

Fire-resistance test on a fire collar protecting a plasterboard wall penetrated by a single service

Test Report

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Report number: FSP 1946
Date: 13 December 2018

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

Commercial-in-confidence

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Report Status and Revision History:

VERSION	STATUS	DATE	DISTRIBUTION	ISSUE NUMBER
Revision A	Draft for review	29/10/2018	CSIRO/ Client	FSP 1946
Revision B	Draft for review	09/11/2018	CSIRO	FSP 1946
Revision C	Final for issue	13/12/2018	CSIRO/ Client	FSP 1946

Report Authorization:

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13 December 2018

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Fire-resistance test on a fire collar protecting a plasterboard wall penetrated by a single service

Sponsored Investigation No. FSP 1946

1 Introduction

1.1 Identification of specimen

The sponsor identified the specimen as a service penetrating a plasterboard wall system.

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.

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 4817/4309

1.7 Test date

The fire-resistance test was conducted on 24 October 2018.

2 Description of specimen

2.1 General

The wall system is described as 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.

The wall was penetrated by a single service.

The pipe used in the test was stated to be manufactured in accordance with:

- AS/NZS 5065:2005: Polyethylene and polypropylene pipes and fittings for drainage and sewerage applications.

SNAP HP315R Retrofit fire collar protecting a 315-mm HDPE pipe.

The HP315R Retrofit collar comprised a 0.95-mm steel casing with a 327-mm inner diameter and a 501-mm diameter base flange. The 202-mm high collar casing incorporated a closing mechanism that was comprised of two soft Intumesh intumescent strips lined within the internal circumference of the collar. The inner and outer strips were 12-mm thick x 197-mm wide x 1064-mm long, and 2.5-mm thick x 197-mm wide x 1111-mm long, respectively. Between the strips was a layer of 316 stainless steel mesh 1102 mm long x 192-mm wide with wire mesh diameter of 0.15-mm, as shown in drawing numbered HP315R-T dated 16 August 2017, by Snap Fire Systems Pty Ltd. The Snap collars were surface mounted around the pipe on both the exposed and unexposed face of the wall and fixed through 6 mounting brackets using 8-mm threaded rod and 12 x M8 nuts.

The annular gap around the pipe and plasterboard on both sides of the wall was filled with H.B Fullers Firesound sealant to a depth of 10-mm and finished flush with wall.

The penetrating service comprised a 315-mm Mueller Pipelines PE 100 HDPE pipe, with a wall thickness of 10-mm penetrating the wall through a 325-mm diameter cut-out hole as shown in drawing titled "Specimen # 1, 315 HDPE Pipe & HP315R", dated 15 October 2018, provided 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. The pipe was left open at the unexposed end and sealed with a Superwool plug on the exposed end.

2.2 Dimensions

The wall specimen was nominally 1150-mm wide x 1150-mm high x 116-mm thick. All dimensions are nominal.

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 wall was constructed on 18th October 2018 and left under standard laboratory atmospheric conditions until the test date.

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 HP315R-T dated 16 August 2017, by Snap Fire Systems Pty Ltd.

Drawing titled "Specimen # 1, 315 HDPE Pipe & HP315R", dated 15 October 2018, provided 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 19°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
2 minutes	- Light smoke is fluing from the pipe and around the collar of the specimen.
4 minutes	- Smoke level has intensified, particularly from the pipe end.
6 minutes	- Smoke emitted from the furnace flues.
10 minutes	- Red glow of furnace visible down the pipe. Photograph 4.
10 minutes	- Intumescent material from collar appears to have closed off pipe.
14 minutes	- Intermittent red glow can be seen down the pipe.
15 minutes	- The pipe appears to have closed off again.
18 minutes	- Smoke fluing from pipe has diminished, however smoke from collar continues to be emitted.
21 minutes	- Fluing of smoke from pipe minimal. Smoke from the collar is restricted to the top where the pipe has distorted considerably. Flaming orange gases from furnace flues noted. Photograph 6.
40 minutes	- The exposed section of pipe within the top of the collar has collapsed. Black intumescent material has filled the gap between pipe and collar.
60 minutes	- Further distortion of the pipe. Smoke continues to be emitted from the collar
90 minutes	- Black intumescent material continues filled the gap between pipe and collar. Smoke emitted from the collar intensifies.
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.

8.5 Performance

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

SNAP HP315R Retrofit fire collar protecting a 315-mm HDPE pipe

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 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 specimen was:-

-/120/120

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

The fire-resistance level (FRL) is limited to that of the separating element.

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

A handwritten signature in blue ink, appearing to read 'Peter Gordon', with a stylized flourish at the end.

Peter Gordon
Testing Officer

Appendices

Appendix A – Measurement location

Specimen	T/C Position	T/C designation
Specimen 1 – SNAP HP315R Retrofit fire collar and Firesound sealant protecting a 315-mm (HDPE) pipe	On P/B Wall 25-mm above Collar	S1
	On P/B Wall 25-mm Right of Collar	S2
	On top of Collar 25-mm from Plasterboard	S3
	On right side of Collar 25-mm from Plasterboard	S4
	On top of pipe 25-mm from collar	S5
	On pipe 25-mm from collar right	S6
Rover		S7
Ambient		S8

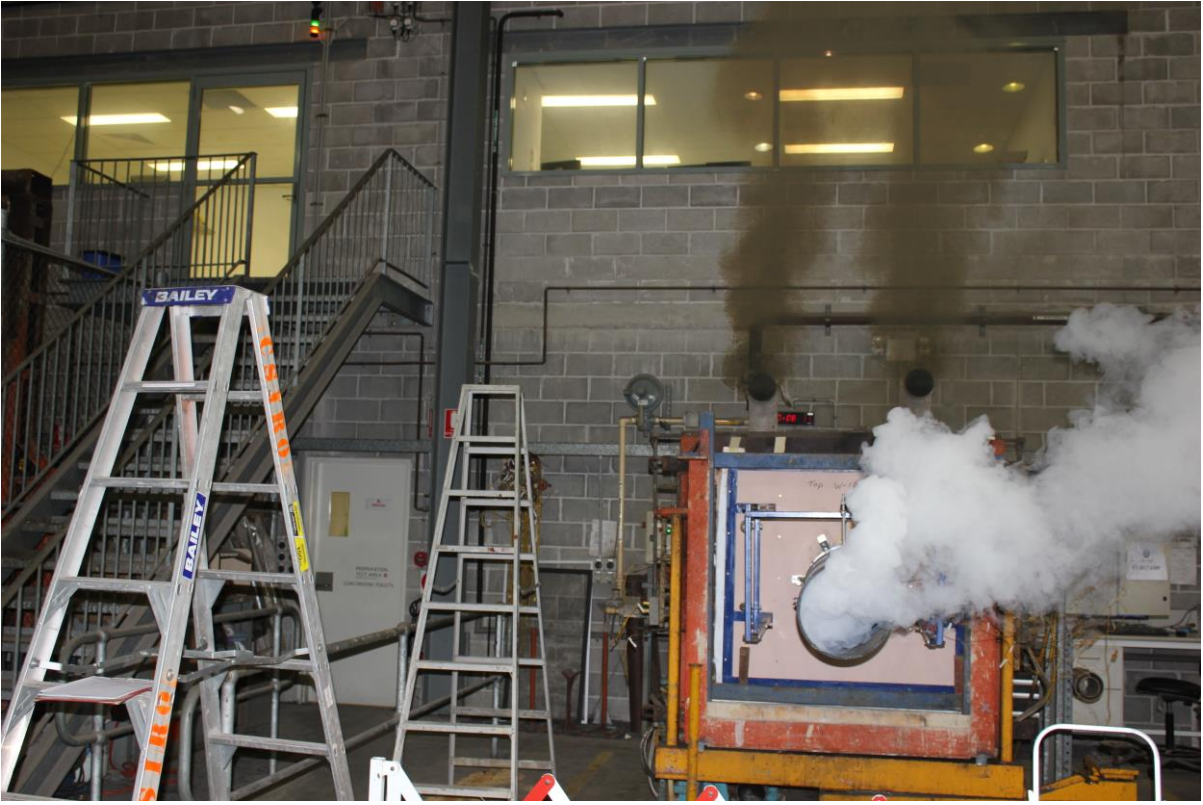
Appendix B – Photographs



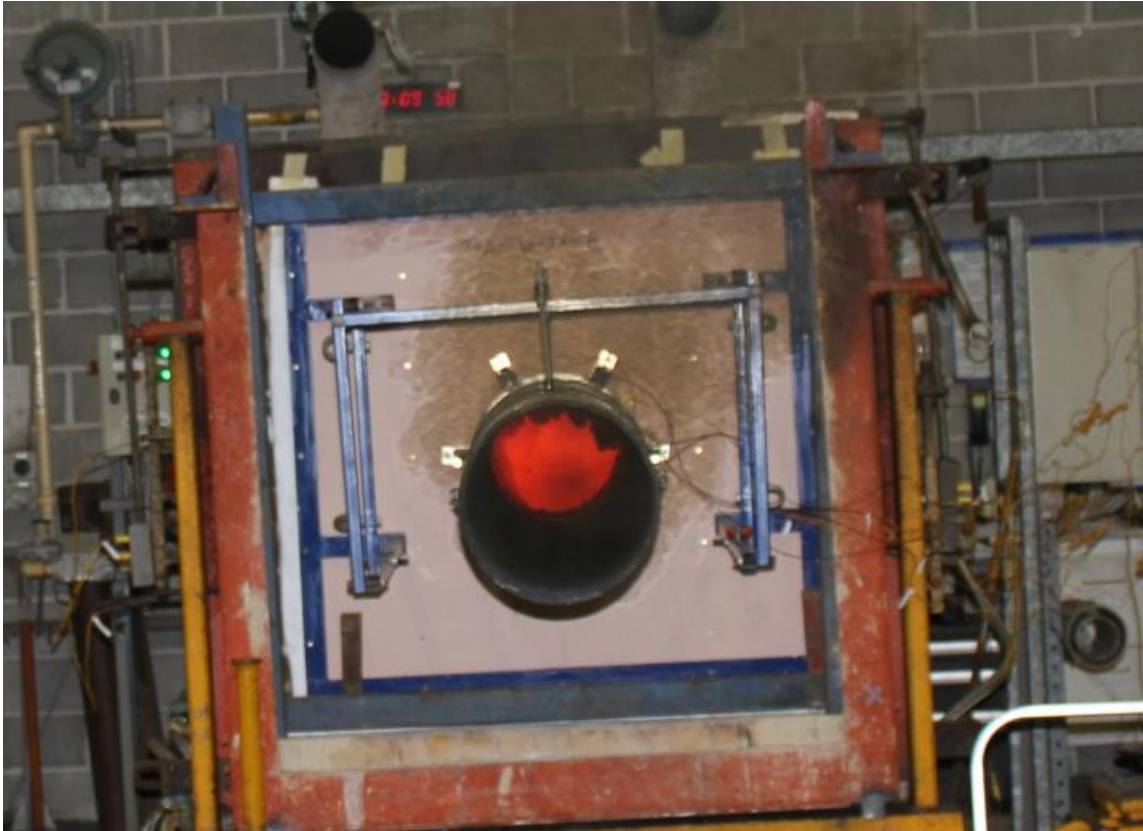
PHOTOGRAPH 1 – EXPOSED FACE OF SPECIMEN PRIOR TO TESTING



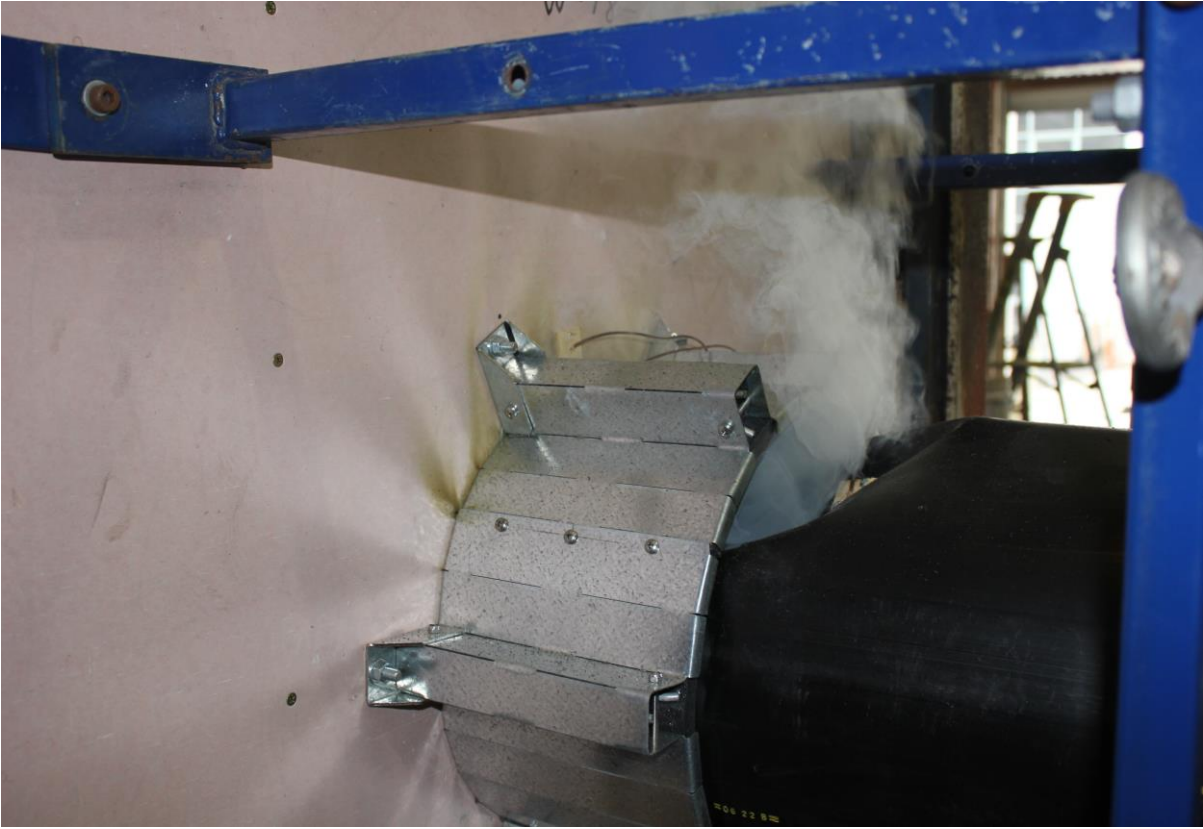
PHOTOGRAPH 2 – UNEXPOSED FACE OF SPECIMEN PRIOR TO TESTING



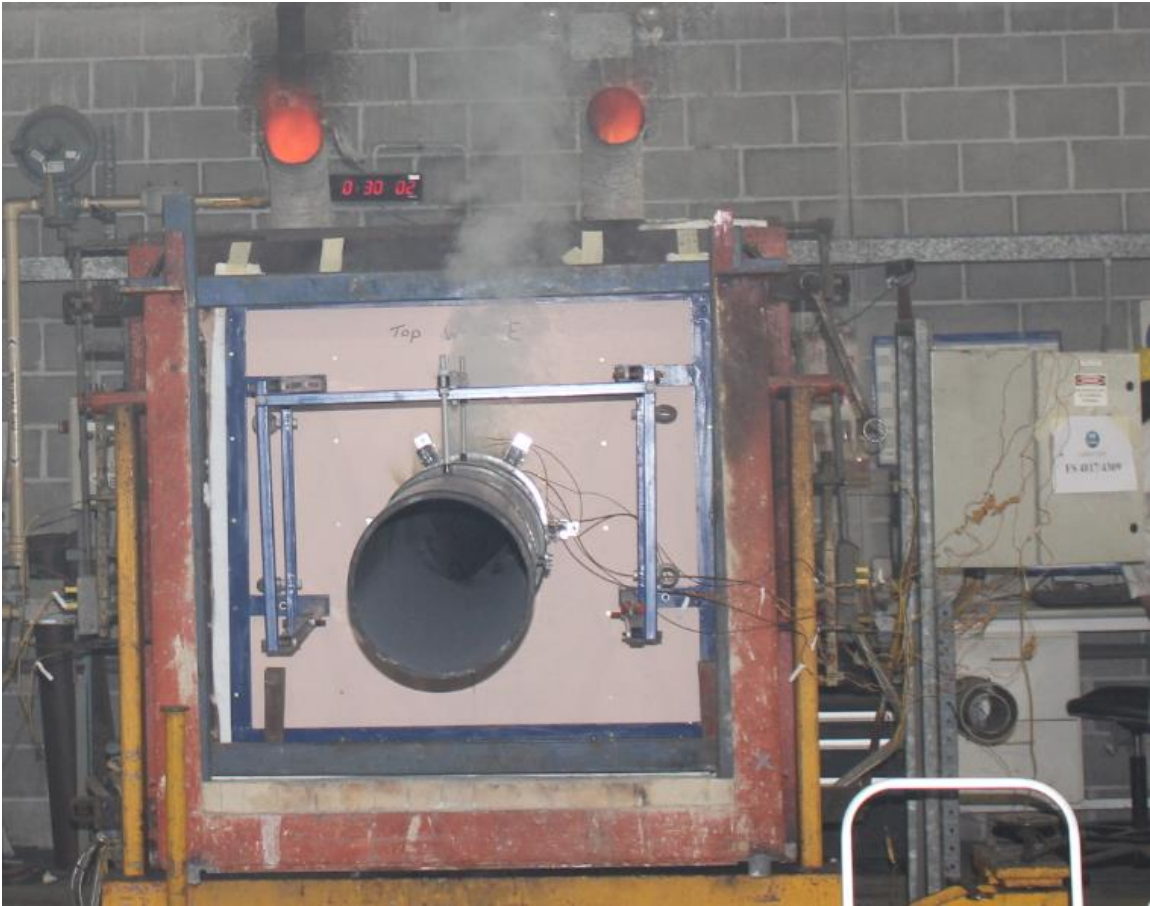
PHOTOGRAPH 3 – SPECIMEN AFTER 6 MINUTES OF TESTING



PHOTOGRAPH 4 – SPECIMEN AFTER 10 MINUTES OF TESTING



PHOTOGRAPH 5 – SPECIMEN AFTER 21 MINUTES OF TESTING



PHOTOGRAPH 6 – SPECIMEN AFTER 30 MINUTES OF TESTING



PHOTOGRAPH 7 – SPECIMEN AFTER 60 MINUTES OF TESTING



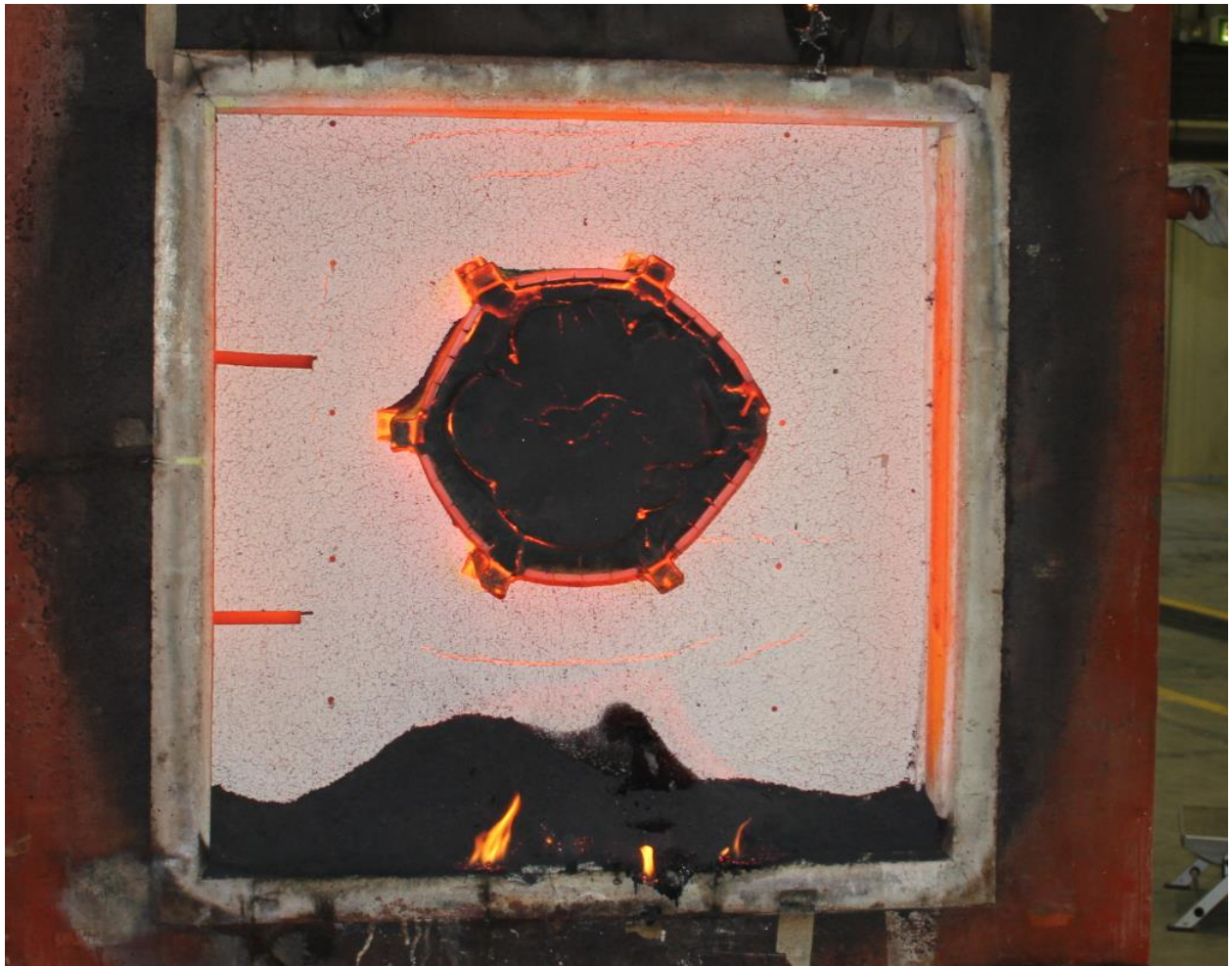
PHOTOGRAPH 8 – SPECIMEN AFTER 90 MINUTES OF TESTING



PHOTOGRAPH 9 – SPECIMEN AFTER 120 MINUTES OF TESTING



PHOTOGRAPH 10 – UNEXPOSED FACE OF SPECIMEN AT THE CONCLUSION OF TESTING



PHOTOGRAPH 11 – EXPOSED FACE OF SPECIMEN AT CONCLUSION OF TESTING

Appendix C – Furnace Temperature

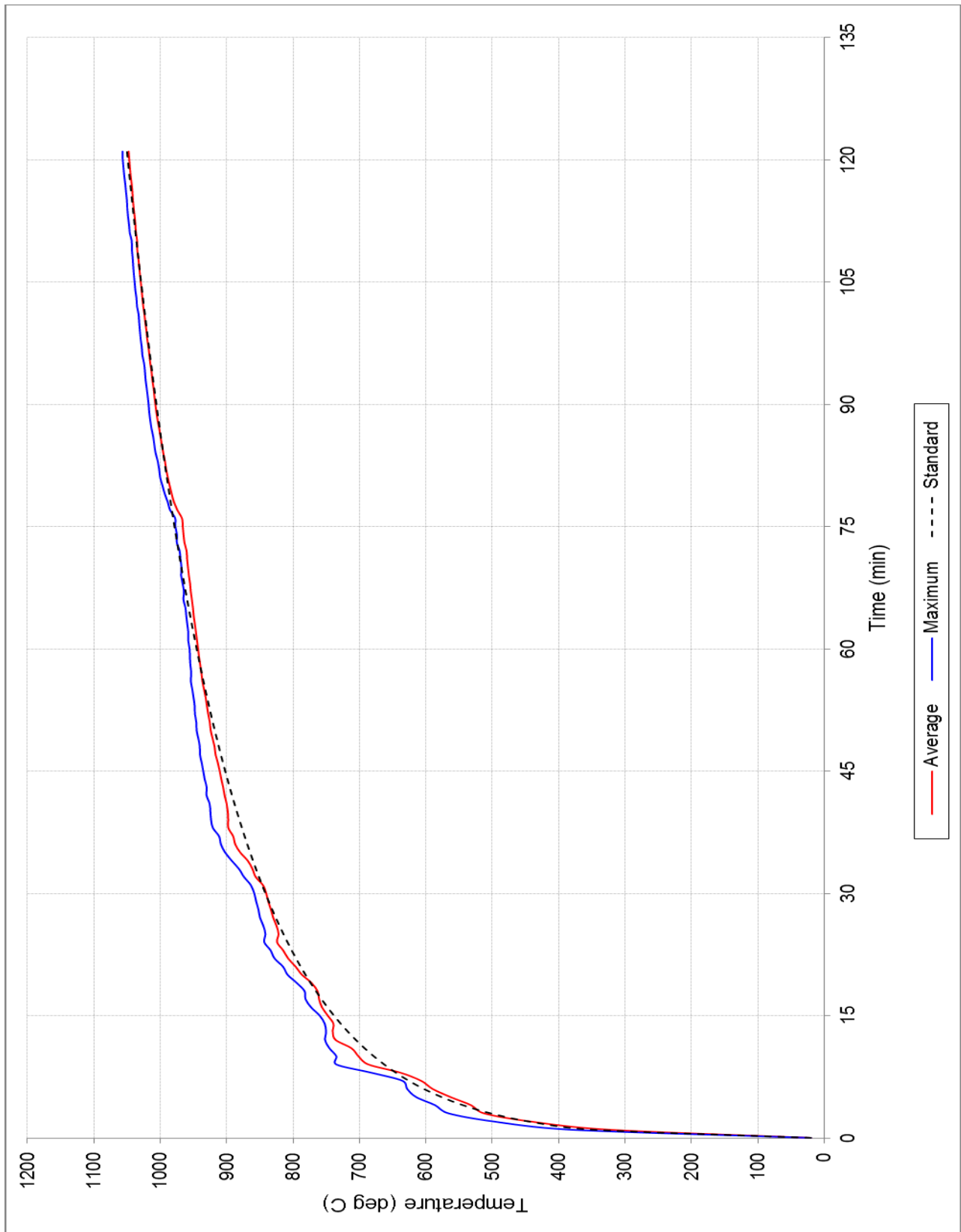


FIGURE 1 – FURNACE TEMPERATURE

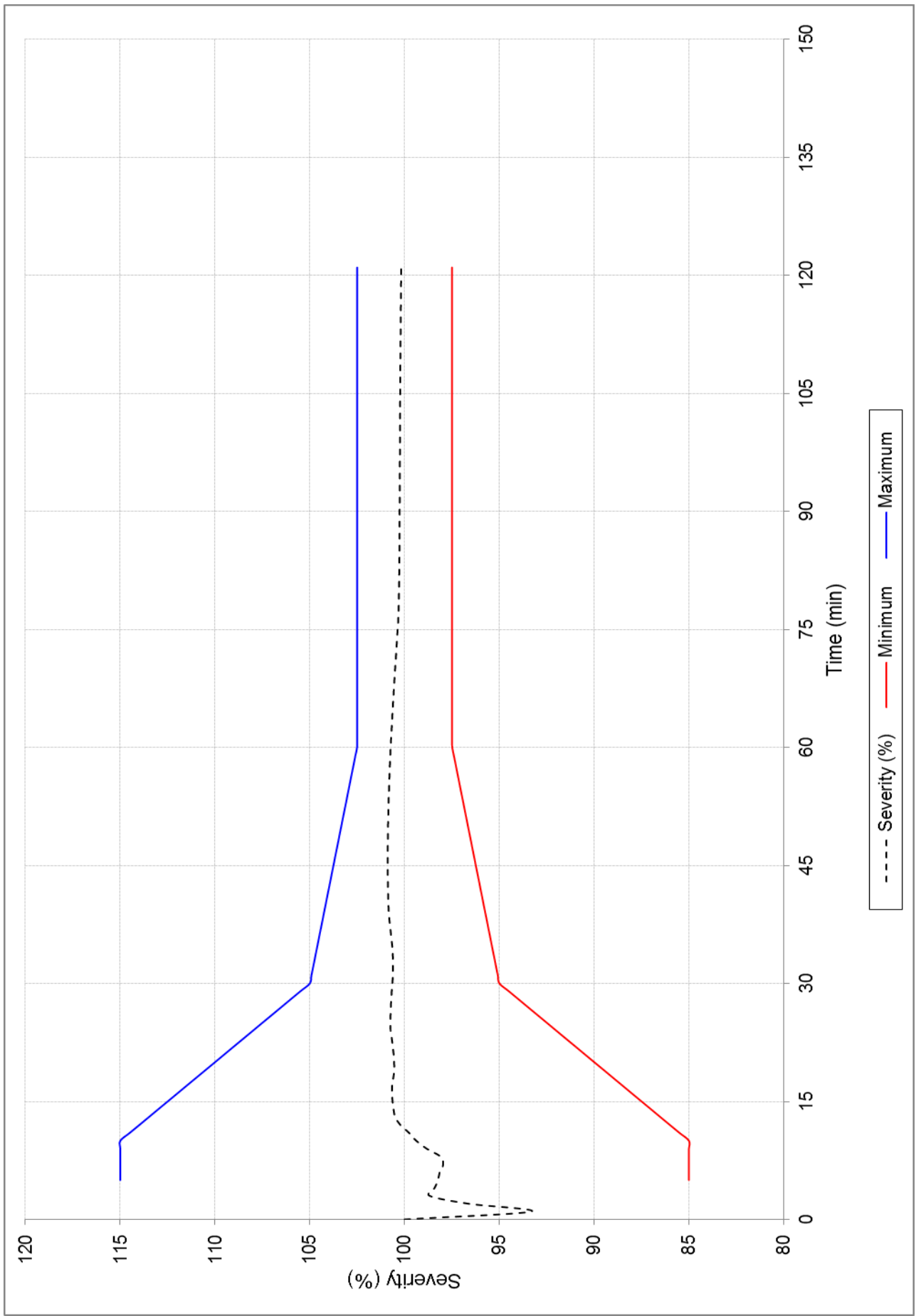


FIGURE 2 – FURNACE SEVERITY

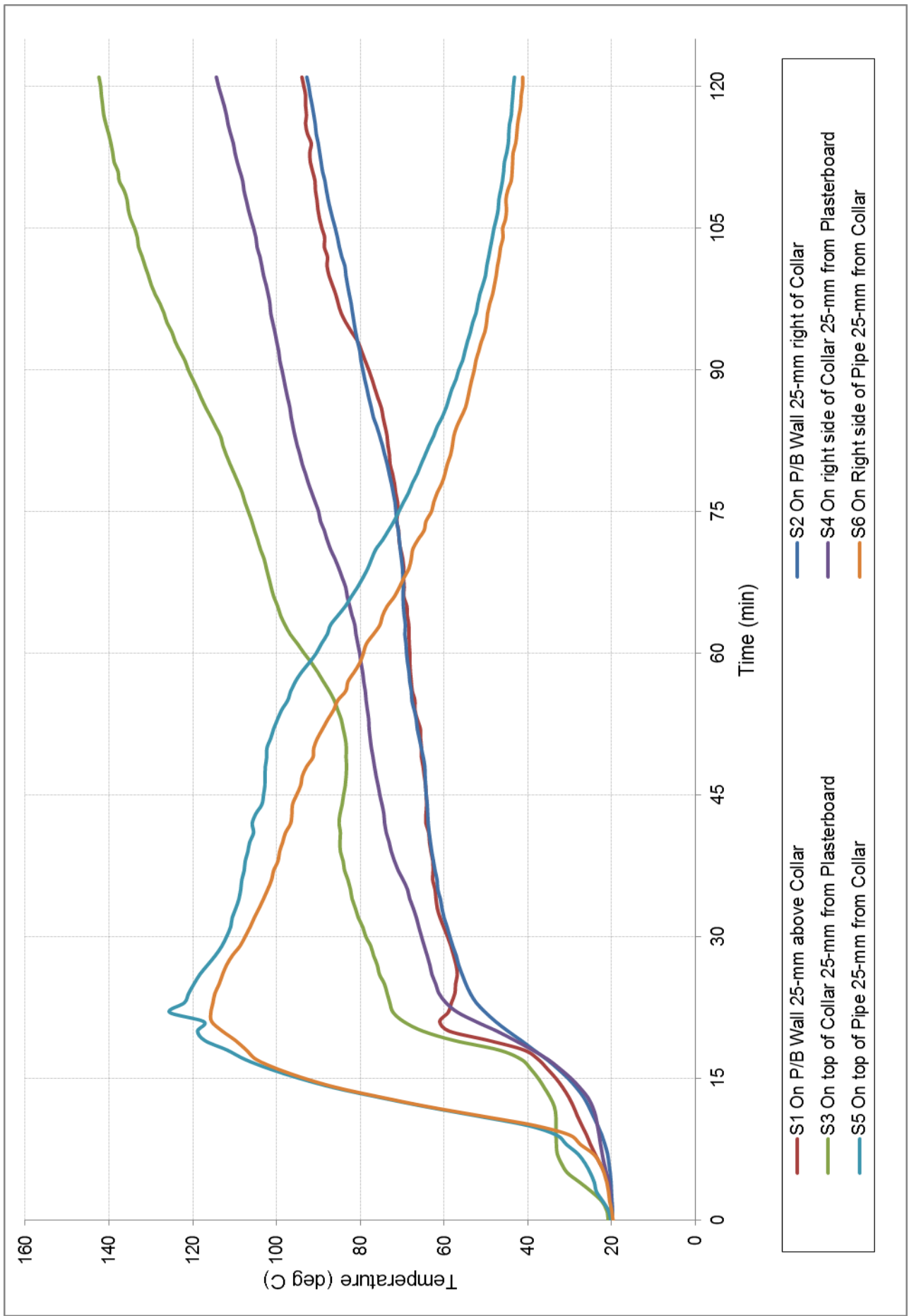
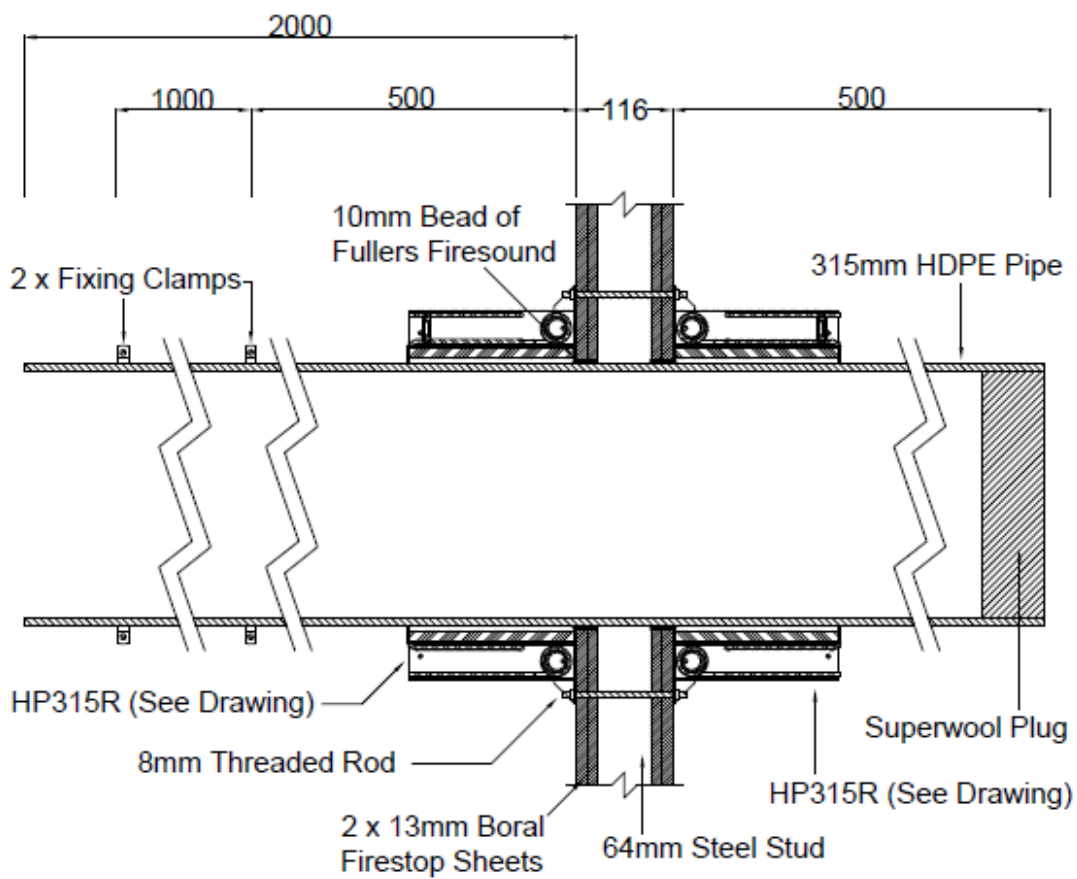


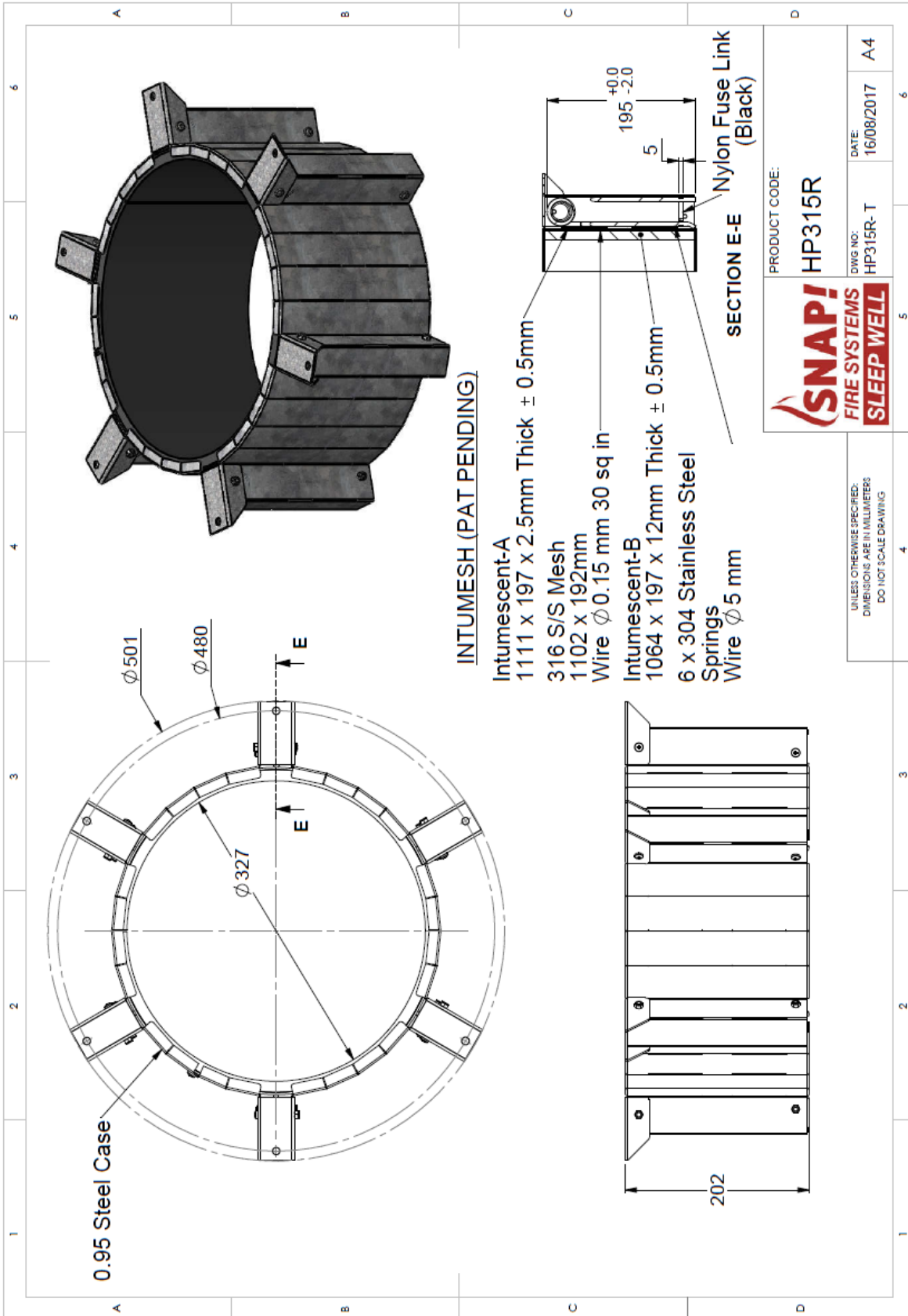
FIGURE 3 SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN

Specimen #1
315 HDPE Pipe & HP315R
Date: 15 OCT 2018



DRAWING TITLED "SPECIMEN #1 315 PVC PIPE & HP315R" DATED 25 SEPTEMBER 2018, PROVIDED BY SNAP FIRE SYSTEMS PTY LTD.

Appendix E – Specimen Drawings



DRAWING NUMBERED HP315-R-T DATED 16 OCTOBER 2017, BY SNAP FIRE SYSTEMS PTY LTD.

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. |

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