

Fire-resistance test on services penetrating a plasterboard wall

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Commercial-in-confidence

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Contents

1	Introduction	4
1.1	Identification of specimen	4
1.2	Sponsor	4
1.3	Manufacturer	4
1.4	Test standard	4
1.5	Reference standard.....	4
1.6	Test number	4
1.7	Test date	5
2	Description of specimen	5
2.1	General.....	5
2.2	Dimensions	10
2.3	Orientation.....	10
2.4	Conditioning.....	10
2.5	Selection, construction and installation of the specimen and the supporting construction	10
3	Documentation	10
4	Equipment.....	10
4.1	Furnace	10
4.2	Temperature	11
4.3	Measurement system	11
5	Ambient temperature	11
6	Departure from standard	11
7	Termination of test	11
8	Test results	11
8.1	Critical observations	11
8.2	Furnace temperature.....	12
8.3	Furnace severity.....	12
8.4	Specimen temperature	12
8.5	Performance	12
9	Fire-resistance level (FRL)	14
10	Field of direct application of test results	14
11	Tested by	14
	Appendices	15
	Appendix A – Measurement location	15
	Appendix B – Test photographs	16
	Appendix C – Test data charts.....	21
	Appendix D – Specimen drawings.....	28
	Appendix E – Certificate(s) of Test	32
	References.....	40

Fire-resistance test on services penetrating a plasterboard wall

Sponsored Investigation No. FSP 2053

1 Introduction

1.1 Identification of specimen

The sponsor identified the test specimens as four (4) services penetrating a Knauf plasterboard wall system protected by various fire stopping systems.

1.2 Sponsor

Knauf Plasterboard Pty Limited
31 Military Road
Matraville, NSW 2036

1.3 Manufacturer

Knauf Plasterboard Pty Limited
31 Military Road
Matraville, NSW 2036

BOSS Products (Australia) Pty Ltd
Unit 8, 15-23 Kumulla Rd
Caringbah NSW

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 4923/4439

1.7 Test date

The fire-resistance test was conducted on 21st October 2019.

2 Description of specimen


2.1 General

The specimens comprised a PE-Xa Rehau Rautitan Pipe, a single lagged copper pipe and pair of lagged copper pipes penetrating the wall protected by various first stopping systems.


The penetrated wall system comprised a single layer of 13-mm thick FireShield plasterboard on each side of 92-mm x 0.55 BMT C-studs to form a 118-mm thick wall system. The wall cavity was filled with 75-mm thick Knauf Earthwool insulation (density of 11 kg/m³). The Knauf wall system (KSW310) has an established FRL of -/60/60 as detailed in BRANZ reports FAR 3210 and FAR 3230.

Specimen No.	Penetration details
1	A 20-mm diameter PE-Xa Rehau Rautitan pipe incorporating an elbow joint in the wall cavity penetrating a 55-mm aperture on the exposed face protected with Fire Mastic-HPE sealant.
2	A 43-mm diameter PVC pipe incorporating an elbow joint in the wall cavity penetrating a 90-mm aperture on the exposed face protected with Fire Mastic-HPE sealant.
3	A nominal 40-mm diameter copper pipe with lagging penetrating a 127-mm aperture protected with Knauf Bindex Fire and Acoustic sealant.
4	A pair of nominal 40-mm diameter copper pipes with lagging penetrating two 127-mm apertures protected with Knauf Bindex Fire and Acoustic sealant.

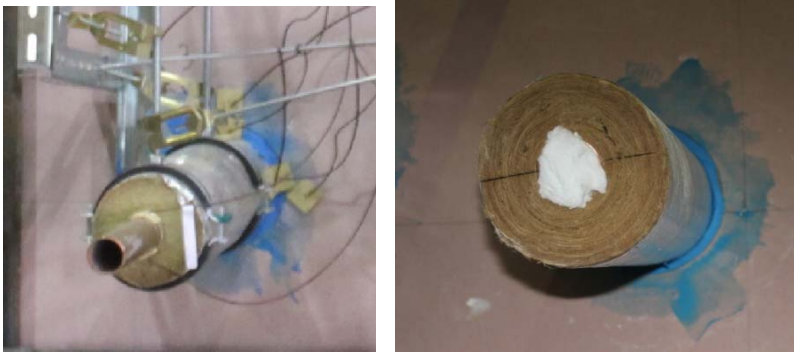
Specimen 1 – A 20-mm diameter PE-Xa Rehau Rautitan pipe incorporating an elbow joint in the wall cavity penetrating a 55-mm aperture on the exposed face protected with Fire Mastic-HPE sealant.

SEPARATING ELEMENT	
The wall system contained single layer of 13-mm thick FireShield plasterboard on each side of 92-mm x 0.55 BMT C-studs. The wall cavity was filled with 75-mm thick Knauf Earthwool. The Knauf wall system (KSW310) has an established FRL of -/60/60 as detailed in BRANZ reports FAR 3210 and FAR 3230.	
TYPE AND SIZE OF CONSTRUCTION	
A 55-mm diameter aperture on the exposed side plasterboard lining of the 118-mm thick wall.	
PENETRATING SERVICE	
Description	PE-Xa Rehau Rautitan pipe incorporating a 90° elbow joint within the wall cavity.
Size	A 20-mm OD, pipe with wall thickness of 2.8-mm incorporating a Rehau PX No.12 90 Degree elbow. The pipe extended 500-mm away from the exposed face and approximately 500-mm upwards inside the wall cavity.
End conditions	The pipe was plugged on the exposed side with ceramic Superwool fibre and left open inside the wall cavity.
Supports	Internally to the unexposed face wall at the elbow joint.
FIRE STOPPING SYSTEM	
Trade names	Fire Mastic-HPE
Manufacturers	BOSS Fire & Safety Pty Ltd
Description	Fire Mastic-HPE is a graphite-based, thixotropic, one part acrylic emulsion
Application	Inside the wall cavity on the unexposed side a 200-mm high x 600-mm wide piece of 13-mm FireShield plasterboard was fixed to wall using two 200-mm wide 50-mm x 50-mm x 0.7 BMT steel angles that were screwed to the C-studs using four 10g X 16-mm flat top drill point tek screws. A 200-mm wide x 600-mm wide sheet of 12-mm plywood was then fixed over the steel angles using three 10g x 16-mm flat top drill point tek screws over each angle. The 20-mm PE-Xa pipe was then fixed at the elbow joint to the plywood with an Auspex Clip and a 25-mm screw. Inside the wall cavity on the exposed side, a 200-mm high x 600-mm wide piece of 13-mm FireShield with a 55-mm opening was fixed to the wall using 10g x 38-mm laminating screws at 300-mm centres. The annular gap between the pipe and wall was sealed with FireMastic-HPE to a depth of approximately 26-mm and finished flush with the face of the wall.
Photograph	
Drawing	Drawings 1 to 4 Title “Knauf Service Penetration Pilot Fire Test SP4439 FRL -/60/60 KSW310 13mm FireShield”, by Knauf Plasterboard Pty Ltd.


Specimen 2 – A 43-mm diameter PVC pipe incorporating an elbow joint in the wall cavity penetrating a 90-mm aperture on the exposed face protected with Fire Mastic-HPE sealant.

SEPARATING ELEMENT	
The wall system contained single layer of 13-mm thick FireShield plasterboard on each side of 92-mm x 0.55 BMT C-studs. The wall cavity was filled with 75-mm thick Knauf Earthwool. The Knauf wall system (KSW310) has an established FRL of -/60/60 as detailed in BRANZ reports FAR 3210 and FAR 3230.	
TYPE AND SIZE OF CONSTRUCTION	
A 90-mm diameter aperture on the exposed side of the 118-mm thick wall.	
PENETRATING SERVICE	
Description	Vinidex PVC pipe incorporating a 90° elbow.
Size	A 43-mm OD pipe with a 2.3-mm wall thickness incorporating a 90° PVC elbow. The pipe extended 500-mm away from the exposed face and approximately 500-mm upwards inside the wall cavity.
End conditions	The pipe was plugged on the exposed side with ceramic Superwool fibre and left open inside the wall cavity.
Supports	Internally to the unexposed face wall at the elbow joint.
FIRE STOPPING SYSTEM	
Trade names	Fire Mastic-HPE
Manufacturers	BOSS Fire & Safety Pty Ltd
Description	Fire Mastic-HPE is a graphite-based, thixotropic, one part acrylic emulsion
Application	Inside the wall cavity on the unexposed side a 200-mm high x 600-mm wide piece of 13-mm FireShield was fixed to wall using two 200-mm long x 50-mm x 50-mm x 0.7 BMT steel angles that were fixed to the C-studs using four 10g x 16-mm flat top drill point tek screws. A 200-mm high x 600-mm wide sheet of 12-mm plywood was then fixed over the steel angles using three 10g x 16-mm flat top drill point tek screws over each angle. The 43-mm PVC pipe was then fixed at the elbow joint to the plywood with a nylon coated metal saddle flush clip and 10g x 16-mm flat top drill point tek screws. Inside the wall cavity on the exposed side, a 200-mm high x 600-mm wide piece of 13-mm FireShield with a 90-mm opening was fixed to the wall using 10g 38-mm laminating screws at 300-mm centres. The annular gap between the pipe and wall was sealed with FireMastic-HPE to a depth of approximately 26-mm and finished flush with wall.
Photograph	
Drawing	Drawings 1 to 4 Title “Knauf Service Penetration Pilot Fire Test SP4439 FRL -/60/60 KSW310 13mm FireShield”, by Knauf Plasterboard Pty Ltd.

Specimen 3 – A nominal 40-mm diameter copper pipe with lagging penetrating a 127-mm aperture protected with Knauf Bindex Fire and Acoustic sealant.

SEPARATING ELEMENT	
The wall system contained single layer of 13-mm thick FireShield plasterboard on each side of 92-mm x 0.55 BMT C-studs. The wall cavity was filled with 75-mm thick Knauf Earthwool. The Knauf wall system (KSW310) has an established FRL of -/60/60 as detailed in BRANZ reports FAR 3210 and FAR 3230.	
TYPE AND SIZE OF CONSTRUCTION	
127-mm diameter apertures through a 118-mm thick wall.	
PENETRATING SERVICE	
Description	A lagged copper pipe.
Size	A 38.5-mm OD copper pipe with a wall thickness of 1-mm lagged with 38-mm thick Rockwood with an outer foil facing. The pipe extended 700-mm from the unexposed side and 500-mm from the exposed side. The lagging extended 500-mm from both sides of the wall.
End conditions	Sealed on the exposed end using ceramic Superwool fibre and left open on the unexposed end.
Supports	Approximately 100-mm and 500-mm away from the wall on the unexposed face.
FIRE STOPPING SYSTEM	
Trade names	Knauf Bindex Fire and Acoustic sealant
Manufacturers	Knauf Plasterboard Pty Limited
Description	Knauf Bindex Fire and Acoustic sealant is a one part acrylic sealant.
Application	The annular gap between the pipe lagging and the wall was sealed with Knauf Bindex Fire and Acoustic sealant to the depth of 13-mm and finished flush with the wall.
Photograph	
Drawing	Drawings 1 to 4 Title "Knauf Service Penetration Pilot Fire Test SP4439 FRL -/60/60 KSW310 13mm FireShield", by Knauf Plasterboard Pty Ltd.

Specimen 4 – A pair of nominal 40-mm diameter copper pipes with lagging penetrating two 127-mm apertures protected with Knauf Bindex Fire and Acoustic sealant.

SEPARATING ELEMENT	
The wall system contained single layer of 13-mm thick FireShield plasterboard on each side of 92-mm x 0.55 BMT C-studs. The wall cavity was filled with 75-mm thick Knauf Earthwool. The Knauf wall system (KSW310) has an established FRL of -/60/60 as detailed in BRANZ reports FAR 3210 and FAR 3230.	
TYPE AND SIZE OF CONSTRUCTION	
Two 127-mm diameter apertures in a 118-mm thick wall. The apertures were located adjacent to each other.	
PENETRATING SERVICE	
Description	Two lagged copper pipes.
Size	Two x 38.5-mm OD copper pipes with a wall thickness of 1-mm lagged with a 38-mm thick Rockwool with an outer foil facing. The pipes extended 700-mm from the unexposed side and 500-mm from the exposed side. The lagging extended 500-mm from both sides of the wall.
End conditions	Sealed on the exposed end using ceramic Superwool fibre and left open on the unexposed end.
Supports	Approximately 100-mm and 500-mm away from the wall on the unexposed face.
FIRE STOPPING SYSTEM	
Trade names	Knauf Bindex Fire and Acoustic sealant
Manufacturers	Knauf Plasterboard Pty Limited
Description	Knauf Bindex Fire and Acoustic sealant is a one part acrylic sealant.
Application	The annular gap between the pipe lagging and the wall was sealed with Knauf Bindex Fire and Acoustic sealant to the depth of 13-mm and finished flush with the wall.
Photograph	
Drawing	Drawings 1 to 4 Title “Knauf Service Penetration Pilot Fire Test SP4439 FRL -/60/60 KSW310 13mm FireShield”, by Knauf Plasterboard Pty Ltd.

2.2 Dimensions

The overall dimension of the framed wall was normally 1150-mm wide x 1150-mm long x 118-mm thick, to suit the opening in the specimen containing frame.

2.3 Orientation

The framed wall was placed vertically against the furnace chamber with the four penetrations extending into the furnace the exposed side.

2.4 Conditioning

The specimen construction was completed on 11 September 2019 and left to cure 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:

- Drawings number 1, 3 and 4, title “Knauf Service Penetration Pilot Fire Test SP4439 FRL -/60/60 KSW310 13mm FireShield”, dated 6 September 2019 by Knauf Plasterboard Pty Ltd.
- Drawing number 2, title “Knauf Service Penetration Pilot Fire Test SP4439 FRL -/60/60 KSW310 13mm FireShield”, dated 23 October 2019 by Knauf Plasterboard Pty Ltd.
- Technical Data sheet titled “ Fire Mastic-HPE” dated 2017 by BOSS Fire & Safety Pty Ltd

No confidential information about the test specimen has been submitted to CSIRO Infrastructure Technologies.

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 specimens 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 14°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 91 minutes by the agreement with the sponsor.

8 Test results

8.1 Critical observations

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

- 2 minutes - A small amount of smoke is being emitted between the plasterboard wall and sealant of Specimen 4.
- 5 minutes - The smoke emitted from Specimen 4 has ceased.
- 11 minutes - A small amount of steam / smoke is being emitted between the plasterboard wall and sealant of Specimens 3 and 4.
- 16 minutes - The level of smoke being emitted from Specimens 3 and 4 has increased.

- 30 minutes - An orange glow can be seen inside the pipes on the exposed side of the copper pipes in Specimens 3 and 4.
- 45 minutes - The sealant around the lagging of Specimens 3 and 4 has begun to swell. The smoke being emitted from Specimens 3 and 4 has reduced.
- 60 minutes - The sealant around the lagging of Specimens 3 and 4 continues to swell.
- 72 minutes - Insulation Failure Specimen 4 – maximum temperature rise of 180K is exceeded from the on sealant of specimen 4 (thermocouple #15).
- 75 minutes - The plasterboard wall on the left side of Specimen 4 has begun to discolour.
- 76 minutes - Insulation Failure Specimen 3 – maximum temperature rise of 180K is exceeded from the on sealant of specimen 3 (thermocouple #9).
- 91 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.

Figure 4 shows the curve of temperature versus time associated with Specimen 2.

Figure 5 shows the curve of temperature versus time associated with Specimen 3.

Figure 6 shows the curve of temperature versus time associated with Specimen 4.

Figure 7 shows the curve of temperature versus time associated with internal steel stud.

8.5 Performance

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

Specimen 1 – A 20-mm diameter PE-Xa Rehau Rautitan pipe incorporating an elbow joint within the wall cavity penetrating a 55-mm aperture on the exposed face protected with Fire Mastic HPE sealant.

Structural adequacy	-	Not applicable
Integrity	-	no failure at 91 minutes
Insulation	-	no failure at 91 minutes

Specimen 2 – A 43-mm diameter PVC pipe incorporating an elbow joint within the wall cavity penetrating a 90-mm aperture on the exposed face protected with Fire Mastic HPE sealant.

Structural adequacy	-	Not applicable
Integrity	-	no failure at 91 minutes
Insulation	-	no failure at 91 minutes

Specimen 3 – A nominal 40-mm diameter copper pipe with lagging penetrating a 127-mm aperture protected with Knauf Bindex Fire and Acoustic sealant.

Structural adequacy	-	Not applicable
Integrity	-	no failure at 91 minutes
Insulation	-	76 minutes

Specimen 4 – A pair of nominal 40-mm diameter copper pipes with lagging penetrating two 127-mm apertures protected with Knauf Bindex Fire and Acoustic sealant.

Structural adequacy	-	Not applicable
Integrity	-	no failure at 91 minutes
Insulation	-	no failure at 72 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:

Specimen 1	-/60/60
Specimen 2	-/60/60
Specimen 3	-/60/60
Specimen 4	-/60/60

Specimen 1 and 2: The fire-resistance level of the specimen is applicable when the system is exposed to fire from the same direction as tested.

Specimens 3 and 4: The fire-resistance level of the specimen 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 -/60/60. 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 1530.4-20014, have been made provided no individual component is removed or reduced.

11 Tested by



Peter Gordon
Testing Officer

Appendices

Appendix A – Measurement location

SPECIMEN	T/C Position	T/C Designation
Internal - metal stud	On stud hot flange, mid height	S1
	On stud mid height web	S2
	On stud cold flange, mid height	S3
SPECIMEN 1 – 20-mm OD PE-Xa Rehau Rautitan pipe, having a wall thickness of 2.8-mm penetrating the exposed face of the wall through a 55-mm opening. The annular gap was sealed Boss mastic HPE.	On plasterboard in line with opening on the exposed side	S4
SPECIMEN 2 – 43-mm OD Iplex pipe (PVC) having a wall thickness of 2.3-mm penetrating the exposed face of the wall through a 90-mm opening. The annular gap was sealed Boss mastic HPE.	On plasterboard in line with opening on the exposed side	S5
SPECIMEN 3 – A lagged copper pipe. The copper pipe having a 38.5-mm OD and a wall thickness of 1-mm lagged with 38-mm thick Rockwood and a foil sheet on the outside. The lagged pipes penetrated through a 127-mm opening. The annular gap between the wall and plasterboard were sealed with Knauf sealant to a depth of 13-mm.	On P/B, 25-mm above sealant	S6
	On P/B, 25-mm right of sealant	S7
	On Sealant, above lagging	S8
	On Sealant, right of lagging	S9
	On lagging, 25-mm from sealant	S10
	On lagging, 25-mm right of sealant	S11
	On top of pipe, 25-mm from lagging	S12
	On bottom of pipe, 25-mm from lagging	S13
SPECIMEN 4 – Two lagged copper pipe. The copper pipes having a 38.5-mm OD and a wall thickness of 1-mm lagged with 38-mm thick Rockwood and a foil sheet on the outside. The lagged pipes penetrated through two 127-mm openings. The annular gap between the wall and plasterboard were sealed with Knauf sealant to a depth of 13-mm and flush with the plasterboard wall.	On P/B, 25-mm above sealant	S14
	On P/B, 25-mm right of sealant	S15
	On Sealant, above lagging	S16
	On Sealant, right of lagging	S17
	On top of lagging, 25-mm from sealant	S18
	On lagging, 25-mm left of sealant	S19
	On top of pipe, 25-mm from lagging	S20
	On bottom of pipe, 25-mm right of lagging	S21
	On P/B, 25-mm below sealant	S22
	On P/B, 25-mm right of sealant	S23
	On Sealant, right of lagging	S24
	On Sealant, below lagging	S25
	On top of lagging, 25-mm from sealant	S26
	On lagging, 25-mm left of sealant	S27
	On top of pipe, 25-mm from lagging	S28
	On bottom pipe, 25-mm right of lagging	S29
Rover		S30
Ambient		S31

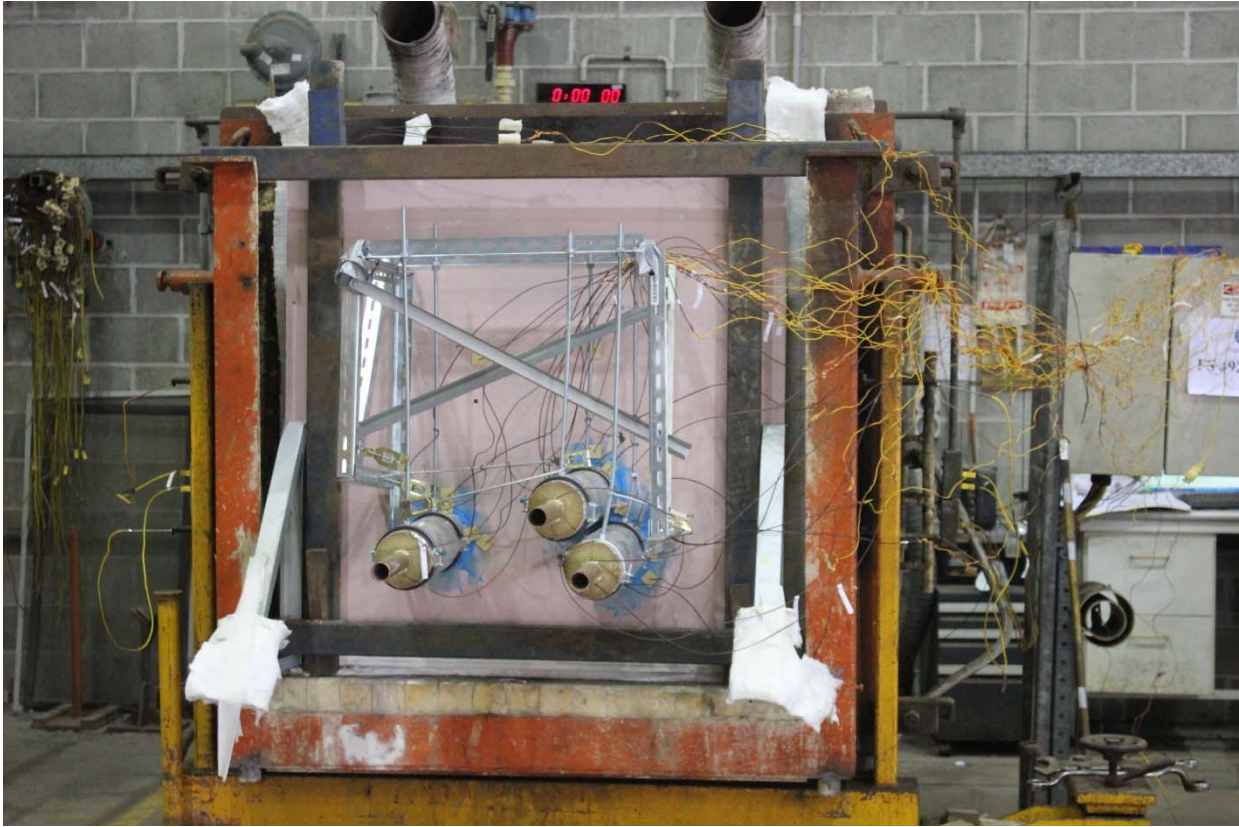
Appendix B – Test photographs



PHOTOGRAPH 1 – THERMOCOUPLE LOCATIONS ON THE UNEXPOSED FACE



PHOTOGRAPH 2 – EXPOSED SIDE OF SPECIMENS PRIOR TO TESTING



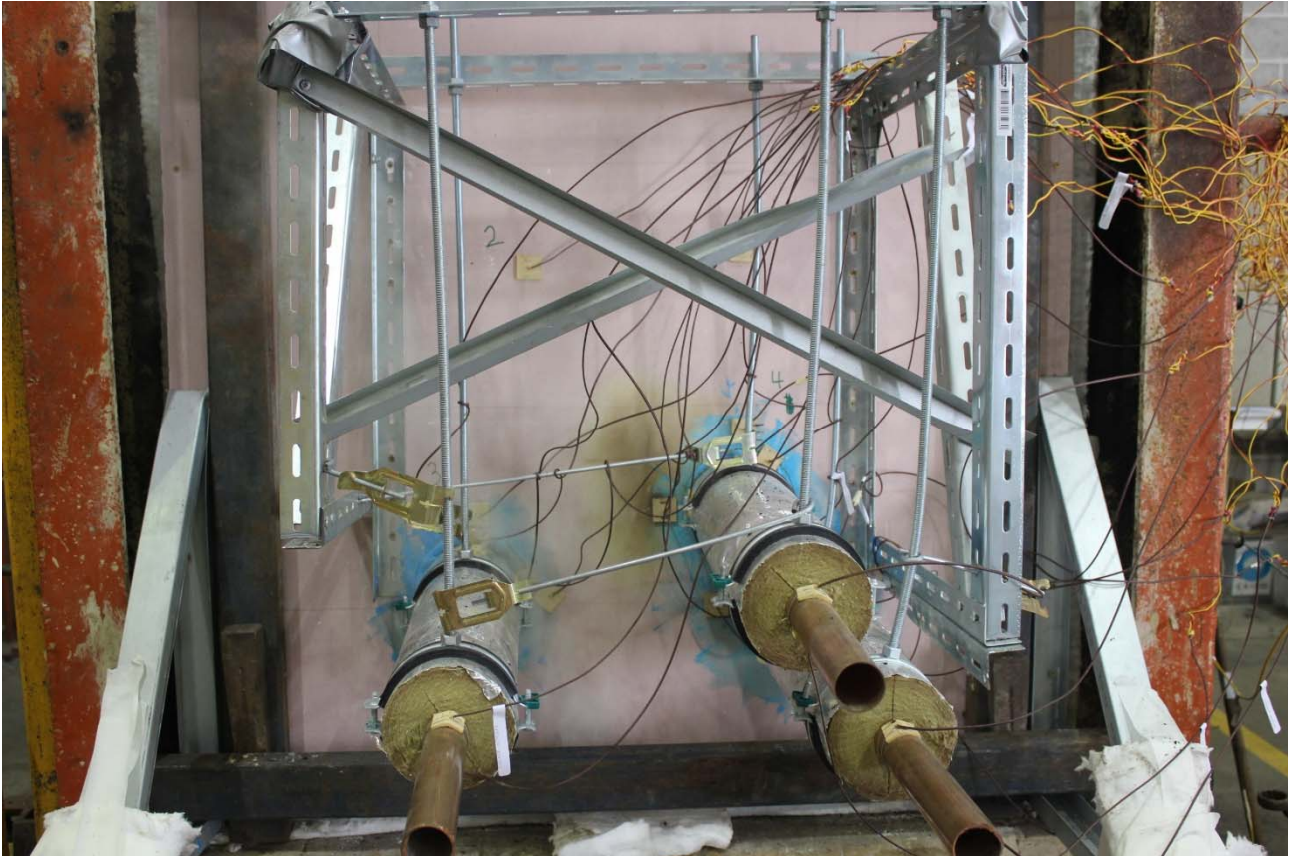
PHOTOGRAPH 3 – UNEXPOSED SIDE OF SPECIMENS PRIOR TO TESTING



PHOTOGRAPH 4 – SPECIMENS AFTER 30 MINUTES OF TESTING



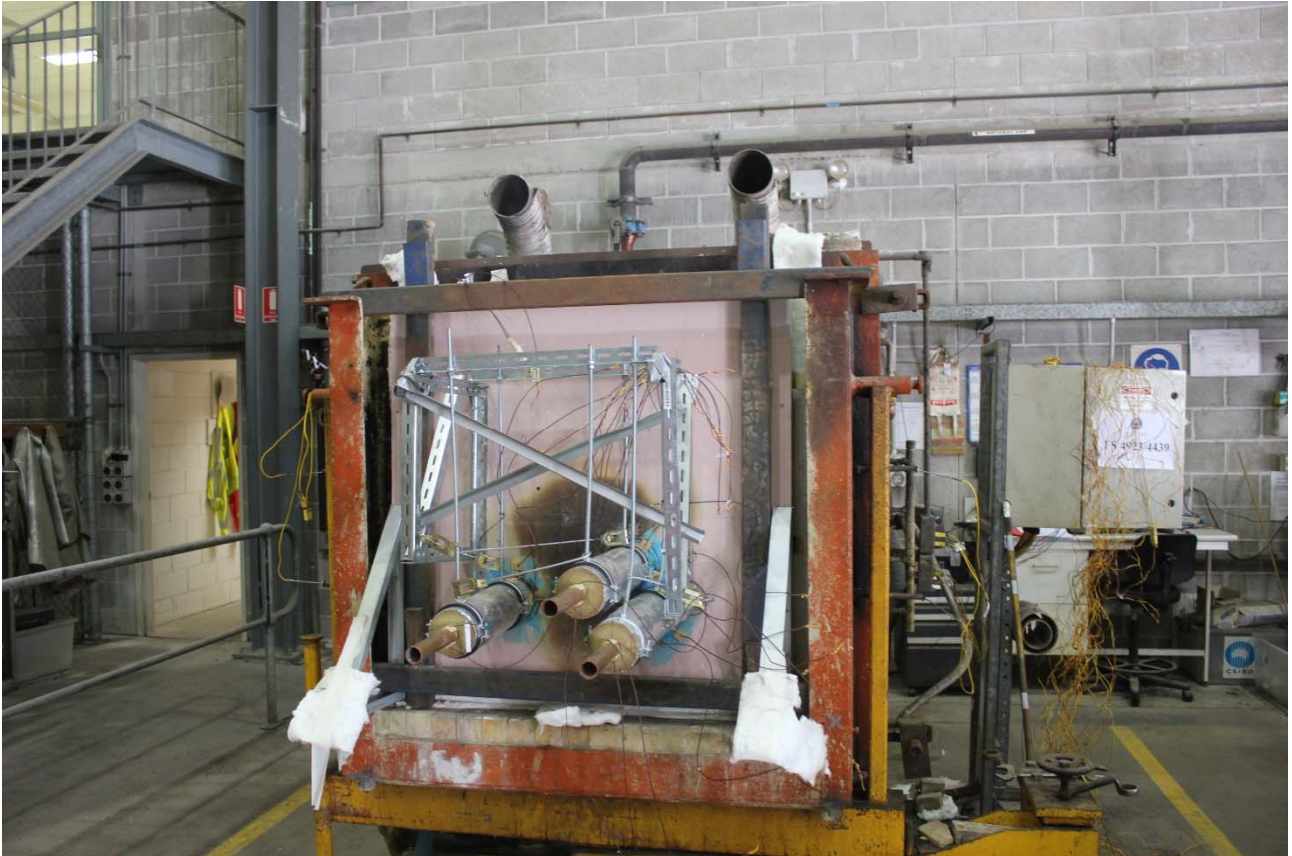
PHOTOGRAPH 5 – SPECIMENS AFTER 60 MINUTES OF TESTING



PHOTOGRAPH 6 – SPECIMENS AFTER 76 MINUTES OF TESTING



PHOTOGRAPH 7 – SPECIMENS AFTER 90 MINUTES OF TESTING



PHOTOGRAPH 8 – SPECIMENS AT THE CONCLUSION OF TESTING



PHOTOGRAPH 9 – EXPOSED FACE OF SPECIMENS AFTER THE CONCLUSION OF TESTING

Appendix C – Test data charts

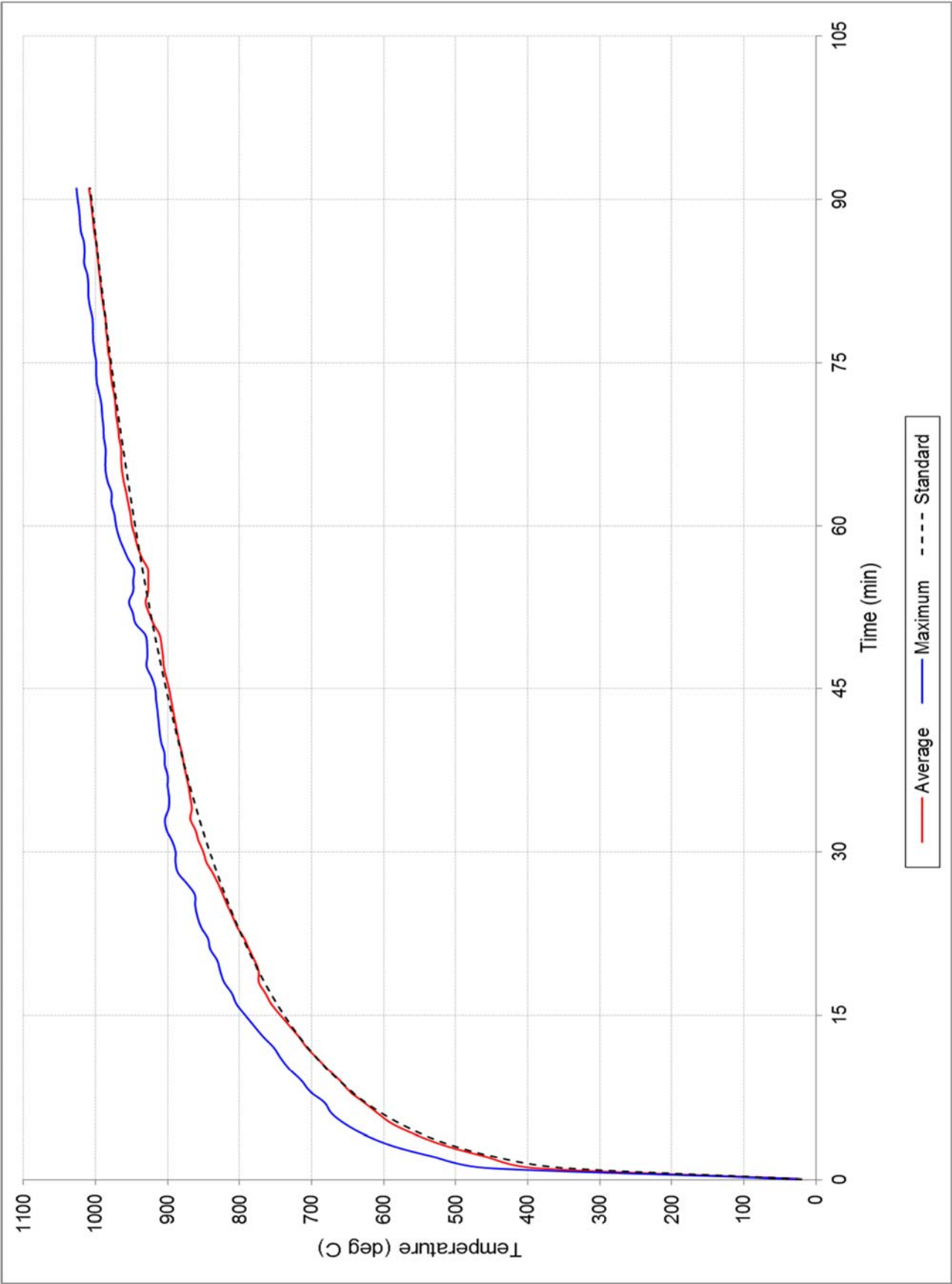


FIGURE 1 – FURNACE TEMPERATURE

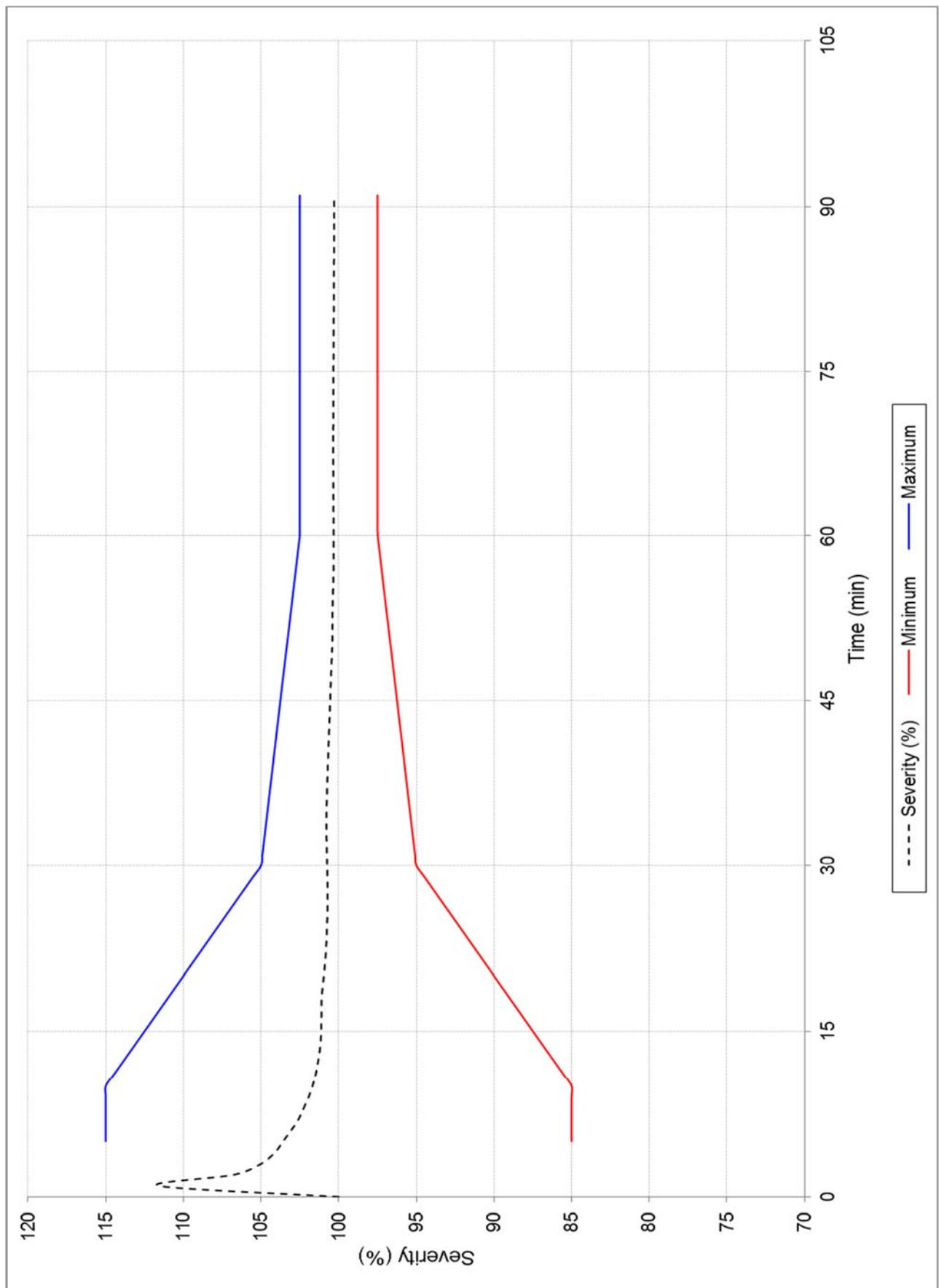


FIGURE 2 – FURNACE SEVERITY

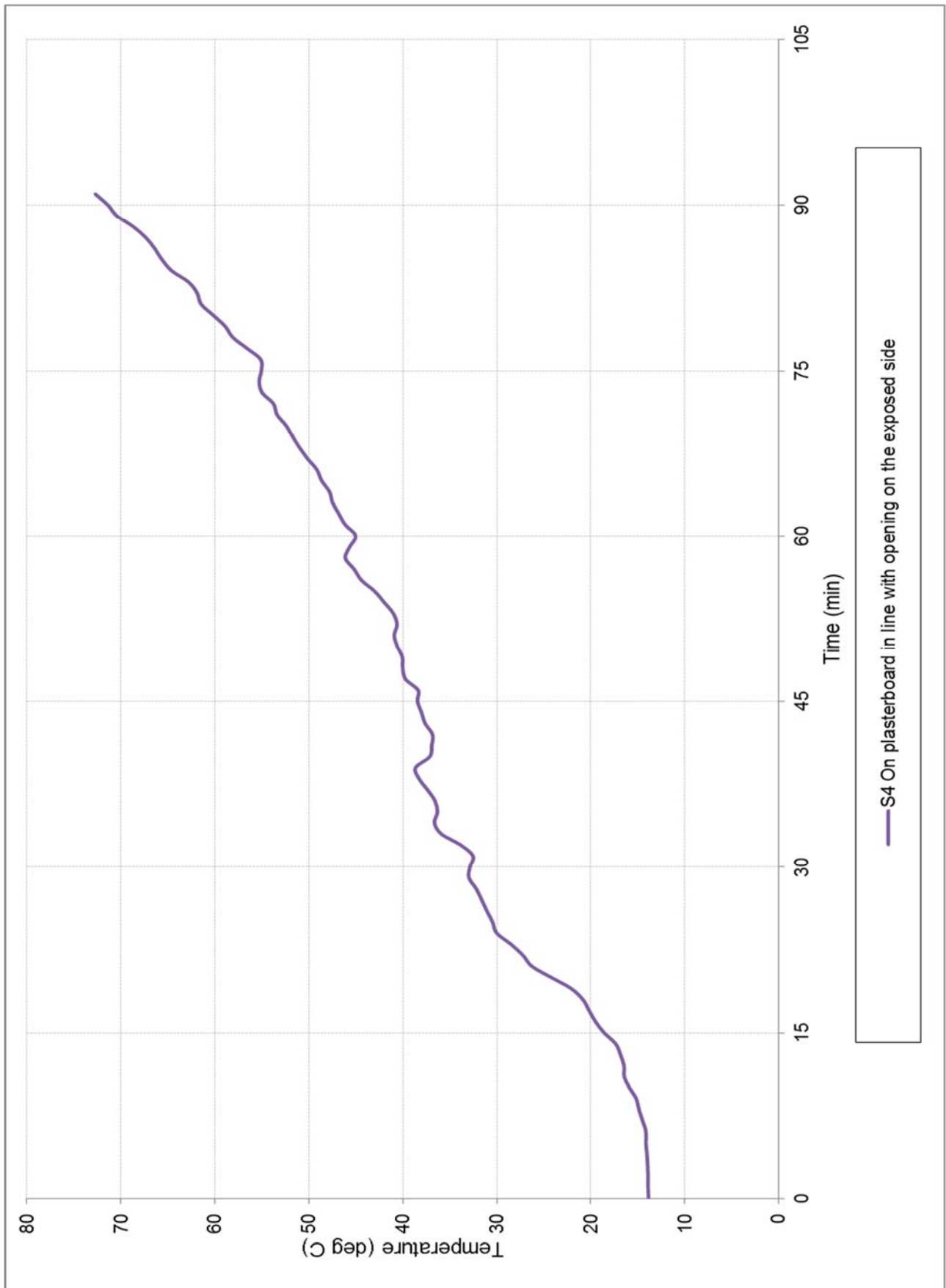


FIGURE 3 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 1

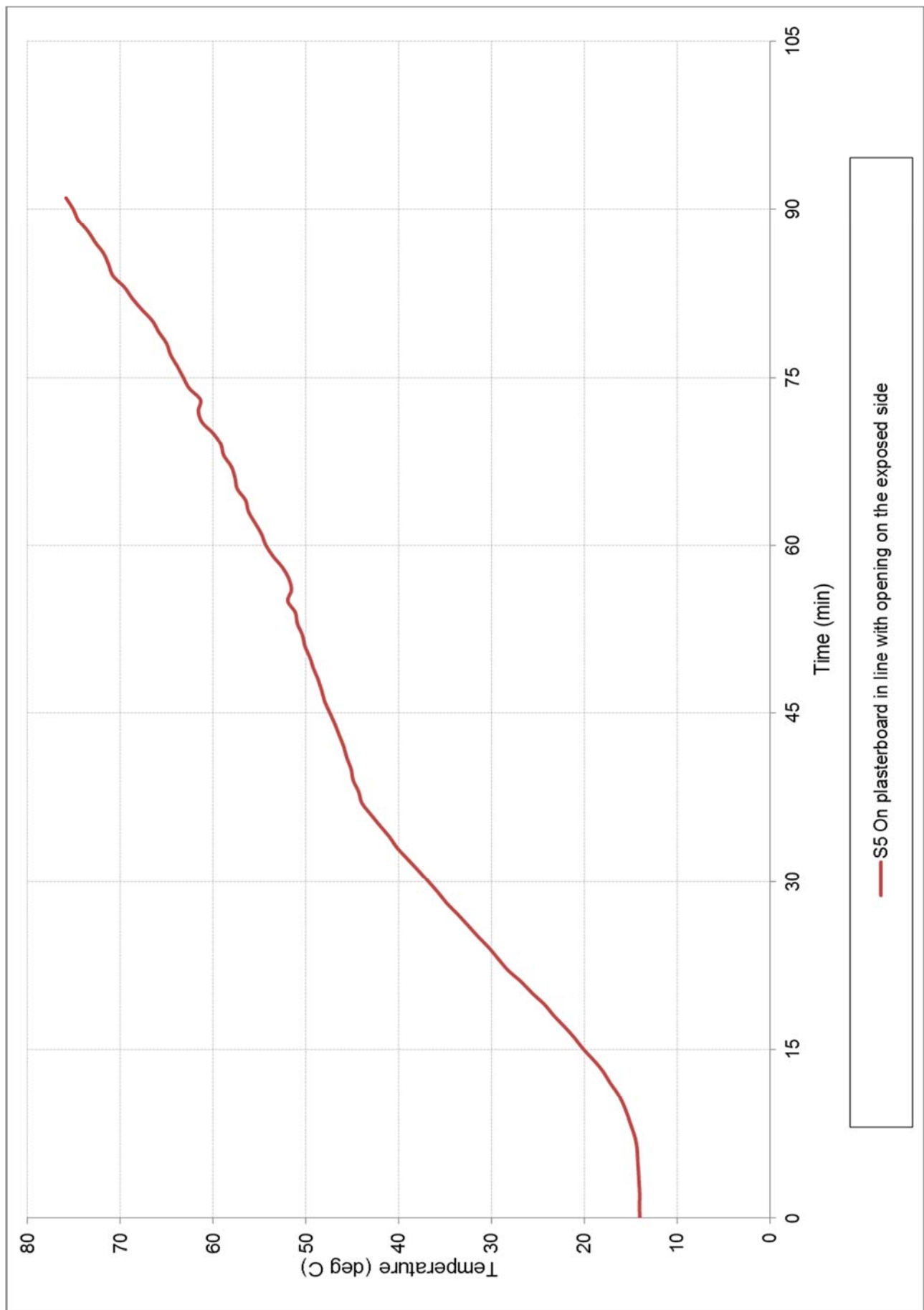


FIGURE 4 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 2

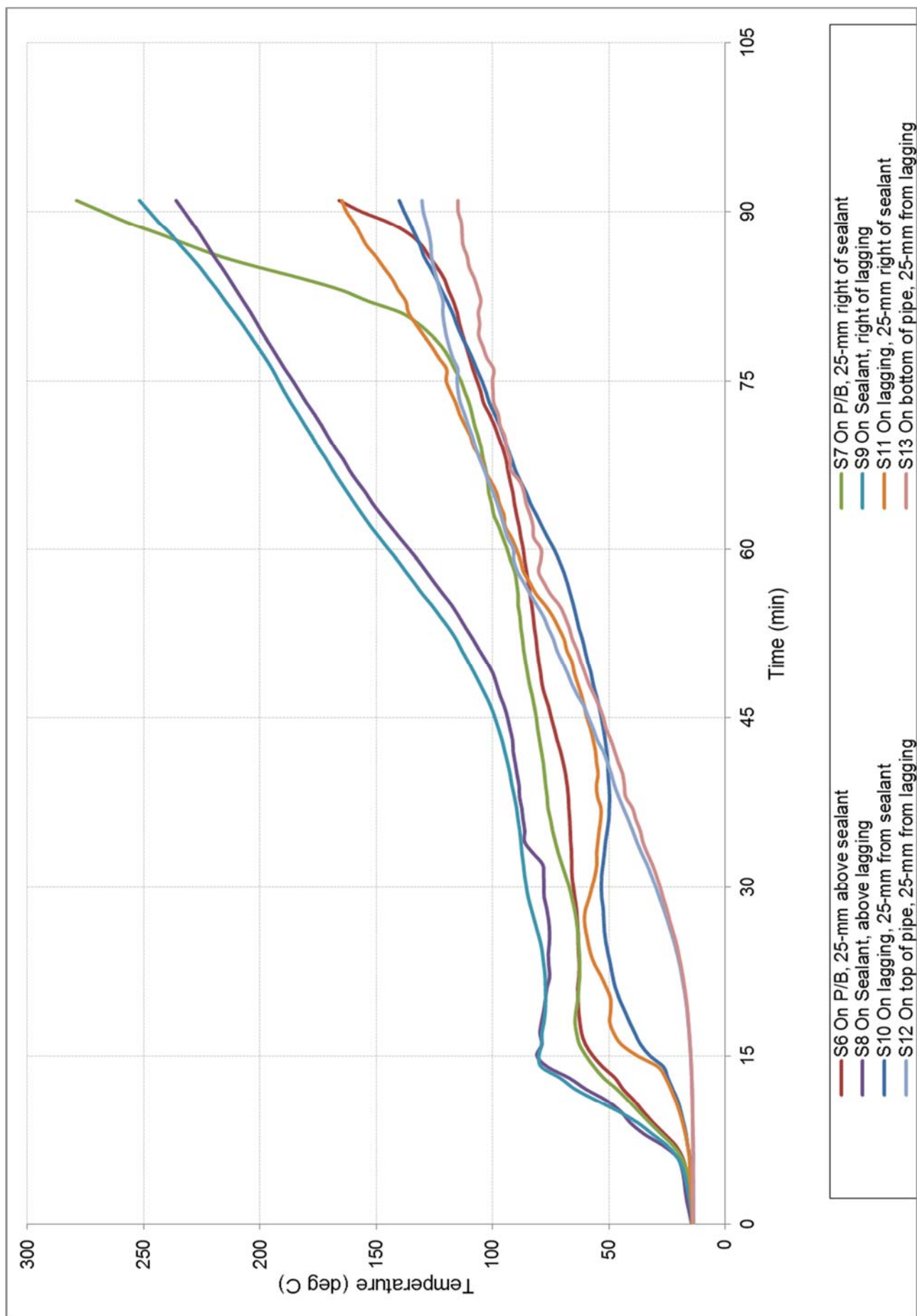


FIGURE 5 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 3

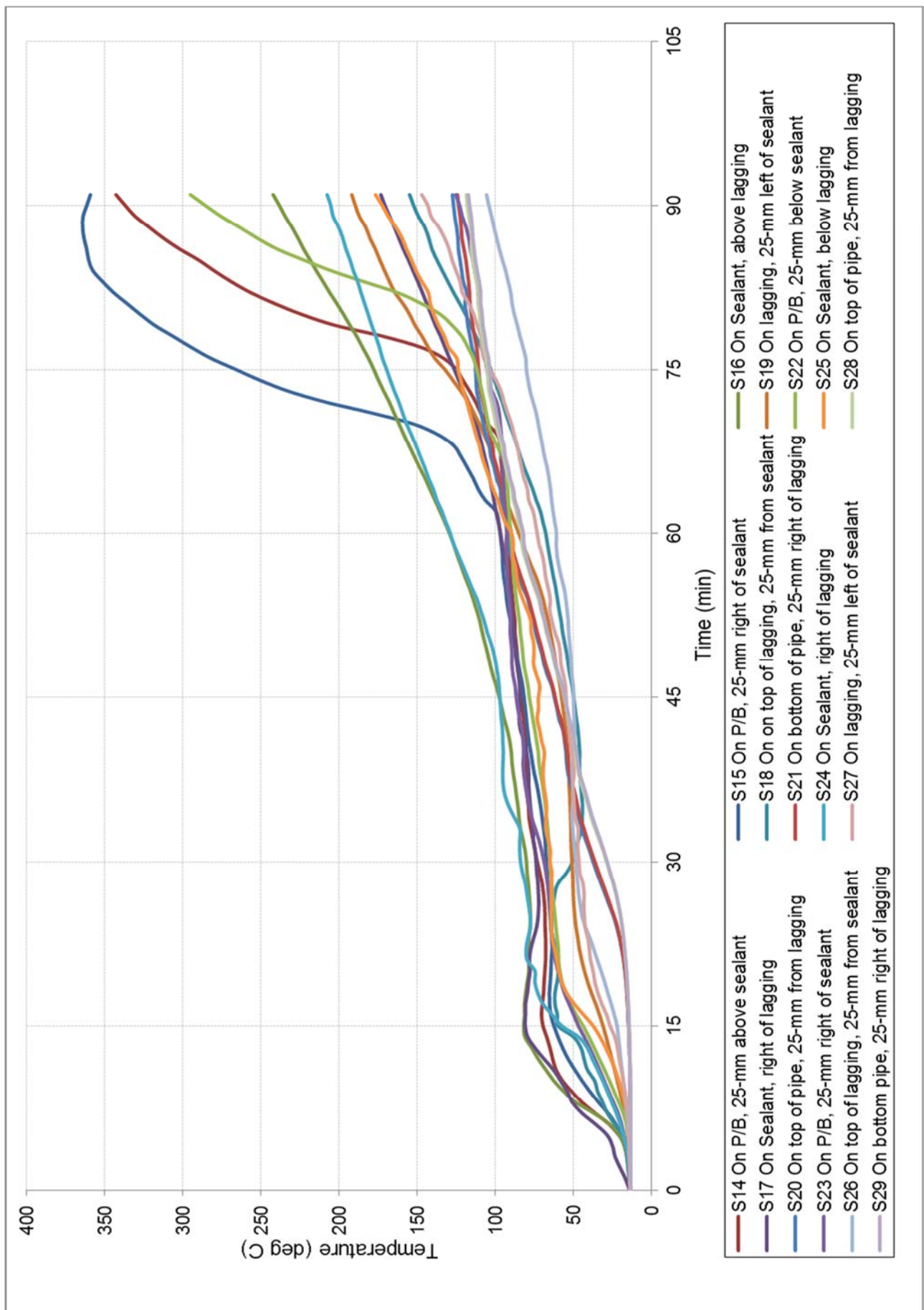


FIGURE 6 – SPECIMEN TEMPERATURE – ASSOCIATED WITH SPECIMEN 4

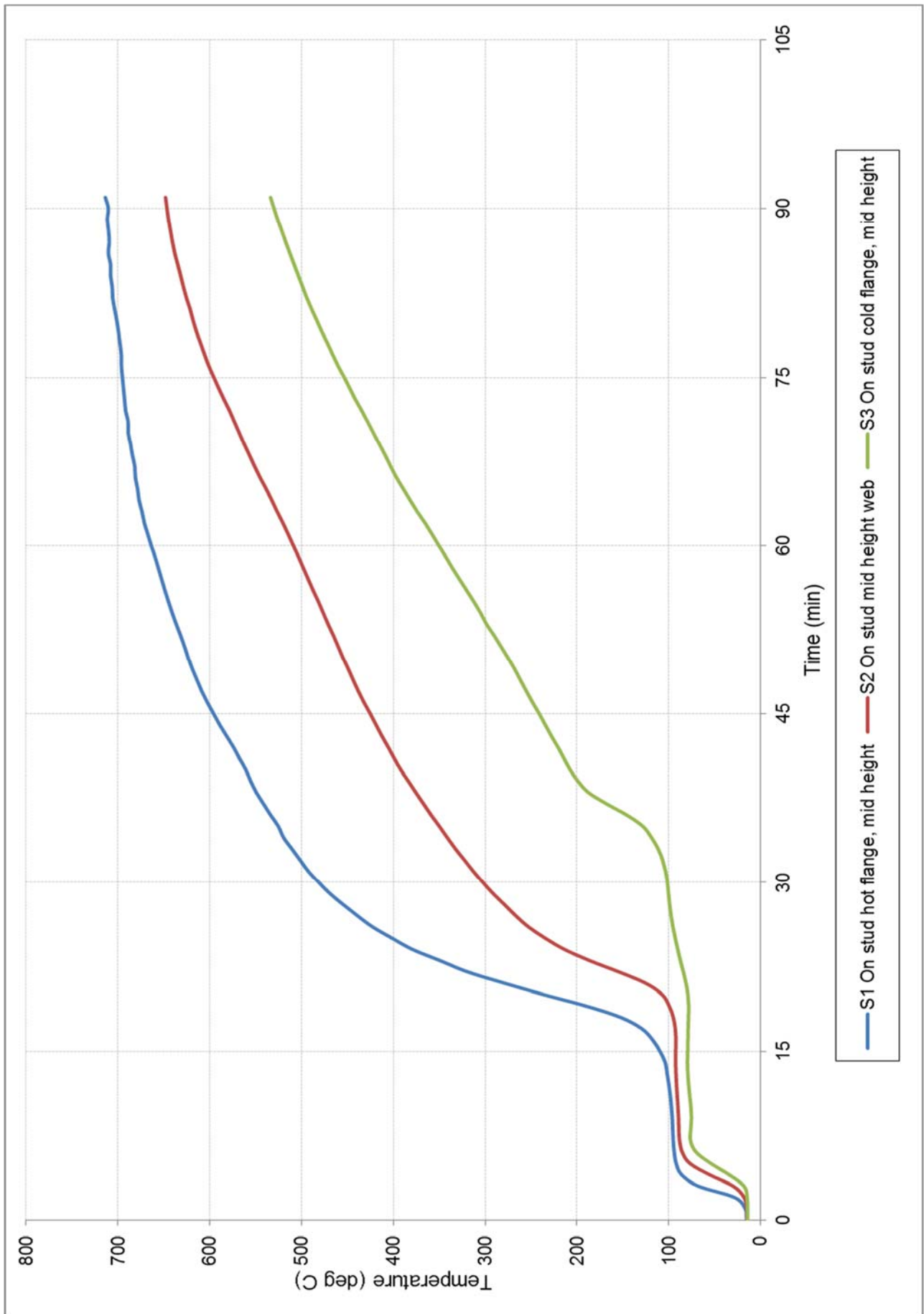
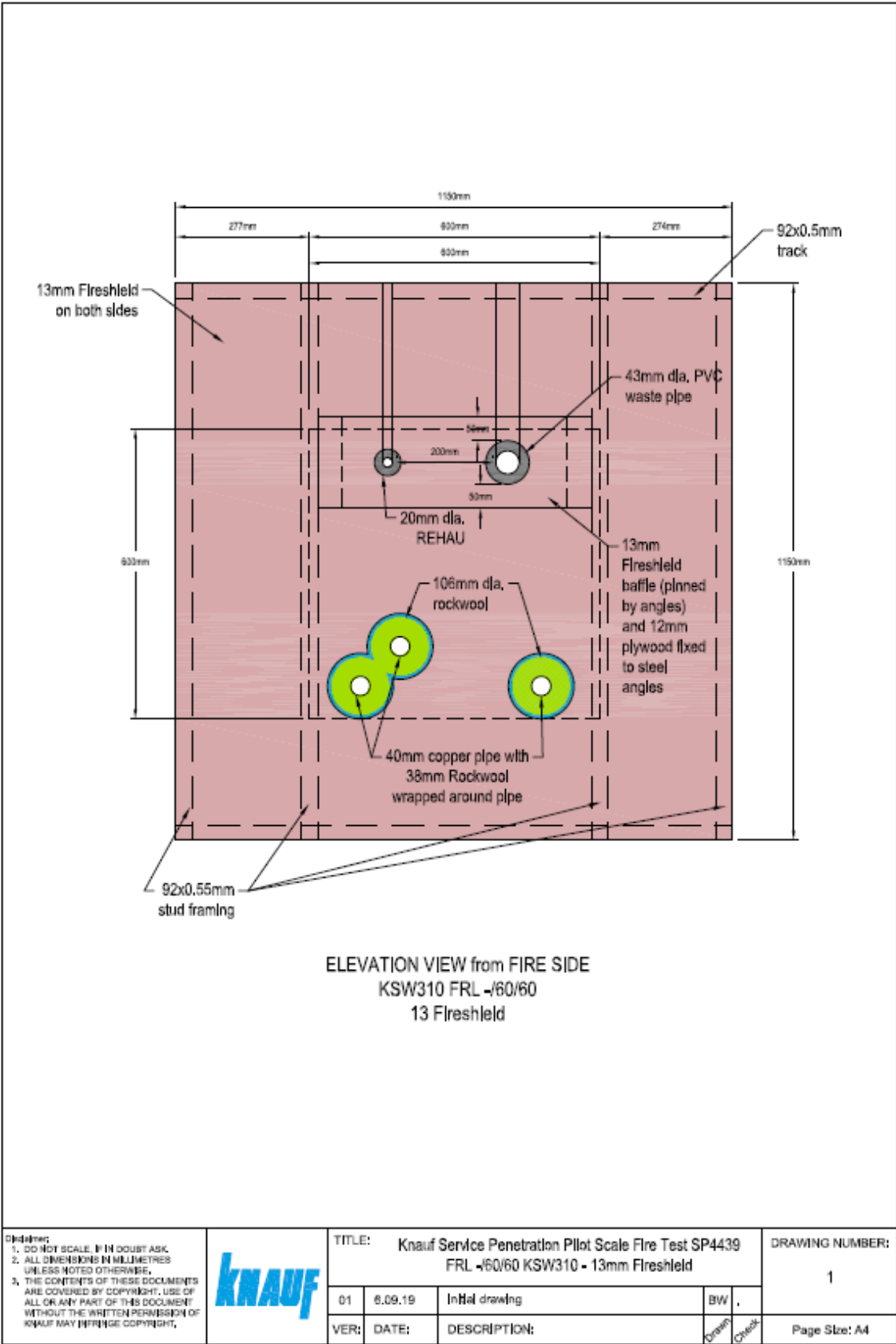
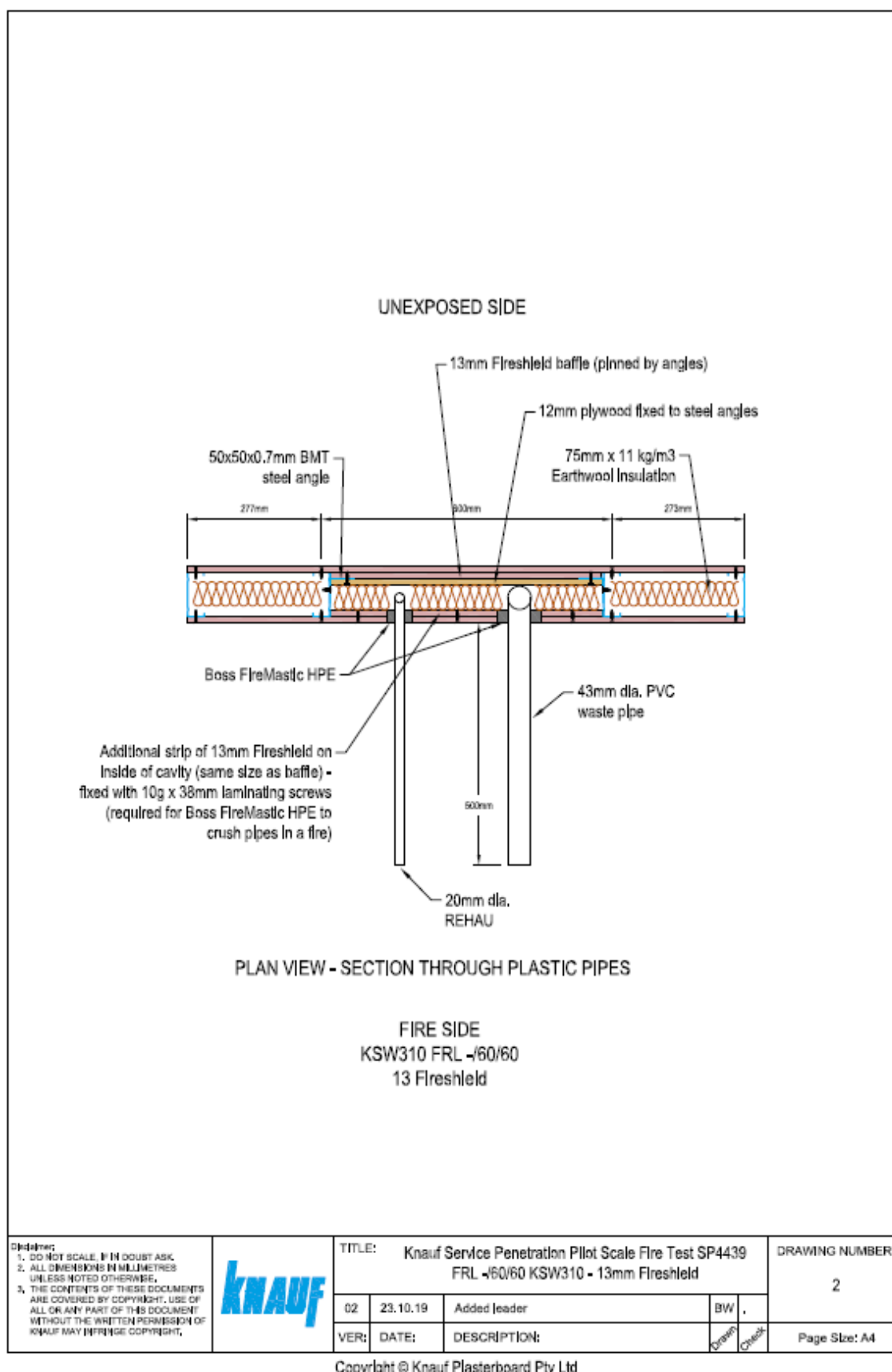


FIGURE 7 – SPECIMEN TEMPERATURE –INTERNAL STEEL STUD

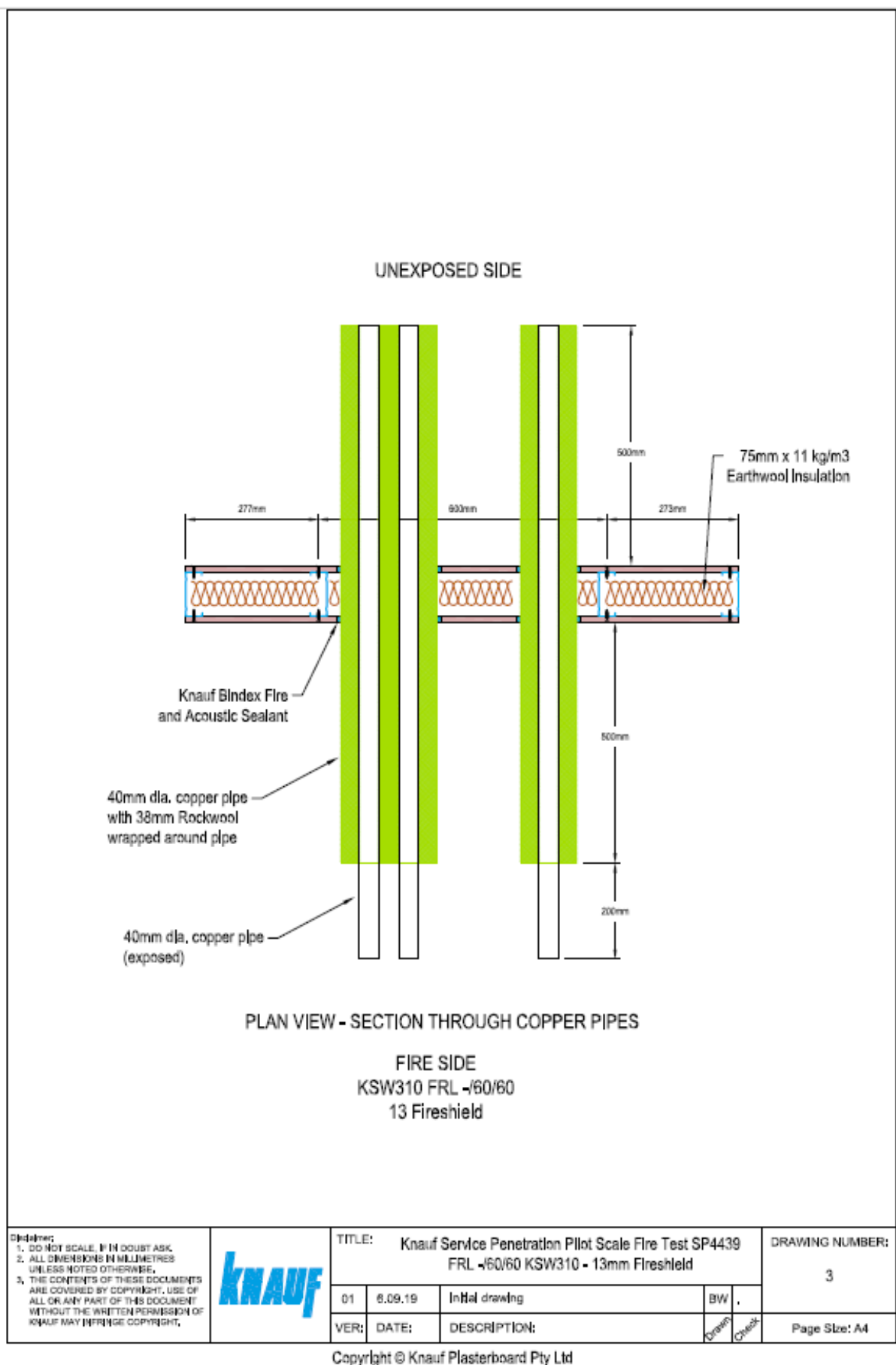
Appendix D – Specimen drawings



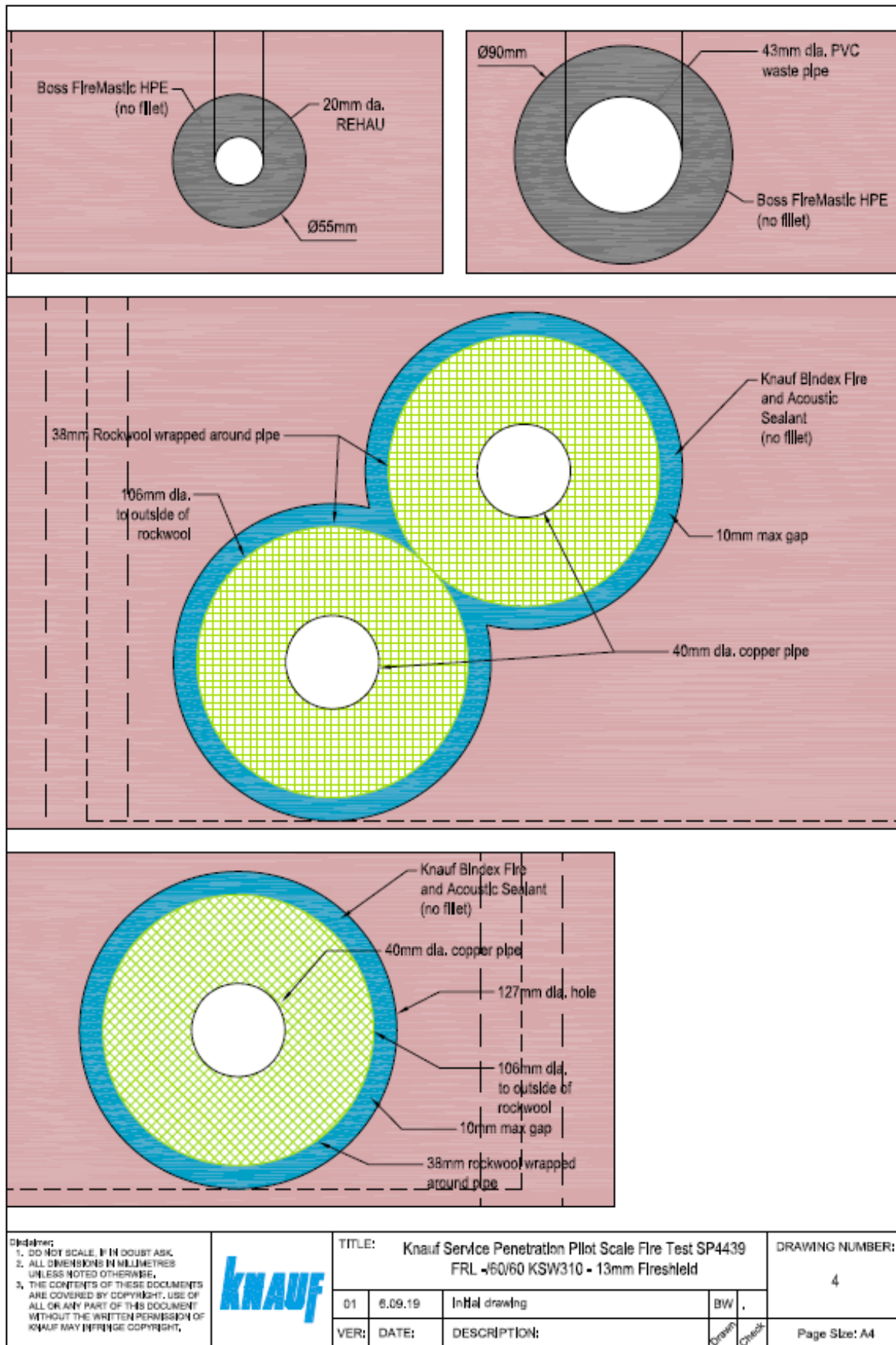
DRAWING NUMBER 1, TITLED “KNAUF SERVICE PENETRATIONS PILOT SCALE FIRE TEST SP4439 FRL-/60/60 KSW310 – 13-MM FIRESHIELD”, DATED 6 SEPTEMBER 2019 BY KNAUF



DRAWING NUMBER 2, TITLED “KNAUF SERVICE PENETRATIONS PILOT SCALE FIRE TEST SP4439 FRL-/60/60 KSW310 – 13-MM FIRESHIELD”, DATED 23 OCTOBER 2019 BY KNAUF



**DRAWING NUMBER 3, TITLED “KNAUF SERVICE PENETRATIONS PILOT SCALE FIRE TEST SP4439
FRL-/60/60 KSW310 – 13-MM FIRESHIELD”, DATED 6 SEPTEMBER 2019 BY KNAUF**



DRAWING NUMBER 4, TITLED “KNAUF SERVICE PENETRATIONS PILOT SCALE FIRE TEST SP4439 FRL-/60/60 KSW310 – 13-MM FIRESHIELD”, DATED 6 SEPTEMBER 2019 BY KNAUF

Appendix E – 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																				
<h3>Certificate of Test</h3>																				
No. 3385																				
<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>																				
<p>Knauf Plasterboard Pty Ltd 31 Military Road Matraville NSW 2036</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 2053.</p>																				
<p>Product Name: A 20-mm diameter PE-Xa Rehau Rautitan pipe incorporating an elbow joint in the wall cavity penetrating a 55-mm aperture on the exposed face protected with Fire Mastic HPE sealant (Specimen 1)</p>																				
<table border="1"><thead><tr><th colspan="2">SEPARATING ELEMENT</th></tr></thead><tbody><tr><td colspan="2">The wall system contained single layer of 13-mm thick FireShield plasterboard on each side of 92-mm x 0.55 BMT C-studs. The wall cavity was filled with 75-mm thick Knauf Earthwool. The Knauf wall system (KSW310) has an established FRL of -/60/60 as detailed in BRANZ reports FAR 3210 and FAR 3230.</td></tr><tr><th colspan="2">TYPE AND SIZE OF CONSTRUCTION</th></tr><tr><td colspan="2">A 55-mm diameter aperture on the exposed side plasterboard lining of the 118-mm thick wall.</td></tr><tr><th colspan="2">PENETRATING SERVICE</th></tr><tr><td>Description</td><td>PE-Xa Rehau Rautitan pipe incorporating a 90° elbow joint within the wall cavity.</td></tr><tr><td>Size</td><td>A 20-mm OD, pipe with wall thickness of 2.8-mm incorporating a Rehau PX No.12 90 Degree elbow. The pipe extended 500-mm away from the exposed face and approximately 500-mm upwards inside the wall cavity.</td></tr><tr><td>End conditions</td><td>The pipe was plugged on the exposed side with ceramic Superwool fibre and left open inside the wall cavity.</td></tr><tr><td>Supports</td><td>Internally to the unexposed face wall at the elbow joint.</td></tr></tbody></table>			SEPARATING ELEMENT		The wall system contained single layer of 13-mm thick FireShield plasterboard on each side of 92-mm x 0.55 BMT C-studs. The wall cavity was filled with 75-mm thick Knauf Earthwool. The Knauf wall system (KSW310) has an established FRL of -/60/60 as detailed in BRANZ reports FAR 3210 and FAR 3230.		TYPE AND SIZE OF CONSTRUCTION		A 55-mm diameter aperture on the exposed side plasterboard lining of the 118-mm thick wall.		PENETRATING SERVICE		Description	PE-Xa Rehau Rautitan pipe incorporating a 90° elbow joint within the wall cavity.	Size	A 20-mm OD, pipe with wall thickness of 2.8-mm incorporating a Rehau PX No.12 90 Degree elbow. The pipe extended 500-mm away from the exposed face and approximately 500-mm upwards inside the wall cavity.	End conditions	The pipe was plugged on the exposed side with ceramic Superwool fibre and left open inside the wall cavity.	Supports	Internally to the unexposed face wall at the elbow joint.
SEPARATING ELEMENT																				
The wall system contained single layer of 13-mm thick FireShield plasterboard on each side of 92-mm x 0.55 BMT C-studs. The wall cavity was filled with 75-mm thick Knauf Earthwool. The Knauf wall system (KSW310) has an established FRL of -/60/60 as detailed in BRANZ reports FAR 3210 and FAR 3230.																				
TYPE AND SIZE OF CONSTRUCTION																				
A 55-mm diameter aperture on the exposed side plasterboard lining of the 118-mm thick wall.																				
PENETRATING SERVICE																				
Description	PE-Xa Rehau Rautitan pipe incorporating a 90° elbow joint within the wall cavity.																			
Size	A 20-mm OD, pipe with wall thickness of 2.8-mm incorporating a Rehau PX No.12 90 Degree elbow. The pipe extended 500-mm away from the exposed face and approximately 500-mm upwards inside the wall cavity.																			
End conditions	The pipe was plugged on the exposed side with ceramic Superwool fibre and left open inside the wall cavity.																			
Supports	Internally to the unexposed face wall at the elbow joint.																			
Page 1 of 2																				
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COPY OF CERTIFICATE OF TEST NUMBERED 3385 (PAGE 1 OF 2)



Certificate of Test

No. 3385

FIRE STOPPING SYSTEM	
Trade names	Fire Mastic-HPE
Manufacturers	BOSS Fire & Safety Pty Ltd
Description	Fire Mastic-HPE is a graphite-based, thixotropic, one part acrylic emulsion
Application	Inside the wall cavity on the unexposed side a 200-mm high x 600-mm wide piece of 13-mm FireShield plasterboard was fixed to wall using two 200-mm wide 50-mm x 50-mm x 0.7 BMT steel angles that were screwed to the C-studs using four 10g X 16-mm flat top drill point tek screws. A 200-mm wide x 600-mm wide sheet of 12-mm plywood was then fixed over the steel angles using three 10g x 16-mm flat top drill point tek screws over each angle. The 20-mm PE-Xa pipe was then fixed at the elbow joint to the plywood with an Auspex Clip and a 25-mm screw. Inside the wall cavity on the exposed side, a 200-mm high x 600-mm wide piece of 13-mm FireShield with a 55-mm opening was fixed to the wall using 10g x 38-mm laminating screws at 300-mm centres. The annular gap between the pipe and wall was sealed with FireMastic-HPE to a depth of approximately 26-mm and finished flush with the face of the wall.
Drawing	Drawings 1 to 4 Title "Knauf Service Penetration Pilot Fire Test SP4439 FRL -/60/60 KSW310 13mm FireShield", by Knauf Plasterboard Pty Ltd.

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

Structural Adequacy	-	not applicable
Integrity	-	no failure at 91 minutes
Insulation	-	no failure at 91 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/60/60.

The fire-resistance level of the specimen is applicable when the system is exposed to fire from the same direction as tested. The FRL of the specimen is limited to that of the fire 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. 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: 21 October 2019

Issued on the 23rd day of April 2020 without alterations or additions.

Brett Roddy | Manager, Fire Testing and Assessments

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COPY OF CERTIFICATE OF TEST NUMBERED 3385 (PAGE 2 OF 2)



Certificate of Test

No. 3386

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:

Knauf Plasterboard Pty Ltd
31 Military Road
Matraville NSW 2036

A full description of the test specimen and the complete test results are detailed in the Division's Sponsored Investigation report numbered FSP 2053.

Product Name: A 43-mm diameter PVC pipe incorporating an elbow joint in the wall cavity penetrating a 90-mm aperture on the exposed face protected with Fire Mastic HPE sealant (Specimen 2)

SEPARATING ELEMENT	
The wall system contained single layer of 13-mm thick FireShield plasterboard on each side of 92-mm x 0.55 BMT C-studs. The wall cavity was filled with 75-mm thick Knauf Earthwool. The Knauf wall system (KSW310) has an established FRL of -/60/60 as detailed in BRANZ reports FAR 3210 and FAR 3230.	
TYPE AND SIZE OF CONSTRUCTION	
A 90-mm diameter aperture on the exposed side of the 118-mm thick wall.	
PENETRATING SERVICE	
Description	Vinidex PVC pipe incorporating a 90° elbow.
Size	A 43-mm OD pipe with a 2.3-mm wall thickness incorporating a 90° PVC elbow. The pipe extended 500-mm away from the exposed face and approximately 500-mm upwards inside the wall cavity.
End conditions	The pipe was plugged on the exposed side with ceramic Superwool fibre and left open inside the wall cavity.
Supports	Internally to the unexposed face wall at the elbow joint.

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Certificate of Test

No. 3386

FIRE STOPPING SYSTEM	
Trade names	Fire Mastic-HPE
Manufacturers	BOSS Fire & Safety Pty Ltd
Description	Fire Mastic-HPE is a graphite-based, thixotropic, one part acrylic emulsion
Application	Inside the wall cavity on the unexposed side a 200-mm high x 600-mm wide piece of 13-mm FireShield was fixed to wall using two 200-mm long x 50-mm x 50-mm x 0.7 BMT steel angles that were fixed to the C-studs using four 10g x 16-mm flat top drill point tek screws. A 200-mm high x 600-mm wide sheet of 12-mm plywood was then fixed over the steel angles using three 10g x 16-mm flat top drill point tek screws over each angle. The 43-mm PVC pipe was then fixed at the elbow joint to the plywood with a nylon coated metal saddle flush clip and 10g x 16-mm flat top drill point tek screws. Inside the wall cavity on the exposed side, a 200-mm high x 600-mm wide piece of 13-mm FireShield with a 90-mm opening was fixed to the wall using 10g 38-mm laminating screws at 300-mm centres. The annular gap between the pipe and wall was sealed with FireMastic-HPE to a depth of approximately 26-mm and finished flush with wall.
Drawing	Drawings 1 to 4 Title "Knauf Service Penetration Pilot Fire Test SP4439 FRL -/60/60 KSW310 13mm FireShield", by Knauf Plasterboard Pty Ltd.

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

Structural Adequacy	-	not applicable
Integrity	-	no failure at 91 minutes
Insulation	-	no failure at 91 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/60/60.

The fire-resistance level of the specimen is applicable when the system is exposed to fire from the same direction as tested. The FRL of the specimen is limited to that of the fire 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. 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: 21 October 2019

Issued on the 23rd day of April 2020 without alterations or additions.

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Certificate of Test

No. 3387

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:

Knauf Plasterboard Pty Ltd
31 Military Road
Matraville NSW 2036

A full description of the test specimen and the complete test results are detailed in the Division's Sponsored Investigation report numbered FSP 2053.

Product Name: A nominal 40-mm diameter copper pipe with lagging penetrating a 127-mm aperture protected with Knauf Bindex Fire and Acoustic sealant (Specimen 3)

SEPARATING ELEMENT	
The wall system contained single layer of 13-mm thick FireShield plasterboard on each side of 92-mm x 0.55 BMT C-studs. The wall cavity was filled with 75-mm thick Knauf Earthwool. The Knauf wall system (KSW310) has an established FRL of -/60/60 as detailed in BRANZ reports FAR 3210 and FAR 3230.	
TYPE AND SIZE OF CONSTRUCTION	
127-mm diameter apertures through a 118-mm thick wall.	
PENETRATING SERVICE	
Description	A lagged copper pipe.
Size	A 38.5-mm OD copper pipe with a wall thickness of 1-mm lagged with 38-mm thick Rockwood with an outer foil facing. The pipe extended 700-mm from the unexposed side and 500-mm from the exposed side. The lagging extended 500-mm from both sides of the wall.
End conditions	Sealed on the exposed end using ceramic Superwool fibre and left open on the unexposed end.
Supports	Approximately 100-mm and 500-mm away from the wall on the unexposed face.

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Certificate of Test

No. 3387

FIRE STOPPING SYSTEM	
Trade names	Knauf Bindex Fire and Acoustic sealant
Manufacturers	Knauf Plasterboard Pty Limited
Description	Knauf Bindex Fire and Acoustic sealant is a one part acrylic sealant.
Application	The annular gap between the pipe lagging and the wall was sealed with Knauf Bindex Fire and Acoustic sealant to the depth of 13-mm and finished flush with the wall.
Drawing	Drawings 1 to 4 Title "Knauf Service Penetration Pilot Fire Test SP4439 FRL -/60/60 KSW310 13mm FireShield", by Knauf Plasterboard Pty Ltd.

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

Structural Adequacy	-	not applicable
Integrity	-	no failure at 91 minutes
Insulation	-	76 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/60/60.

The fire-resistance level of the specimen is applicable when the system is exposed to fire from either direction. The FRL of the specimen is limited to that of the fire 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. 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: 21 October 2019

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Certificate of Test

No. 3388

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:

Knauf Plasterboard Pty Ltd
31 Military Road
Matraville NSW 2036

A full description of the test specimen and the complete test results are detailed in the Division's Sponsored Investigation report numbered FSP 2053.

Product Name: A pair of nominal 40-mm diameter copper pipes with lagging penetrating two 127-mm apertures protected with Knauf Bindex Fire and Acoustic sealant (Specimen 4)

SEPARATING ELEMENT	
The wall system contained single layer of 13-mm thick FireShield plasterboard on each side of 92-mm x 0.55 BMT C-studs. The wall cavity was filled with 75-mm thick Knauf Earthwool. The Knauf wall system (KSW310) has an established FRL of -/60/60 as detailed in BRANZ reports FAR 3210 and FAR 3230.	
TYPE AND SIZE OF CONSTRUCTION	
Two 127-mm diameter apertures in a 118-mm thick wall. The apertures were located adjacent to each other.	
PENETRATING SERVICE	
Description	Two lagged copper pipes.
Size	Two x 38.5-mm OD copper pipes with a wall thickness of 1-mm lagged with a 38-mm thick Rockwood with an outer foil facing. The pipes extended 700-mm from the unexposed side and 500-mm from the exposed side. The lagging extended 500-mm from both sides of the wall.
End conditions	Sealed on the exposed end using ceramic Superwool fibre and left open on the unexposed end.
Supports	Approximately 100-mm and 500-mm away from the wall on the unexposed face.

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Certificate of Test

No. 3388

FIRE STOPPING SYSTEM	
Trade names	Knauf Bindex Fire and Acoustic sealant
Manufacturers	Knauf Plasterboard Pty Limited
Description	Knauf Bindex Fire and Acoustic sealant is a one part acrylic sealant.
Application	The annular gap between the pipe lagging and the wall was sealed with Knauf Bindex Fire and Acoustic sealant to the depth of 13-mm and finished flush with the wall.
Drawing	Drawings 1 to 4 Title "Knauf Service Penetration Pilot Fire Test SP4439 FRL -/60/60 KSW310 13mm FireShield", by Knauf Plasterboard Pty Ltd.

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

Structural Adequacy	-	not applicable
Integrity	-	no failure at 91 minutes
Insulation	-	no failure at 72 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/60/60.

The fire-resistance level of the specimen is applicable when the system is exposed to fire from either direction. The FRL of the specimen is limited to that of the fire 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. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.

Testing Officer: Peter Gordon

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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. |

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FOR FURTHER INFORMATION

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