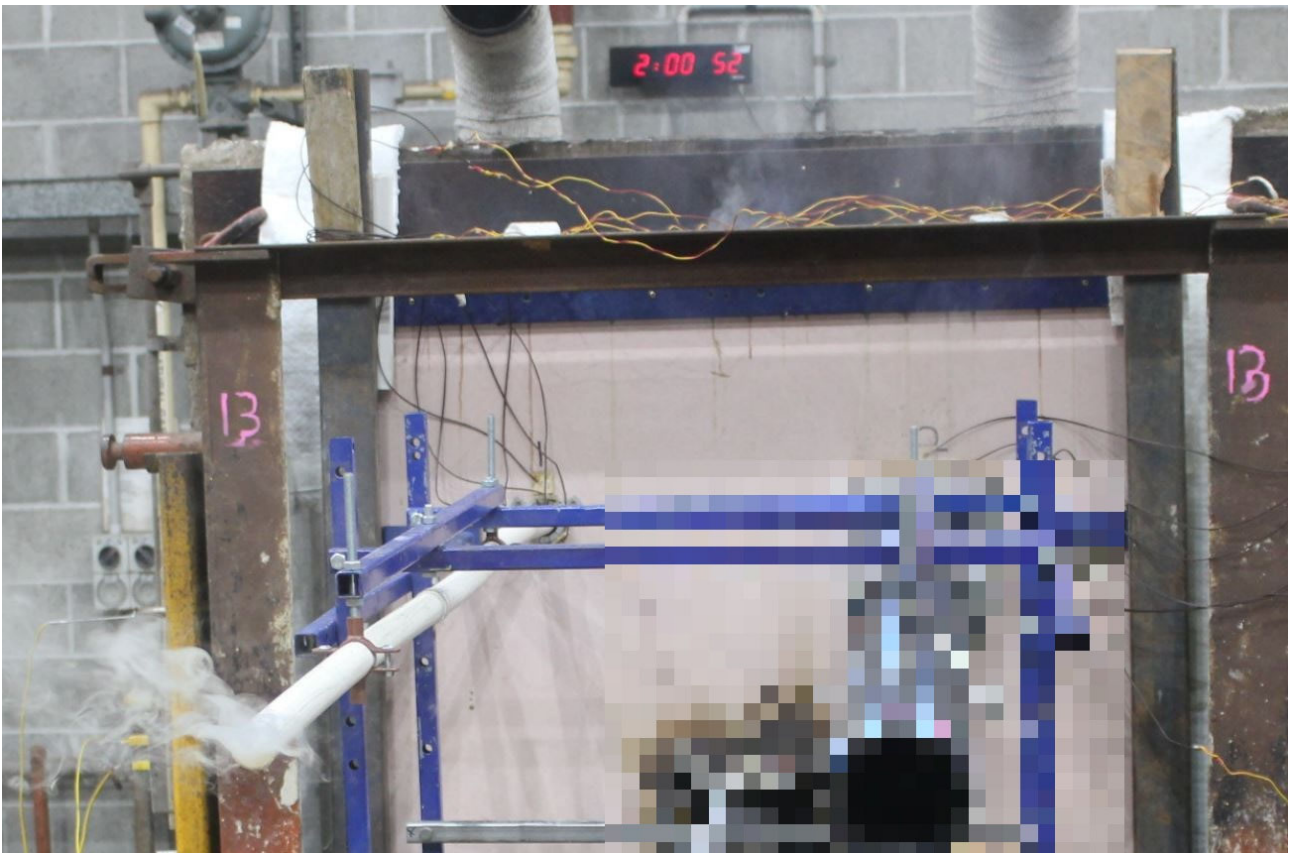
PHOTOGRAPH 5 – SPECIMEN 1 AFTER 60 MINUTES OF TESTING



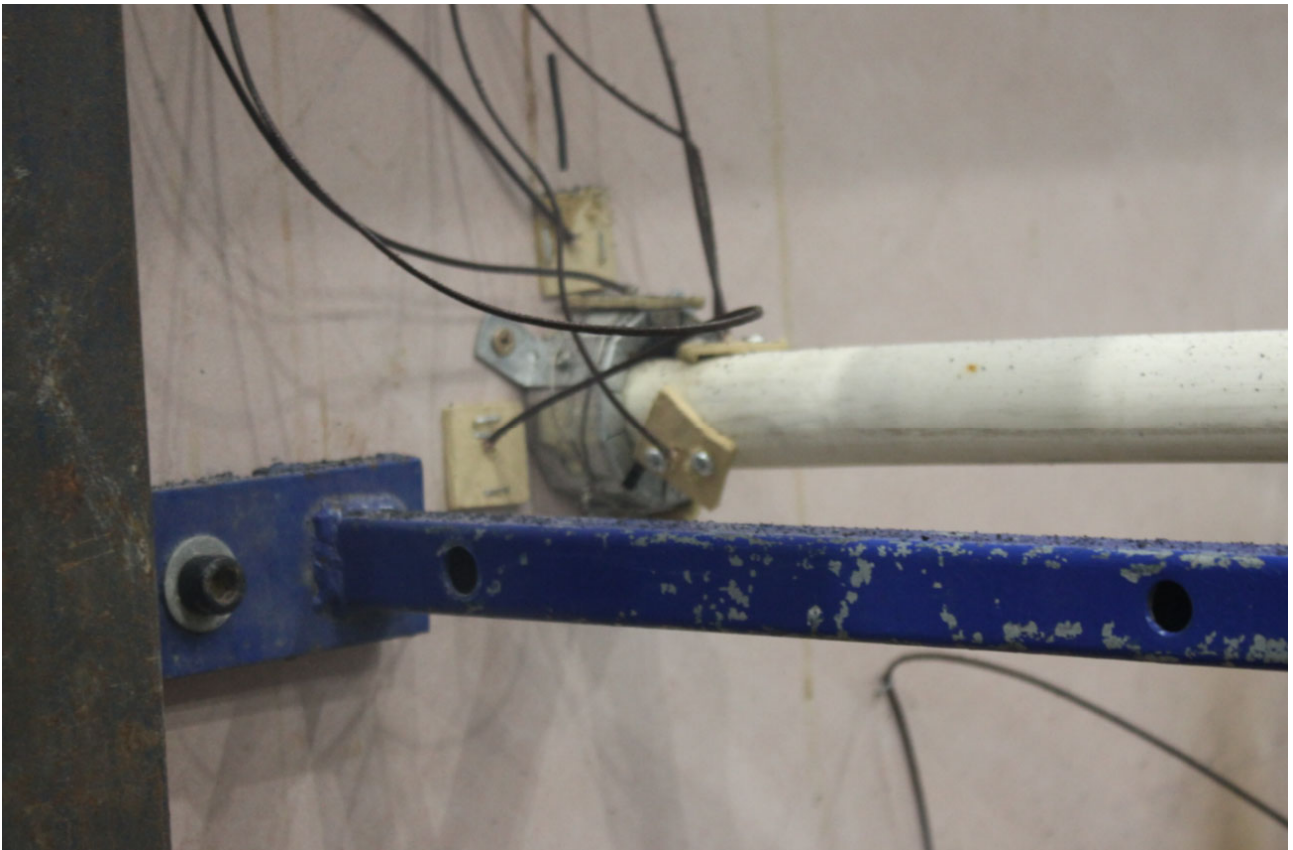
PHOTOGRAPH 6 – SPECIMEN 1 AFTER 90 MINUTES OF TESTING



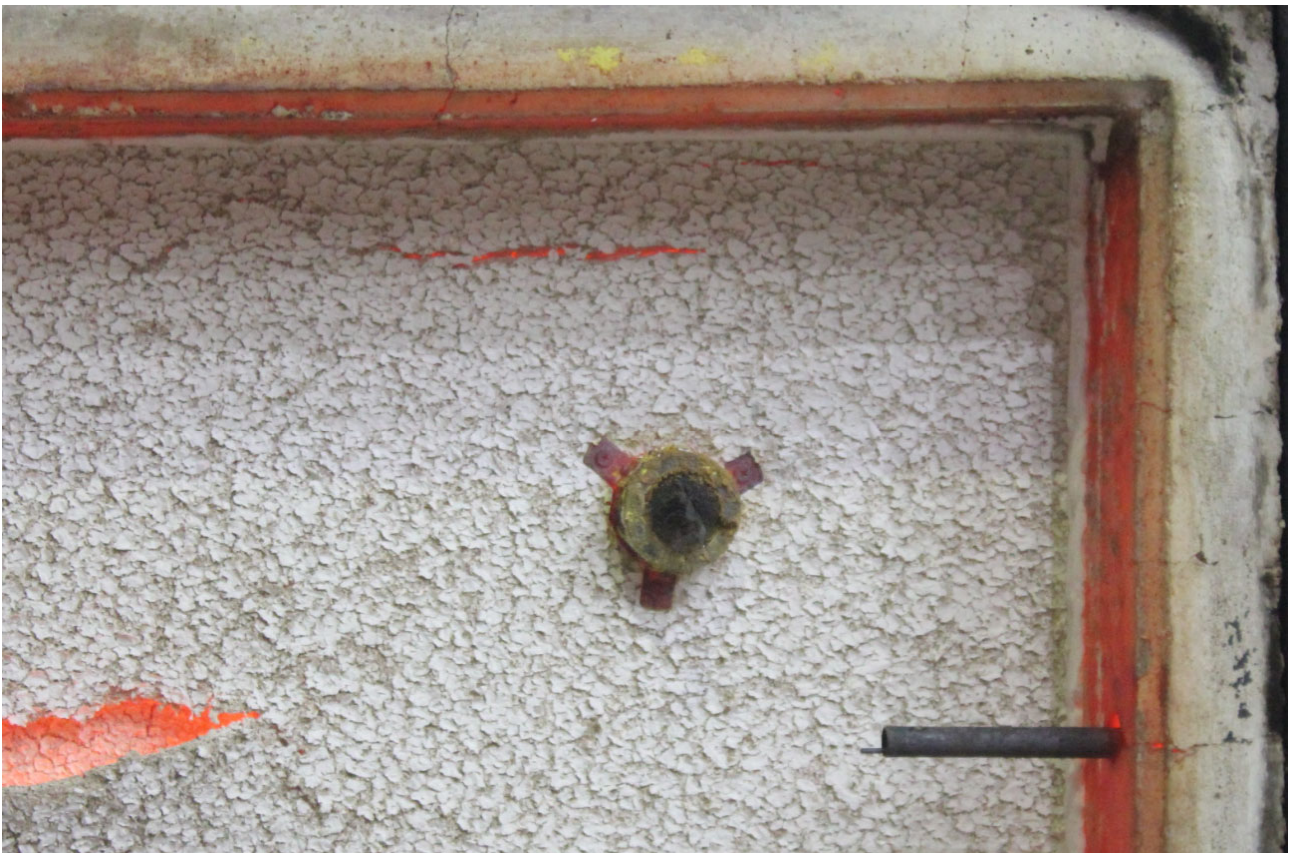
PHOTOGRAPH 7 – BASE OF SPECIMEN 1 AFTER 90 MINUTES OF TESTING



PHOTOGRAPH 8 – SPECIMEN 1 AFTER 120 MINUTES OF TESTING



PHOTOGRAPH 9 – BASE OF SPECIMEM 1 AFTER 120 MINUTES OF TESTING



PHOTOGRAPH 10 – EXPOSED FACE OF SPECIMEN 1 AT CONCLUSION OF TESTING

Appendix C – Test data charts

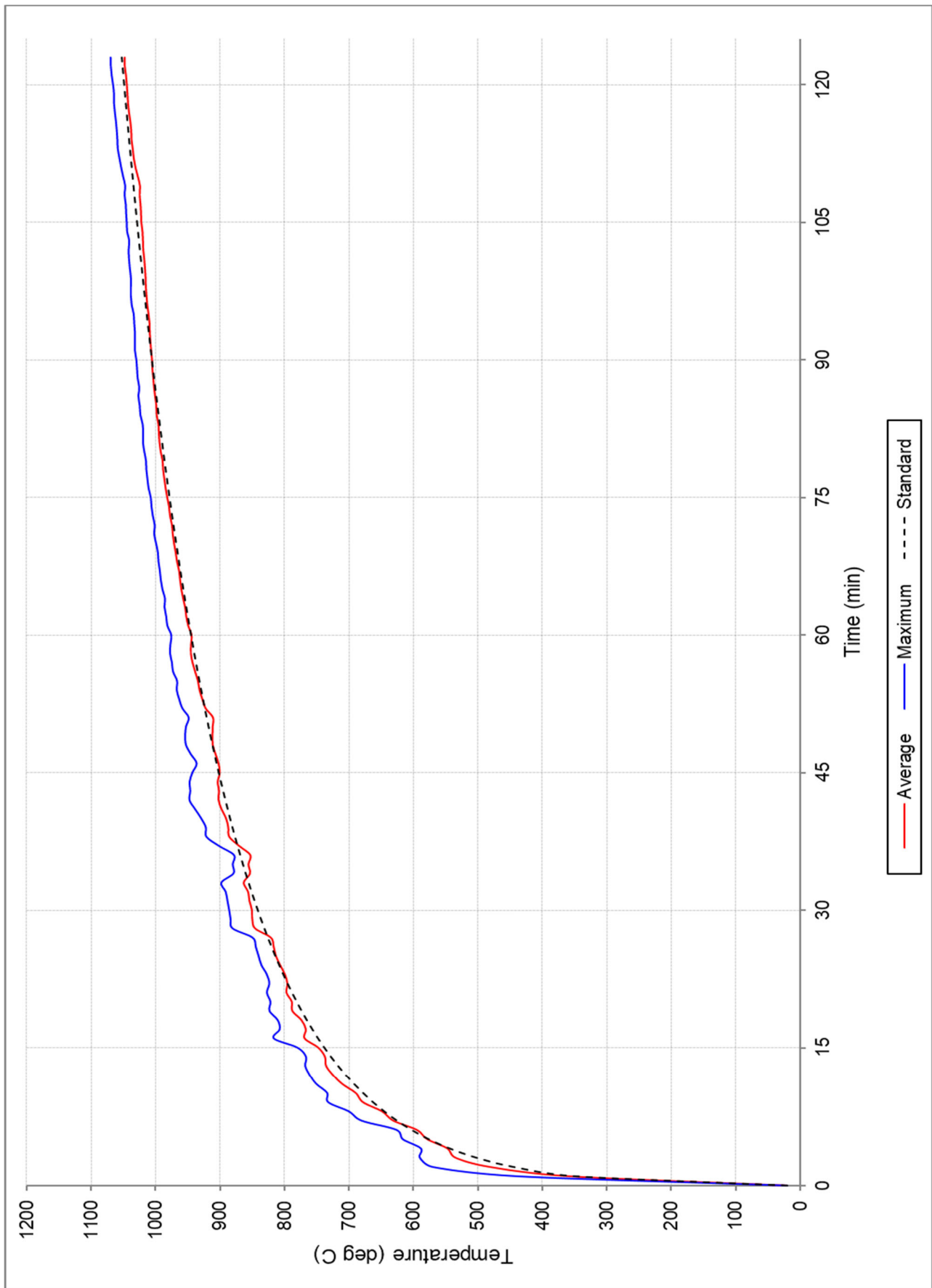


FIGURE 1 – FURNACE TEMPERATURE

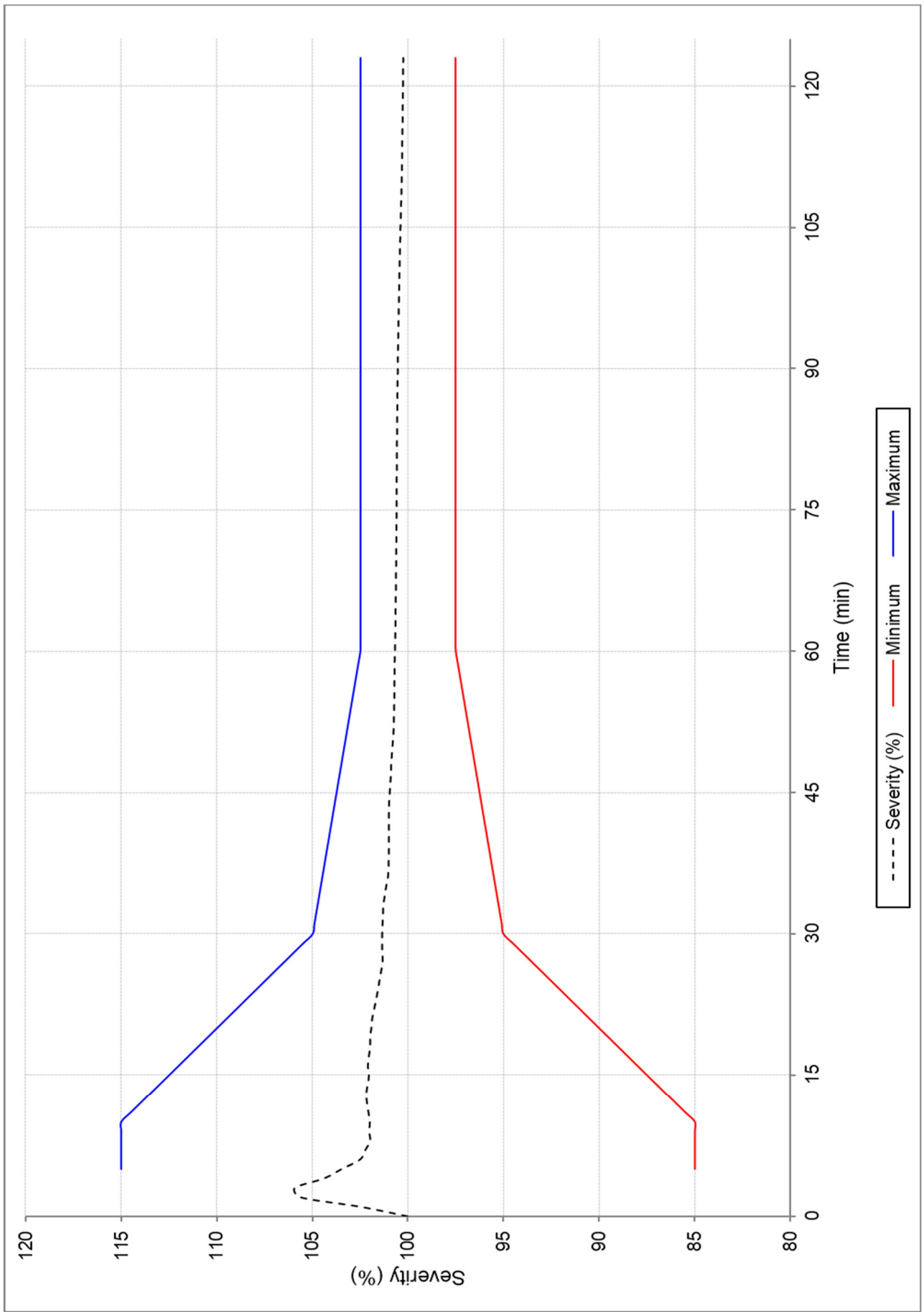


FIGURE 2 – FURNACE SEVERITY

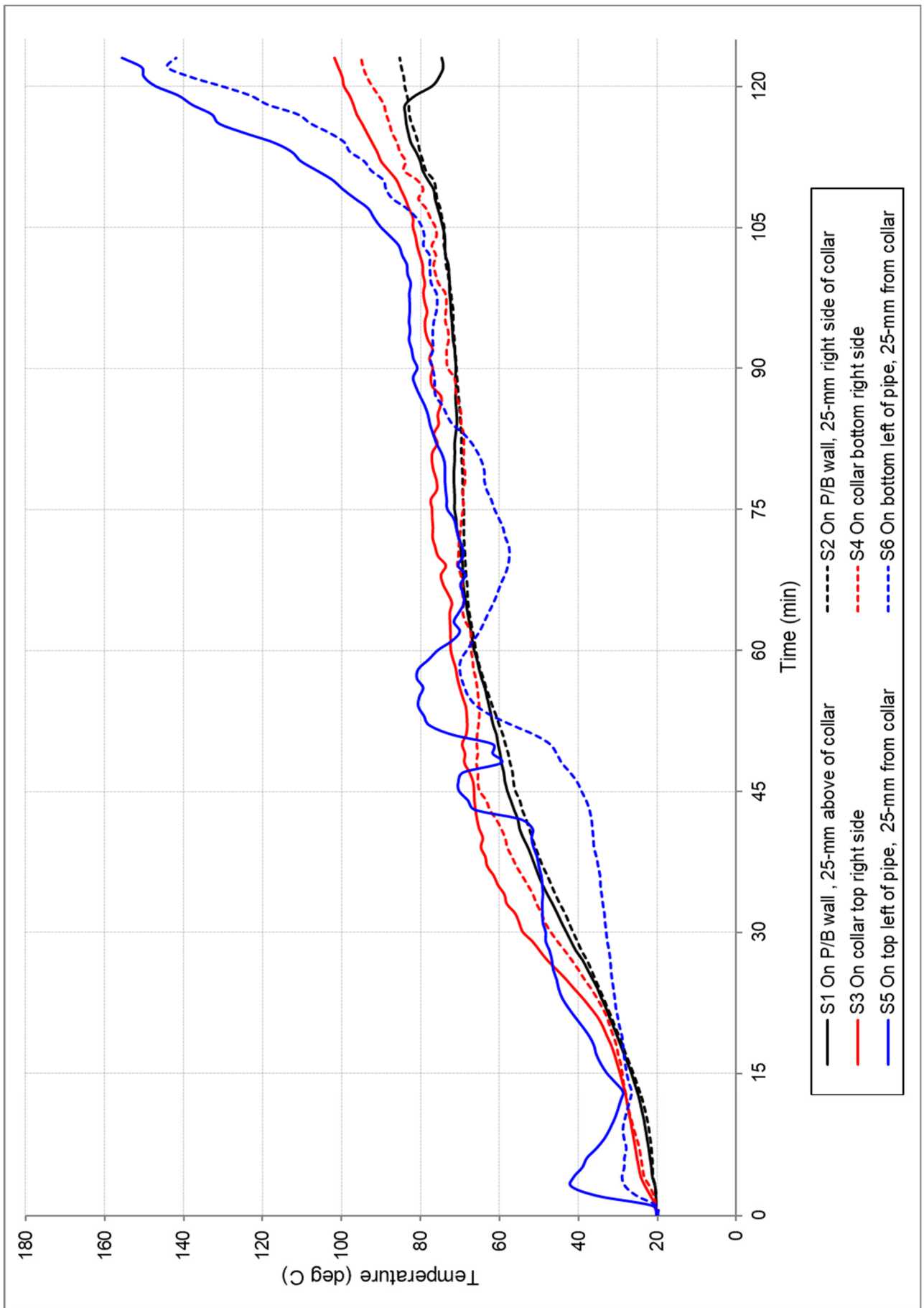
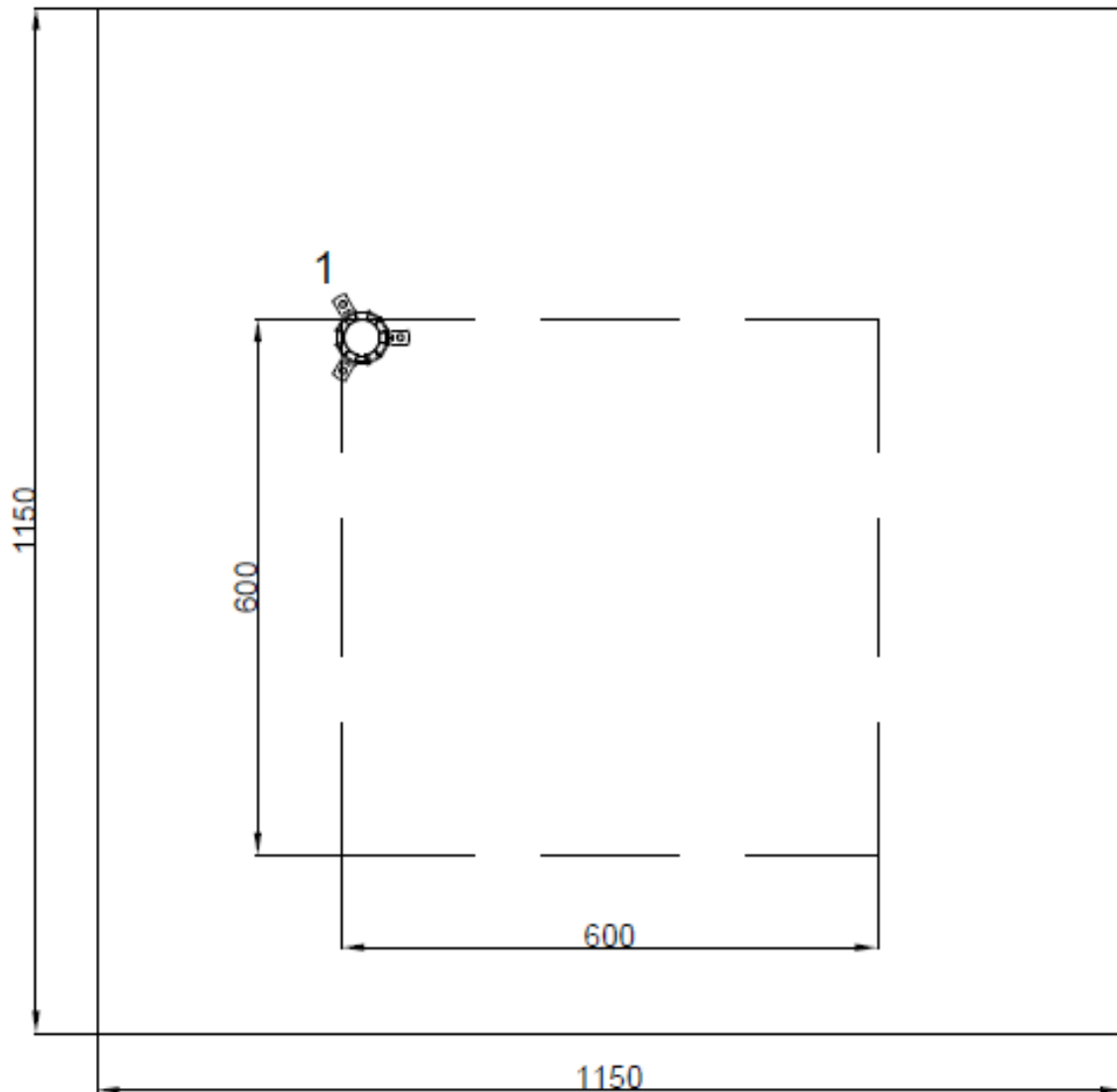


FIGURE 3 – TEMPERATURE VERUS TIME ASSOCIATED WITH SPECIMEN #1

Appendix D – Layout and installation drawings

Snap Fire Systems Pty Ltd
Test Wall W-21-A4 Layout
Date:29 JUL 2021



Penetration	Collar Code	Pipe Type	Pipe Diameter
1	32R	PN12 PVC	25

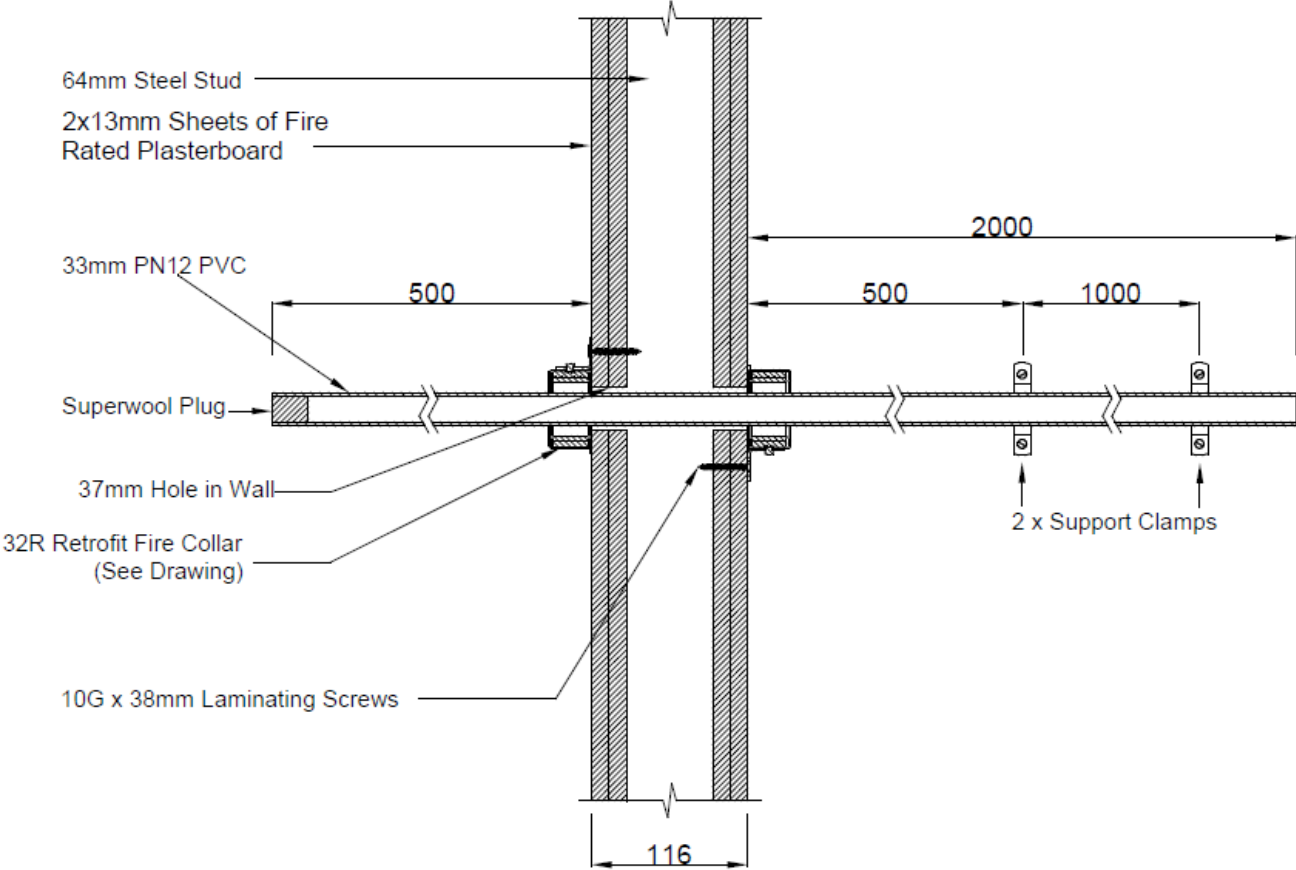
DRAWING TITLED 'TEST WALL W-21-A4 LAYOUT, DATED 29 JULY 2021, BY SNAP FIRE SYSTEMS PTY LTD.

Snap Fire Systems Pty Ltd

Specimen #1

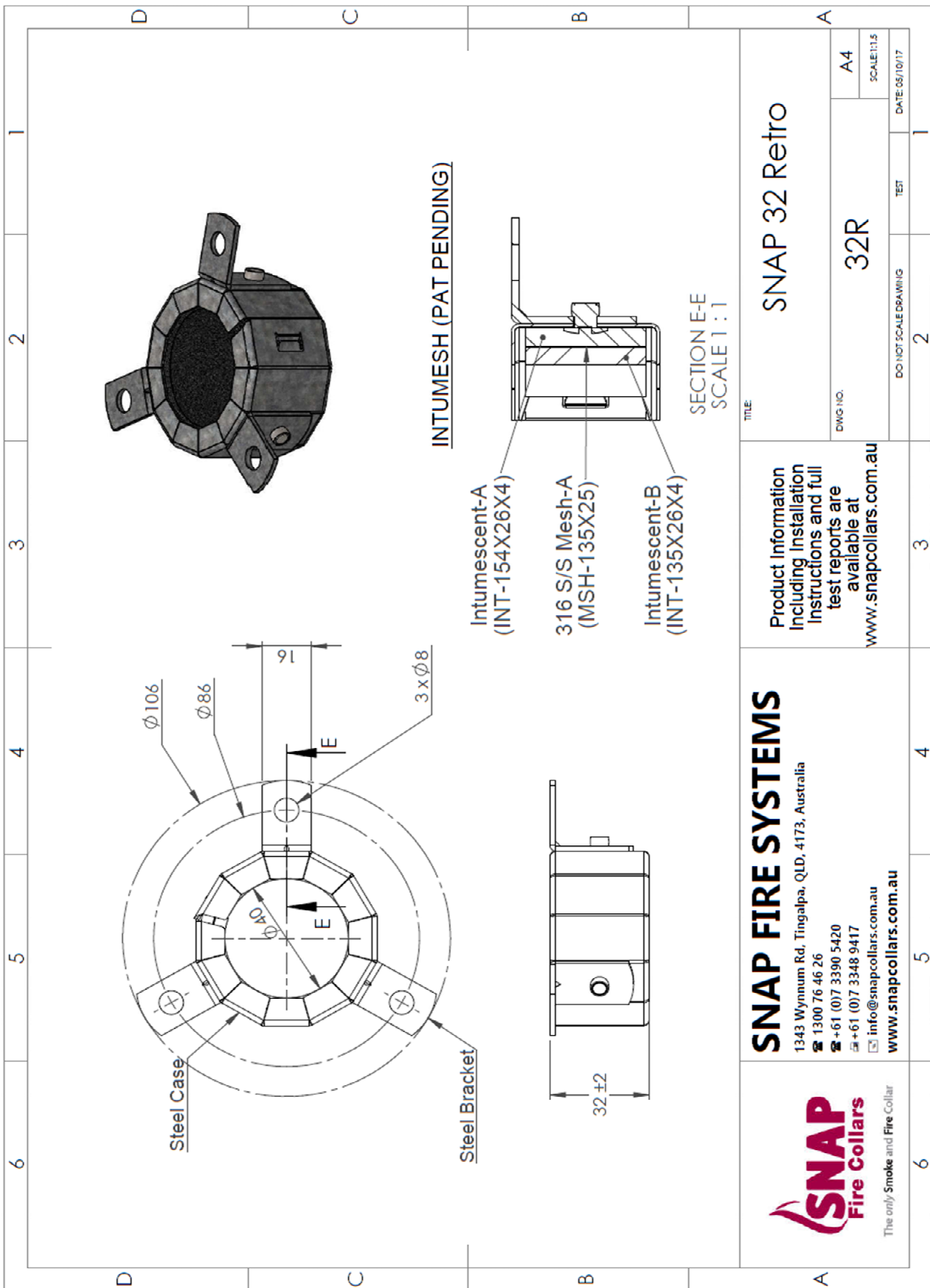
25 PN12 PVC Pipe & 32R

Date: 17 AUG 2021






DRAWING TITLED 'SPECIMEN #1 25 PVC PIPE & 32R', DATED 17 AUGUST 2021, BY SNAP FIRE SYSTEMS PTY LTD

Appendix E – Specimen Drawings



DRAWING TITLED 'SNAP 32 RETRO', DATED 5 OCTOBER 2017, BY SNAP FIRE SYSTEMS PTY LTD.

Appendix F – Certificate(s) of Test

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. 3658
<p>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, Section 10: Service penetrations and control joints, on behalf of:</p>		
IG6 Pty Ltd 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 report numbered FSP 2237.		
Product Name: SNAP 32R Retrofit fire collars protecting a DN25 PN12 uPVC pipe penetrating a 37 mm diameter aperture (Specimen 1)		
Description: The sponsor identified the specimen as retrofit fire collars protecting a steel framed plasterboard wall penetrated by an unplasticized polyvinyl chloride (uPVC) pipe and two PE100 high-density polyethylene (HDPE) pipes. The wall system comprised a 116-mm thick plasterboard lined, steel framed wall comprising two layers of 13-mm thick Boral Firestop plasterboard on each side of 64-mm deep metal studs, (Boral reference SB120.1) with an established FRL of -/120/120 as detailed in Exova Warringtonfire report numbered 27211-00. Specimen 1 is the subject of this Certificate. The SNAP 32R Retrofit fire collar comprised a 0.75-mm steel casing with a 40 mm inner diameter and a 106-mm diameter base flange. The 32-mm high collar casing incorporated a closing mechanism which comprised two soft Intumesh intumescent strips lined within the internal circumference of the collar. The inner and outer strips were 4-mm thick x 26-mm wide x 135-mm long and 4-mm thick x 26-mm wide x 154-mm long, respectively. Between the strips was a layer of 316 stainless steel mesh 135 mm long x 25-mm wide with wire mesh diameter of 0.15-mm. One collar was fixed to each side of the plasterboard wall in a back-to-back configuration using three 10g x 38-mm course thread plasterboard screws. The penetrating service comprised an Iplex DN 25 PN12 uPVC 33.8-mm outside diameter pipe, with a wall thickness of 2.1-mm, fitted through the collar's sleeve. The pipe penetrated the wall through a 37 mm diameter cut-out hole. The pipe projected horizontally 2000-mm away from the unexposed face of the wall and 500 mm into the furnace chamber. The pipe was supported at nominally 500-mm and 1500-mm from the unexposed face of the plasterboard wall and was left open on the unexposed end and plugged with ceramic fibre (Superwool) on the exposed end. The Sponsor provided drawings titled 'SNAP 32 Retro' dated 5 October 2017 and Specimen #1, 25 PN12 PVC Pipe & 32R', dated 17 August 2021 as a complete description of the specimen and should be read in conjunction with this Certificate.		
Performance observed in respect of the following AS 1530.4-2014 criteria		
Structural Adequacy	-	not applicable
Integrity	-	no failure at 121 minutes
Insulation	-	no failure at 121 minutes
and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/120/120.		
The fire-resistance level is applicable when the system is exposed to fire from either direction. The test was conducted on a wall system with an established FRL of -/120/120. The maximum FRL of any test specimen cannot exceed the FRL achieved by the wall system in which it was installed. 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. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.		
Testing Officer:	Peter Gordon	Date of Test: 30 September 2021
Issued on the 14 th day of December 2021 without alterations or additions.		
 Brett Roddy Manager, Fire Testing and Assessments		
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COPY OF CERTIFICATE OF TEST – NO. 3658

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 for 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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