Fire-resistance test on service penetrations in a framed wall system

Test Report

Author: Peter Gordon
Report number: FSP 1833
Date: 28 June 2017

Client: Boss Fire & Safety Pty Ltd

Commercial-in-confidence

NATA Accredited Laboratory
Number: 165
Corporate Site No 3625
Accredited for compliance with ISO/IEC 17025 Testing

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Report Status and Revision History:

VERSION	STATUS	DATE	DISTRIBUTION	ISSUE NUMBER
Revision A	Draft for internal review	31/05/17	CSIRO	FSP 1833
Revision B	Draft	07/06/17	CSIRO and Client	FSP 1833
Revision C	Final for issue	20/06/17	CSIRO and Client	FSP 1833
Revision D	Final for Issue	28/06/17	CSIRO and Client	FSP 1833

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28 June 2017	28 June 2017	28 June 2017

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Fire-resistance test on service penetrations in a framed wall system

Sponsored Investigation No. FSP 1833

1 Introduction

1.1 Identification of specimen

The sponsor identified the specimens as a number of services penetrating a plasterboard wall system with various protection systems.

1.2 Sponsor

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

1.3 Manufacturer

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 4676/4100

1.7 Test date

The fire-resistance test was conducted on 9 May 2017.

2 Description of specimen

2.1 General

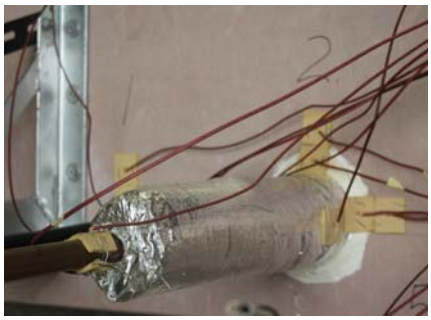
The specimens comprised seven (7) services penetrating a plasterboard wall and protected by sealants.

For the purpose of the test, the specimens were referenced as Specimen 1, 2, 3, 4, 5, 6, and 7.

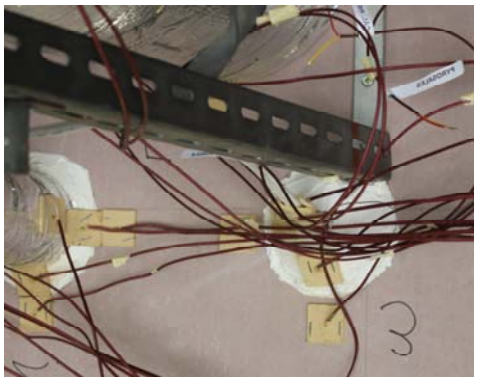
Specimen 1 – FireMastic-HPE sealant protecting a 60-mm diameter aperture penetrated by 20-mm PEX Cross Linked Polyethylene plumbing pipe.

SEPARATING ELEMENT	
Plasterboard wall system – Boral Firestop 16-mm plasterboard both sides , with an established FRL of -/90/90	
TYPE AND SIZE OF CONSTRUCTION	
60-mm diameter aperture in a 96-mm thick wall.	
PENETRATING SERVICE	
Description	PEX Cross Linked Polyethylene plumbing pipe. The service penetrated the unexposed side by 2000-mm and the exposed side by 500-mm.
Size	20-mm OD with a wall thickness of 2.3-mm
End conditions	Sealed on the exposed end using SmarteX P 20-mm Push fit brass Pex cap and left open on the unexposed end.
Supports	Approximately 500-mm and 1500-mm away from the wall on the unexposed face.
FIRE STOPPING SYSTEM	
Trade name	FireMastic-HPE sealant
Manufacturer	Boss Fire & Safety Pty Ltd
Description	High Pressure Exerting graphite-based thixotropic acrylic sealant.
Application	The annular gap of 20-mm between the pipe and the plasterboard on both the exposed and unexposed face were sealed with BOSS FireMastic-HPE to a depth of 16-mm (the full depth of plasterboard walls) and finished flush with the surface of the wall.
Photograph	 Exposed  Unexposed
Drawing	CSIRO 0517 – 02 dated 26/05/17 by Boss Fire & Safety.

Specimen 2 – FireMastic-300 sealant protecting a 19-mm diameter aperture penetrated by a 19-mm copper pipe lagged with Boss P40-MAK Wrap.

SEPARATING ELEMENT	
Plasterboard wall system – single layer Boral Firestop 16-mm plasterboard on both sides , with an established FRL of -/90/90	
TYPE AND SIZE OF CONSTRUCTION	
19-mm diameter aperture in a 96-mm thick wall.	
PENETRATING SERVICE	
Description	A copper pipe extends 800-mm from the unexposed side, 500-mm from the exposed.
Size	19.05-mm OD with a wall thickness of 1.02-mm.
End conditions	Plugged with Boss FireMastic-300 to a depth of 50-mm on the exposed end and left open on the unexposed end.
Supports	Approximately 500-mm and 1500-mm away from the wall on the unexposed face.
FIRE STOPPING SYSTEM	
Trade name	FireMastic-300 sealant and Boss P40-MAK wrap
Manufacturer	Boss Fire & Safety Pty Ltd
Description	FireMastic-300 sealant is an intumescent Fire-Rated one part acrylic emulsion sealant. Boss P40-MAK Wrap is a mineral fibre lagging 38-mm thick with a density of 40-kg/m^3 wrap and foil lining on one side.
Application	A surface seal around the pipe was created with a 50-mm fillet of FireMastic-300 sealant on the exposed and unexposed face. The pipe was then lagged with a sheet of Boss P40-MAK Wrap, wrapped twice around the pipe that extended out 300-mm from the FireMastic-300 on both sides of the wall that was secured with foil tape. There was 200-mm of unprotected pipe on the exposed side.
Photograph	 Exposed  Unexposed
Drawing	CSIRO 0517 – 03 dated 26/05/17 by Boss Fire & Safety.

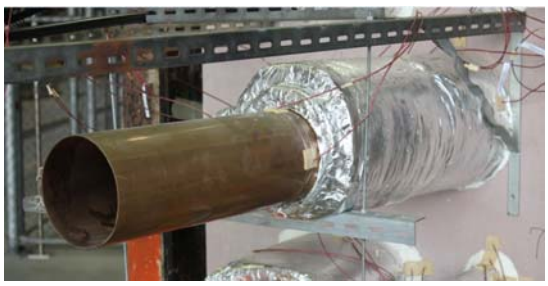
Specimen 3 – FireMastic-300 sealant protecting a 13-mm diameter aperture penetrated by a single Power Cable.

SEPARATING ELEMENT	
Plasterboard wall system – single layer Boral Firestop 16-mm plasterboard on both sides , with an established FRL of -/90/90	
TYPE AND SIZE OF CONSTRUCTION	
13-mm diameter aperture in a 96-mm thick wall.	
PENETRATING SERVICE	
Description	TPS Cable, 2 core and earth penetrating each side of the wall by 500-mm.
Size	2.5-mm^2 2C+E TPS power cable.
End conditions	Cables on both the exposed and unexposed side were left untreated.
Supports	Approximately 500-mm away from the wall on the unexposed face.
FIRE STOPPING SYSTEM	
Trade name	FireMastic-300 sealant
Manufacturer	Boss Fire & Safety Pty Ltd
Description	FireMastic-300 sealant is an intumescent Fire-Rated one part acrylic emulsion sealant.
Application	A surface seal around the cable was created with a 50mm fillet of FireMastic-300 intumescent sealant on the exposed and unexposed face.
Photograph	  Exposed Unexposed
Drawing	CSIRO 0517 – 04 dated 26/05/17 by Boss Fire & Safety.

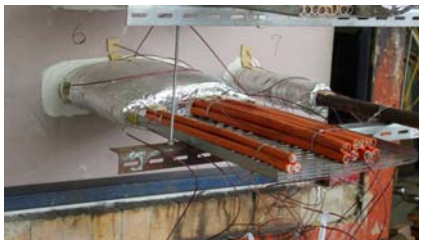
Specimen 4 – FireMastic-300 sealant protecting a 150-mm wide cable tray with 60 cables lagged with Boss P40-MAK Wrap.

SEPARATING ELEMENT	
Plasterboard wall system – single layer Boral Firestop 16-mm plasterboard on both sides , with an established FRL of -/90/90	
TYPE AND SIZE OF CONSTRUCTION	
150-mm wide and 100-mm high aperture in a 96-mm thick wall.	
PENETRATING SERVICE	
Description	Bundle of 60 cables (each cable approximately 14-mm in diameter) secured on a 150-mm cable tray. The services penetrated 500-mm from the exposed side and 800-mm from the unexposed side.
Size	60 x 50 pair, 0.5-mm (as per Appendix D2 – AS1530.4)
End conditions	Cables on both the exposed and unexposed side were left untreated.
Supports	Approximately 500-mm away from the wall on the unexposed face.
FIRE STOPPING SYSTEM	
Trade name	FireMastic-300 sealant and Boss P40-MAK wrap
Manufacturer	Boss Fire & Safety Pty Ltd
Description	FireMastic-300 sealant is an intumescent Fire-Rated one part acrylic emulsion sealant. Boss P40-MAK is a mineral fibre lagging 38-mm thick with a density of 40-kg/m^3 wrap and foil lining on one side.
Application	A surface seal around the cable tray was created with a 50mm fillet of FireMastic-300 sealant on the exposed and unexposed face. Boss P40-MAK wrap was wrapped twice around the cable tray on both sides of the wall (to a thickness of approximately 40-mm) which was secured with steel wire and foil tape. The wrap extended 300-mm from the both sides of the wall, flush with the FireMastic fillet.
Photograph	 Exposed  Unexposed
Drawing	CSIRO 0517 – 05 dated 26/05/17 by Boss Fire & Safety.

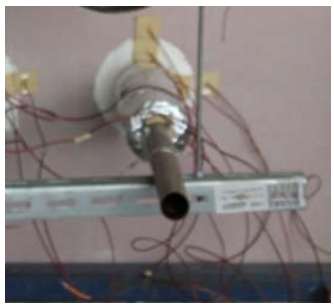
Specimen 5 – FireMastic-300 sealant protecting a 150-mm diameter aperture penetrated by 150-mm Copper pipe lagged with Boss P40-MAK Wrap.

SEPARATING ELEMENT	
Plasterboard wall system – single layer Boral Firestop 16-mm plasterboard on both sides , with an established FRL of -/90/90	
TYPE AND SIZE OF CONSTRUCTION	
150-mm diameter aperture in a 96-mm thick wall.	
PENETRATING SERVICE	
Description	Copper pipe that extends 500-mm on the exposed side and 1100-mm on the unexposed side.
Size	150-mm OD with a wall thickness of 2.03-mm.
End conditions	Sealed on the exposed end using a copper cap and left open on the unexposed end.
Supports	Approximately 500-mm away from the wall on the unexposed face.
FIRE STOPPING SYSTEM	
Trade name	FireMastic-300 sealant and Boss P40-MAK wrap
Manufacturer	Boss Fire & Safety Pty Ltd
Description	FireMastic-300 sealant is an intumescent Fire-Rated one part acrylic emulsion sealant. Boss P40-MAK is a mineral fibre lagging 38-mm thick with a density of 40-kg/m^3 wrap and foil lining on one side.
Application	A surface seal around the pipe was created with a 50mm fillet of FireMastic-300 sealant on the exposed and unexposed face. Two layers of Boss P40-MAK wrap was wrapped approximately twice around the copper pipe to a thickness of 40-mm that were secured with steel wire and foil tape. The wrap extended 300-mm from the exposed side, and 600-mm from the unexposed side; flush with the FireMastic fillet.
Photograph	 Exposed side  Unexposed side
Drawing	CSIRO 0517 – 06 dated 26/05/17 by Boss Fire & Safety.

Specimen 6 – FireMastic-300 sealant protecting a 300-mm wide cable tray with a set of 3 and 8 bundle cables lagged with Boss P40-MAK Wrap.

SEPARATING ELEMENT	
Plasterboard wall system – single layer Boral Firestop 16-mm plasterboard on both sides , with an established FRL of -/90/90	
TYPE AND SIZE OF CONSTRUCTION	
300mm wide and 40-mm high aperture (only cut through where the tray and cables leaving no more than an angular gap of approximately 10-mm) in a 96-mm thick wall.	
PENETRATING SERVICE	
Description	A set of three and eight bundle of cables on a steel cable tray. The services penetrated 500-mm from the exposed side and 800-mm from the unexposed side.
Size	3 x 6-mm^2, 3 core and earth, 8 x 16-mm^2, 3-core and earth on a 300-mm wide tray. The tested cables represent the smaller two cable bundles and arrangement as per Appendix D1- AS1530.4 (the 4x185mm^2 and the 1 x 630mm^2 cable from Appendix D1 were omitted.
End conditions	Cables on both exposed and unexposed side were left untreated.
Supports	Approximately 500-mm from the unexposed side.
FIRE STOPPING SYSTEM	
Trade name	FireMastic-300 sealant and Boss P40-MAK wrap
Manufacturer	Boss Fire & Safety Pty Ltd
Description	FireMastic-300 sealant is an intumescent Fire-Rated one part acrylic emulsion sealant. Boss P40-MAK is a mineral fibre lagging 38-mm thick with a density of 40-kg/m^3 wrap and foil lining on one side.
Application	A surface seal around the pipe was created with a 50mm fillet of FireMastic-300 sealant on the exposed and unexposed face. Boss P40-MAK wrap was wrapped twice (to a thickness of about 40-mm) around the cable tray and secured with steel wire and foil tape. The wrap extended 300-mm from both sides of the wall flush with the FireMastic fillet.
Photograph	  Exposed Side Unexposed side
Drawing	CSIRO 0517 – 07 dated 26/05/17 by Boss Fire & Safety.

Specimen 7 – FireMastic-300 sealant protecting a 32-mm diameter aperture penetrated by a 32-mm Copper pipe lagged with Boss P40-MAK Wrap.

SEPARATING ELEMENT	
Plasterboard wall system – single layer Boral Firestop 16-mm plasterboard on both sides , with an established FRL of -/90/90	
TYPE AND SIZE OF CONSTRUCTION	
32-mm diameter aperture in a 96-mm thick wall.	
PENETRATING SERVICE	
Description	Copper pipe that extended 500-mm from exposed side and 800-mm from the unexposed side.
Size	31.75-mm OD with a wall thickness of 1.22-mm.
End conditions	Plugged with Boss FireMastic-300 to a depth of 50-mm on the exposed end and left open on the unexposed end.
Supports	Approximately 500-mm away from the wall on the unexposed face.
FIRE STOPPING SYSTEM	
Trade name	FireMastic-300 sealant and Boss P40-MAK wrap
Manufacturer	Boss Fire & Safety Pty Ltd
Description	FireMastic-300 sealant is an intumescent Fire-Rated one part acrylic emulsion sealant. Boss P40-MAK is a mineral fibre lagging 38-mm thick with a density of 40-kg/m^3 wrap and foil lining on one side.
Application	A surface seal around the pipe was created with a 50mm fillet of FireMastic-300 sealant on the exposed and unexposed face. Boss P40-MAK wrap was wrapped approximately twice around the copper pipe to a thickness of around 40-mm that were secured with foil tape. The wrap extended 300-mm from both sides of the wall flush with the FireMastic fillet.
Photograph	 Exposed Side  Unexposed side
Drawing	CSIRO 0517 – 08 dated 26/05/17 by Boss Fire & Safety.

2.2 Dimensions

The overall dimension of the plasterboard wall was 1100-mm wide x 1100-mm long x 96-mm thick, to suit the opening in the specimen containing frame.

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 to CSIRO on 4 April 2017.

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 numbered CSIRO 0517, numbered 1-8, dated 25th May 2017, by Boss Fire & Safety.

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 18°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 92 minutes by the agreement with the sponsor.

8 Test results

8.1 Critical observations

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

1 minute -	Smoke being emitted between the cables in Penetration #4. Smoke fluing from the end of pipe in Penetration 1.
2 minutes -	Smoke from Penetration #1 stopped fluing.
3 minutes -	Smoke has resumed fluing from Penetration #1. Smoke being emitted between the power cables in Penetration #6.
7 minutes -	Smoke being emitted from 150-mm copper pipe - Penetration #5
	Material appears to have been combusted in the pipe.
13 minutes -	Smoke is continuing to be emitted from the end of Penetration 1. The amount of smoke being emitted from Penetration #4 has diminished. Smoke from the cables in Penetration #6 has ceased.
26 minutes -	Thermocouple #25 was replaced after faulty readings. New thermocouple reading correctly.
30 minutes -	Smoke from Penetration #1 has ceased.
50 minutes -	Penetration #1 is fluing again.
81 minutes:-	Thermocouple mastic on Penetration #7 replaced after falling off.
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 Penetration 1.

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

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

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

Figure 7 shows the curve of temperature versus time associated with Penetration 5.

Figure 8 shows the curve of temperature versus time associated with Penetration 6.

Figure 9 shows the curve of temperature versus time associated with Penetration 7.

8.5 Performance

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

Penetration # 1 – 20mm PEX pipe sealed with FireMastic-HPE; in a 60-mm ID hole.

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

Penetration # 2 – FireMastic-300 sealant protecting a 19-mm aperture penetrated by a 19-mm copper pipe lagged with Boss P40-MAK Wrap.

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

Penetration # 3 – FireMastic-300 sealant protecting a 13-mm aperture penetrated by a single Power Cable.

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

Penetration # 4 – FireMastic-300 sealant protecting a 150mm wide cable tray lagged with Boss P40-MAK Wrap.

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

Penetration # 5 – FireMastic-300 sealant protecting a 150-mm aperture penetrated by 150-mm Copper pipe lagged with Boss P40-MAK Wrap.

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

Penetration # 6 – FireMastic-300 sealant protecting a 300-mm wide cable tray with a set of 3 and 8 bundle cables lagged with Boss P40-MAK Wrap.

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

Penetration # 7 – FireMastic-300 sealant protecting a 32-mm aperture penetrated by a 32-mm Copper pipe lagged with Boss P40-MAK Wrap.

Structural adequacy	-	Not applicable
Integrity	-	no failure at 91 minutes
Insulation	-	no failure at 91 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 # 1:-	-/90/90	Penetration # 5:-	-/90/90
Penetration # 2:-	-/90/90	Penetration # 6:-	-/90/90
Penetration # 3:-	-/90/90	Penetration # 7:-	-/90/90
Penetration # 4:-	-/90/90		

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

The fire-resistance levels (FRL) are 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 10.12 of AS 1530.4-20014, have been made provided no individual component is removed or reduced.

11 Tested by

Heherson Alarde
Testing Officer

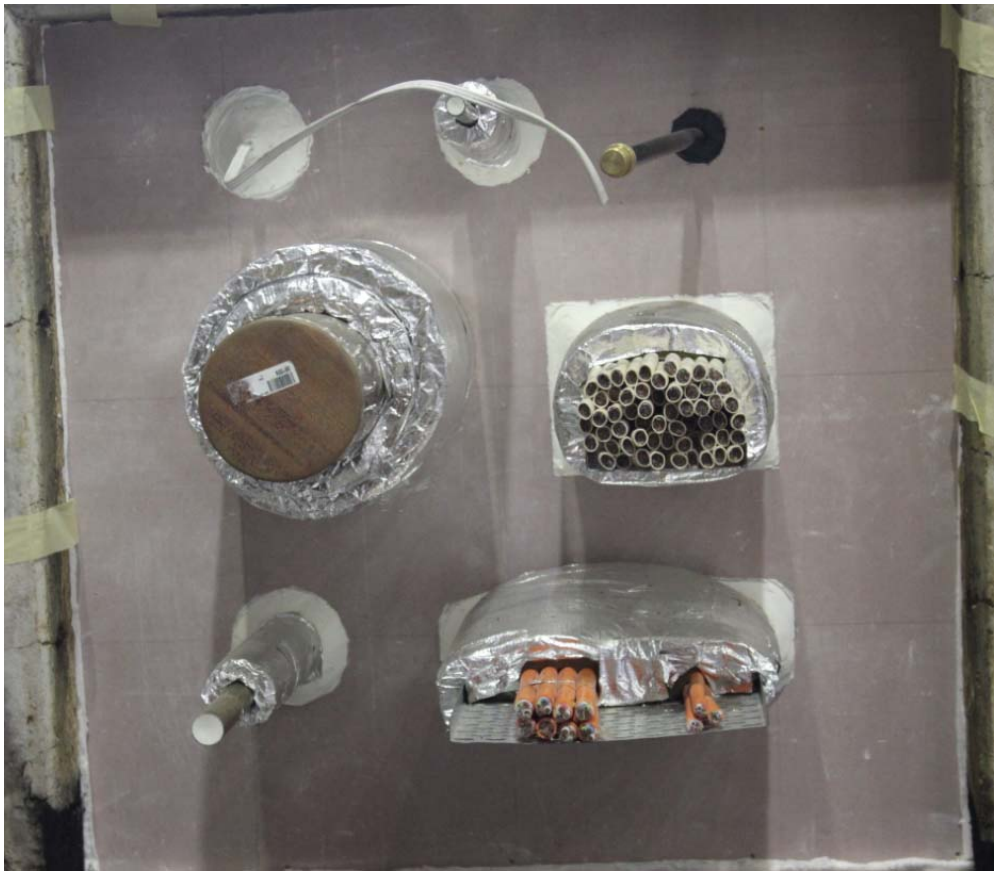
Appendices

Appendix A – Measurement location

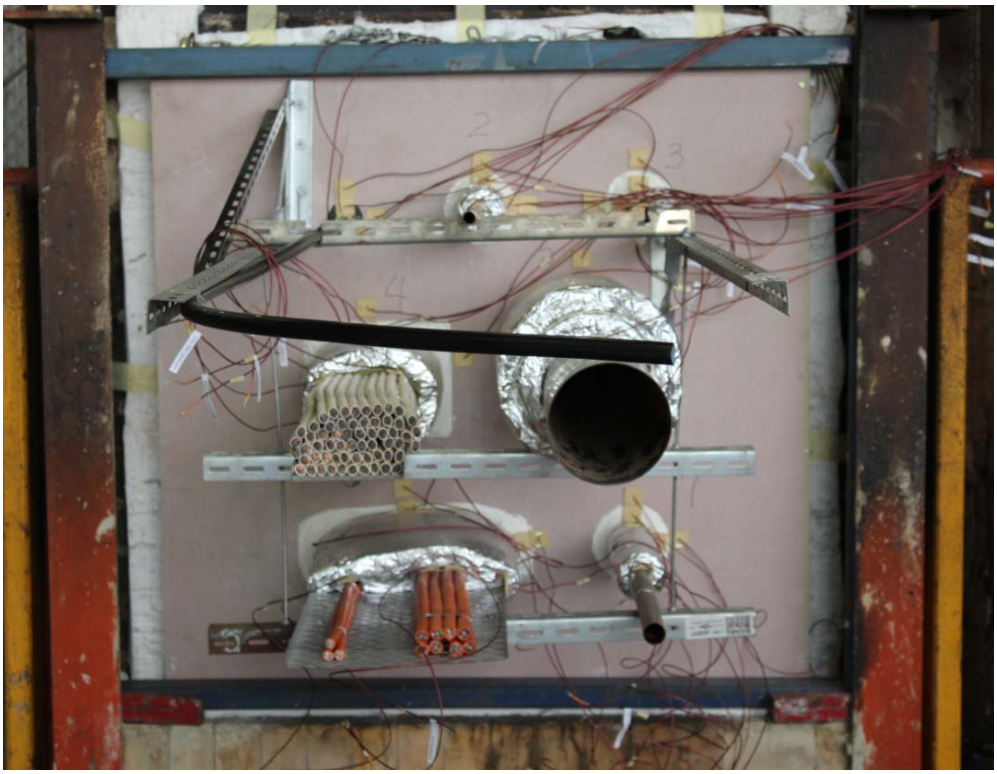
Specimen	Thermocouple (T/C) position	Thermocouple
Penetration 1 – 20mm PEX pipe sealed with FireMastic-HPE	On plasterboard, 25-mm above mastic	S1
	On plasterboard, 25-mm beside mastic	S2
	On mastic - Top	S3
	On mastic - Side	S4
	On top of pipe 25-mm from mastic	S5
	On side of pipe 25-mm from mastic	S6
Penetration 2 – 19.1mm Copper pipe sealed with 50mm surface fillet of FireMastic-300 and Boss P40-MAK Wrap	On plasterboard – 25-mm above mastic	S7
	On plasterboard – 25-mm beside mastic	S8
	On mastic - Top	S9
	On mastic - Side	S10
	On flex pipe, 25-mm from mastic	S11
	On insulation of 10-mm Cu pipe 25-mm from mastic	S12
	On insulation of 6-mm Cu pipe 25-mm from mastic	S13
	On 3-core power cable 25-mm from mastic	S14
Penetration 3 – Bundle of TPS cable. 2.5mm², 2 core & earth TPS cable. Cable sealed with 50-mm surface fillet of FireMastic-300.	On plasterboard, 25-mm above mastic	S15
	On plasterboard, 25-mm beside mastic	S16
	On mastic fillet - Top	S17
	On mastic fillet - Side	S18
	On cable 25-mm from mastic	S19
	On cable 25-mm from mastic	S20
Penetration 4 - 60 x 50-pair, 0.5-mm copper telephone cable sealed with 50-mm surface fillet of FireMastic-300 and Boss P40-MAK Wrap	On plasterboard, 25-mm above mastic	S21
	On plasterboard, 25-mm beside mastic	S22
	On mastic fillet	S23
	On mastic fillet	S24
	On lagging 25-mm from mastic fillet	S25
	On lagging 25-mm from mastic fillet	S26
	On cable bunch	S27
	On cable bunch	S28
	On cable tray left side	S29
	On cable tray right side	S30
Penetration 5 – 150-mm copper pipe sealed with 50-mm surface fillet of FireMastic-300	On plasterboard, 25-mm from wrap	S31
	On plasterboard, 25-mm from wrap	S32
	On wrap 25-mm from plasterboard	S33
	On wrap 25-mm from plasterboard	S34
	On copper pipe, 25-mm from wrap	S35
	On copper pipe, 25-mm from wrap	S36

Penetration 6 – 3 x 6-mm², 3 core and earth cable, and 8x16-mm², 3 core and earth cable, installed on 300-mm wide tray. Sealed with 50-mm surface fillet of FireMastic300 and BOSS P40-MAK Foil wrap, single layer	On Plasterboard 25-mm from mastic fillet.	S37
	On Plasterboard 25-mm from mastic fillet.	S38
	On mastic fillet 25-mm from p/b	S39
	On mastic fillet 25-mm from p/b	S40
	On wrap 25-mm from mastic fillet	S41
	On wrap 25-mm from mastic fillet	S42
	On cables 3 bunch 25-mm from wrap.	S43
	On cables 8 bunch 25-mm from wrap.	S44
	On cables 8 bunch 25-mm from wrap.	S45
	On cable tray	S46
	On cable tray	S47
Penetration 7 – 32mm copper pipe through 32mm aperture. Sealed with 50mm surface fillet of FireMastic-300 and BOSS P40-MAK Foil wrap, single layer	On mastic fillet 25-mm from p/b	S48
	On mastic fillet 25-mm from p/b	S49
	On mastic fillet	S50
	On mastic fillet	S51
	On wrap 25-mm from mastic fillet	S52
	On wrap 25-mm from mastic fillet	S53
	On pipe 25-mm from wrap	S54
	On pipe 25-mm from wrap	S55
Ambient		S56
Rover		S57

Appendix B – Test photographs



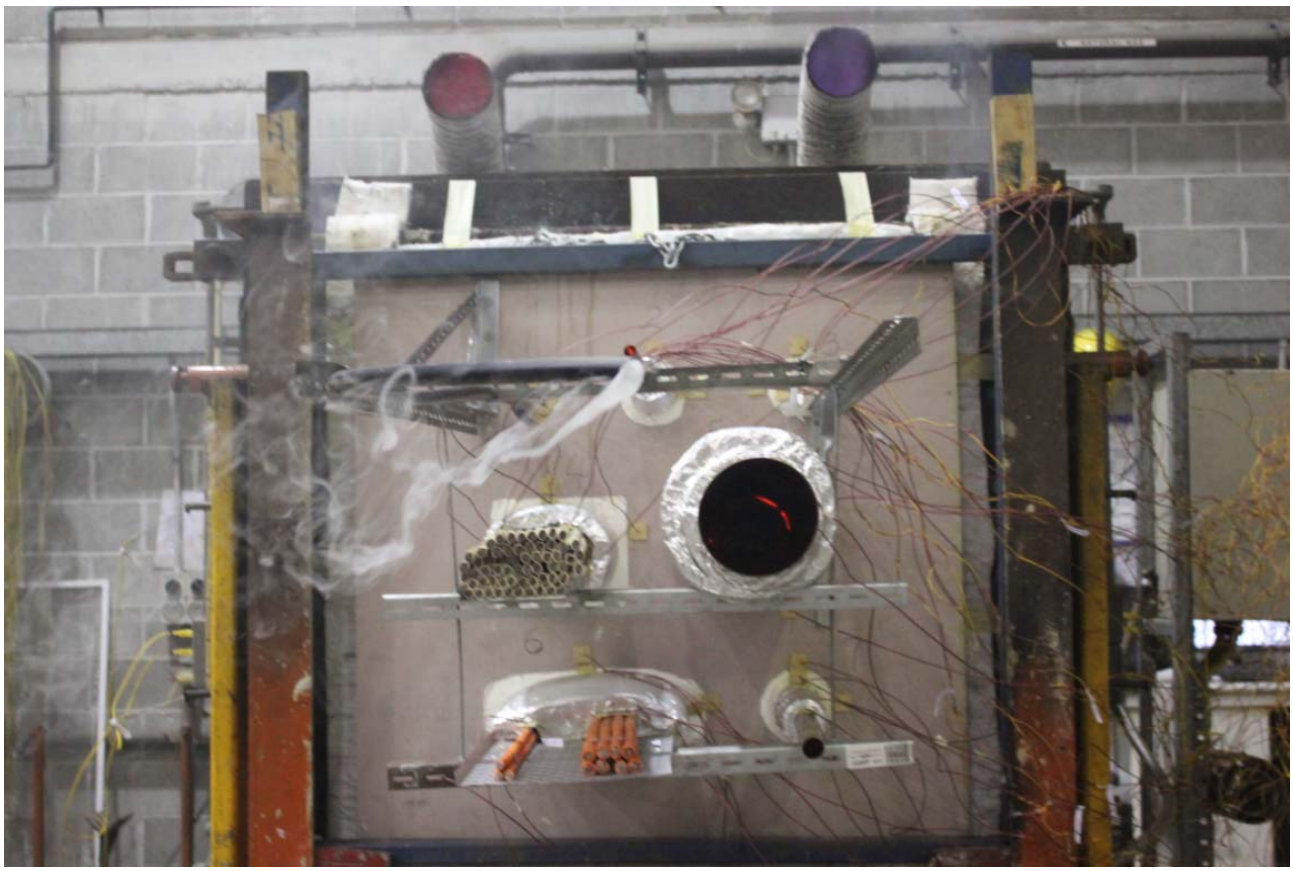
PHOTOGRAPH 1 – EXPOSED SIDE OF THE SPECIMENS PRIOR TO TESTING



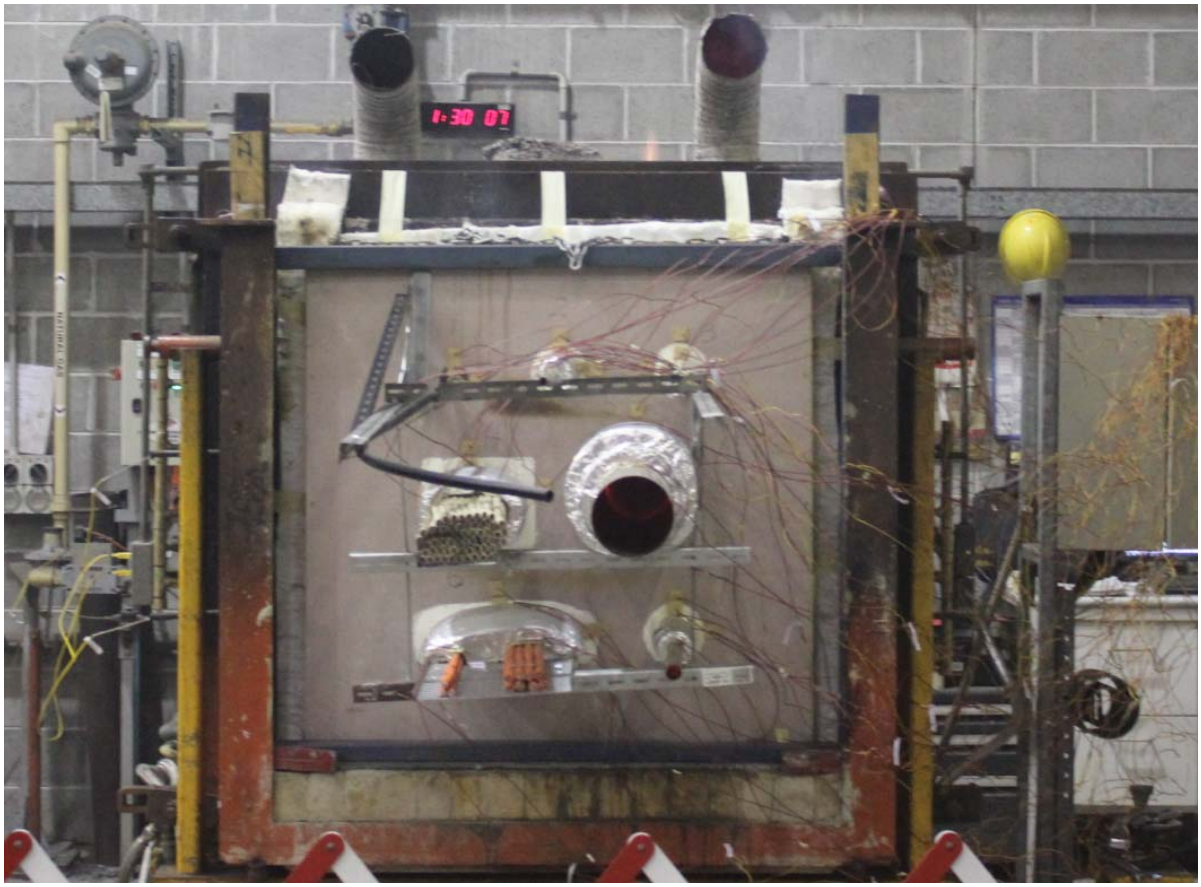
PHOTOGRAPH 2 – UNEXPOSED SIDE OF THE SPECIMENS PRIOR TO TESTING

PHOTOGRAPH 3 – SPECIMENS AFTER 11 MINUTES OF TESTING

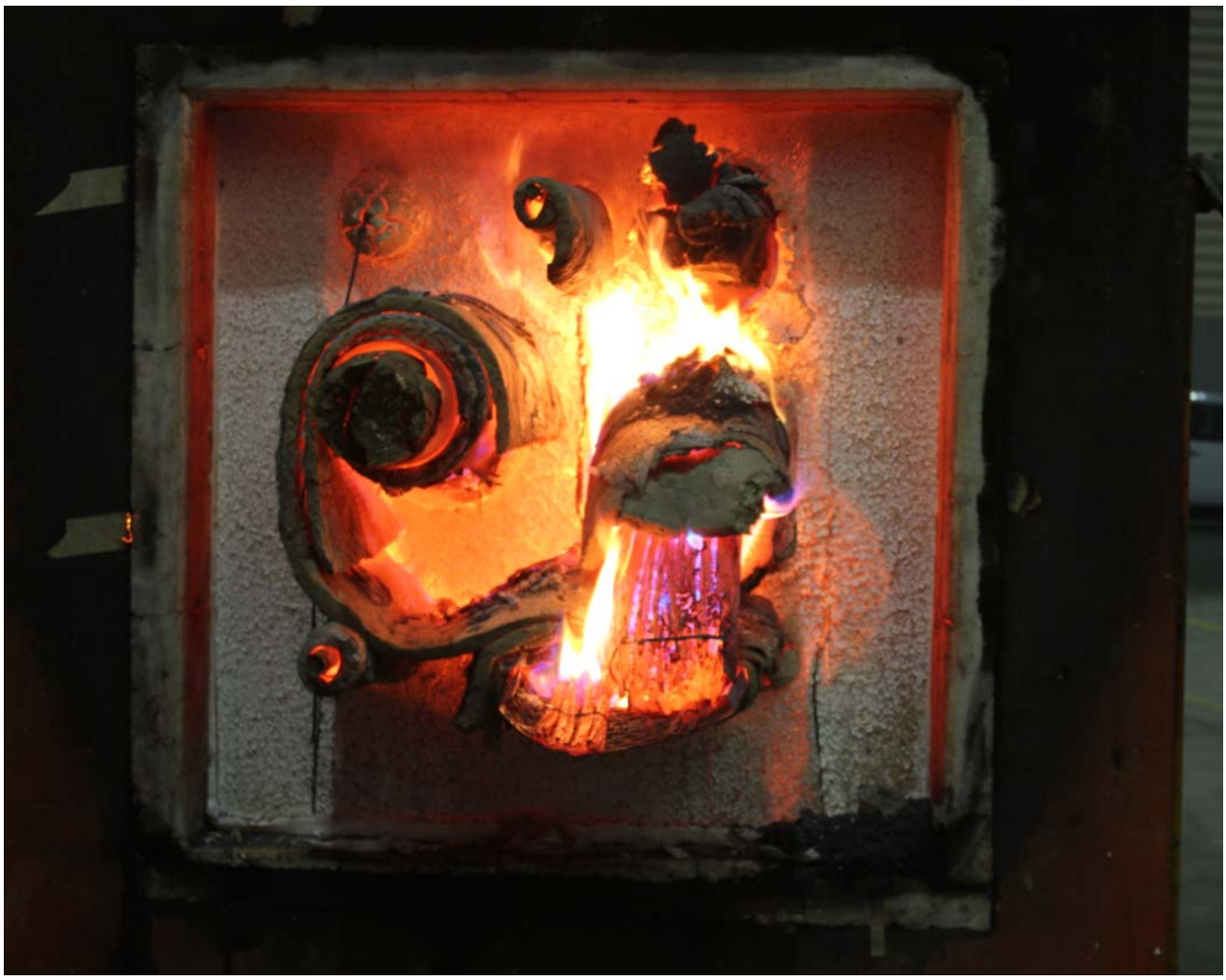
PHOTOGRAPH 4 – SPECIMENS AFTER 30 MINUTES OF TESTING



PHOTOGRAPH 5 – SPECIMENS AFTER 60 MINUTES OF TESTING



PHOTOGRAPH 6 – SPECIMENS AT THE CONCLUSION OF TESTING - 90 MINUTES



PHOTOGRAPH 7 – EXPOSED FACE OF THE SPECIMENS AFTER THE CONCLUSION OF TESTING

Appendix C – Test data charts

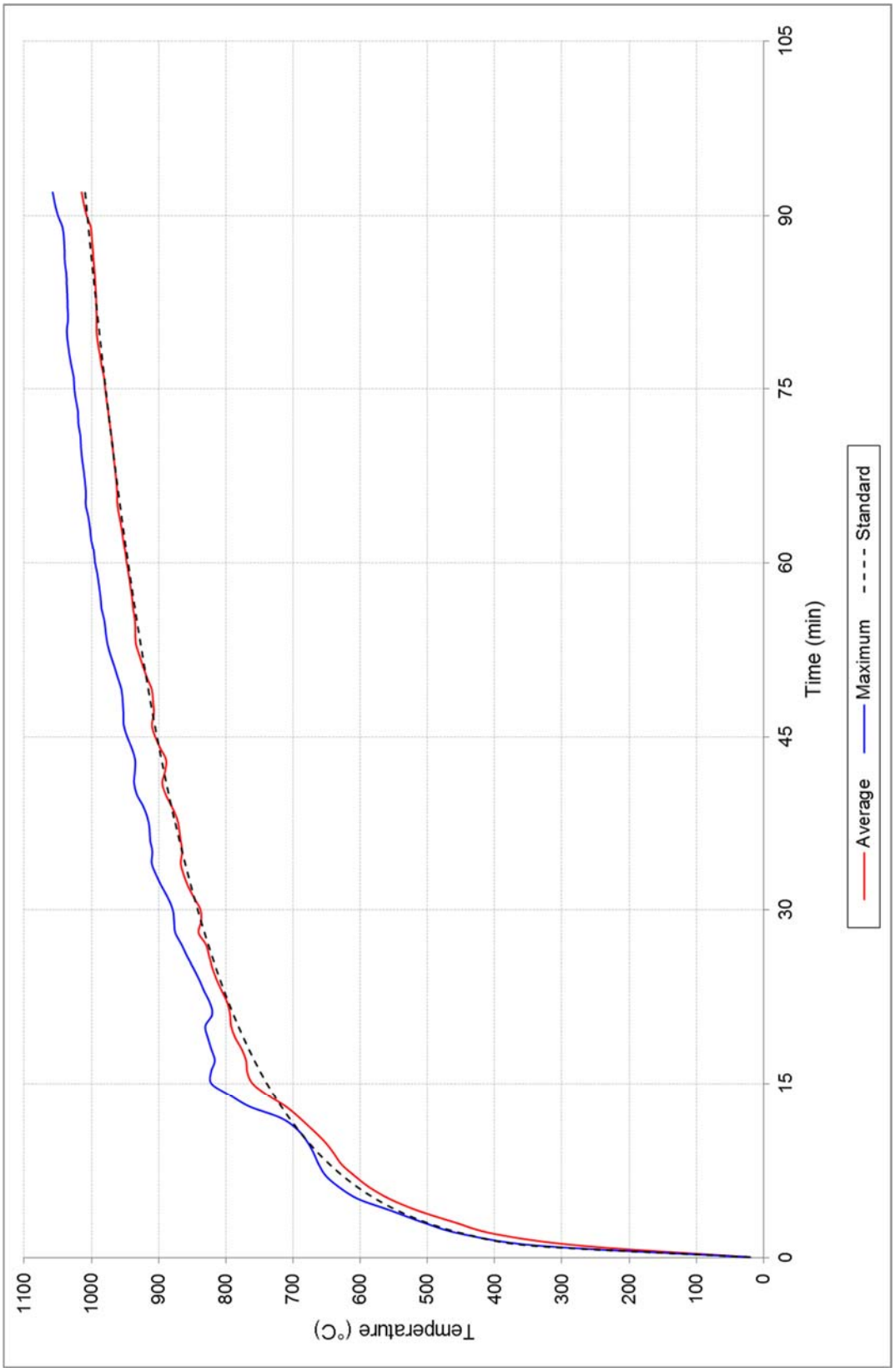


FIGURE 1 – FURNACE TEMPERATURE

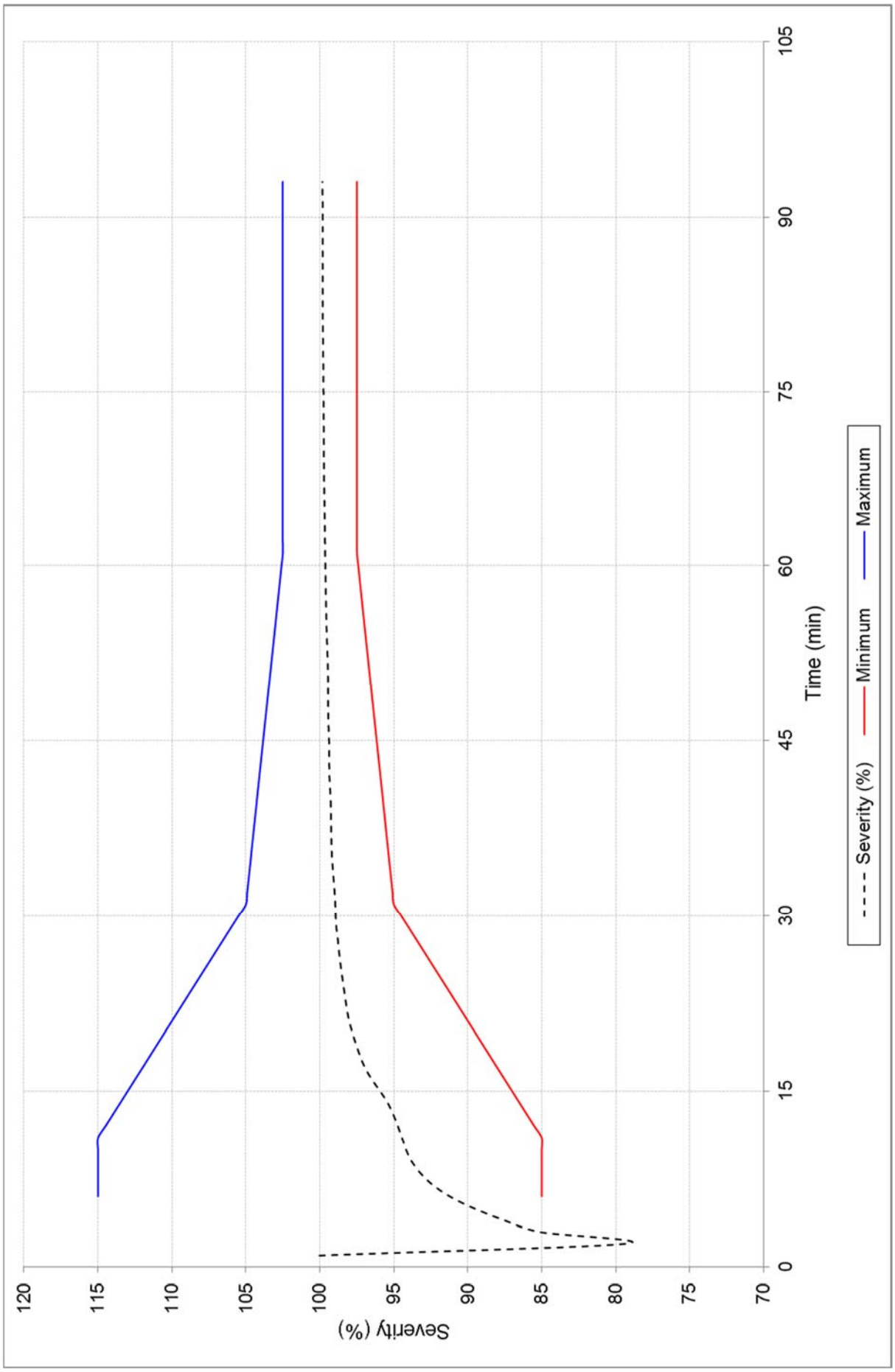


FIGURE 2 – FURNACE SEVERITY

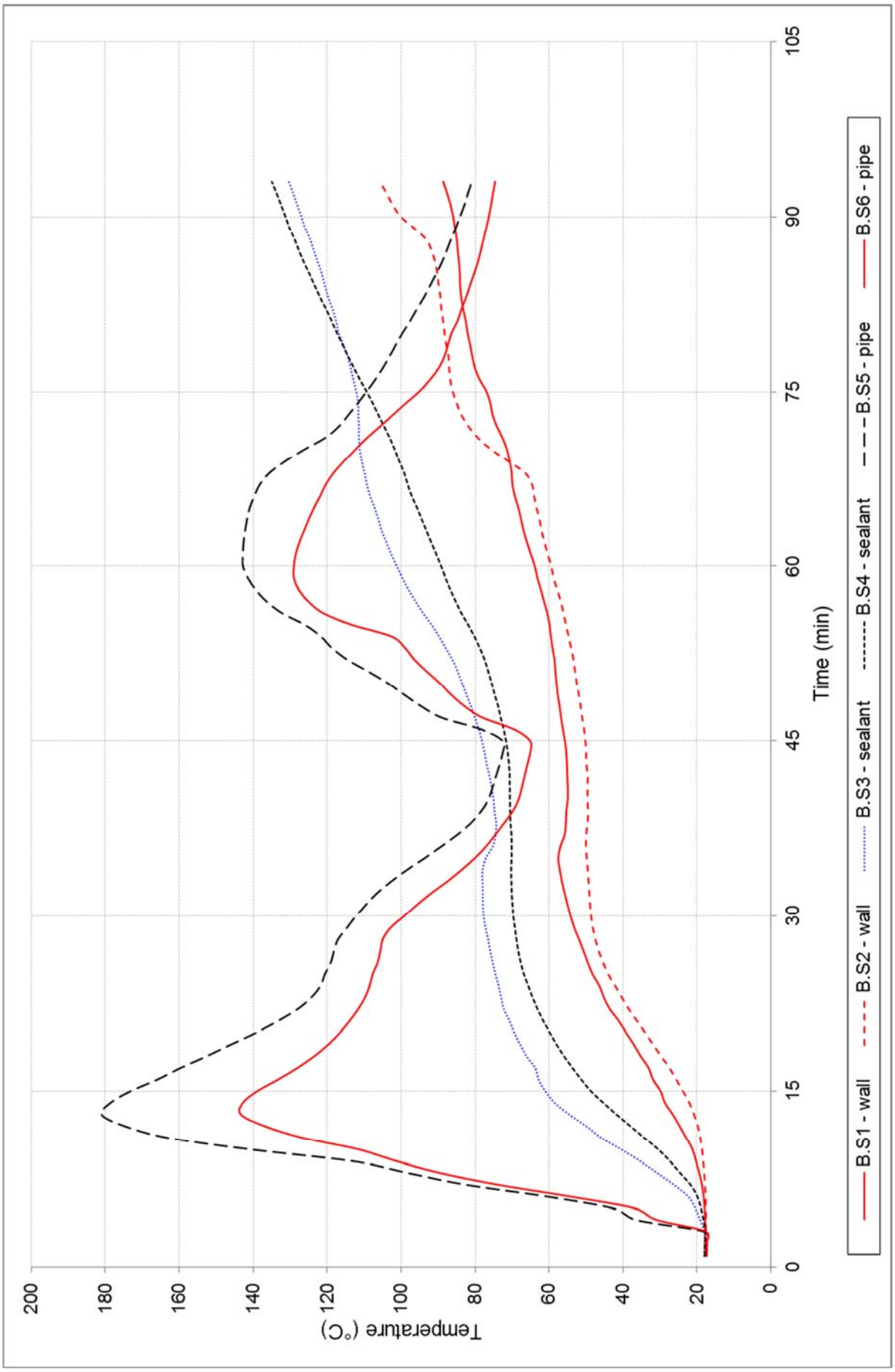


FIGURE 3 – SPECIMEN TEMPERATURE – PENETRATION 1, UNEXPOSED FACE

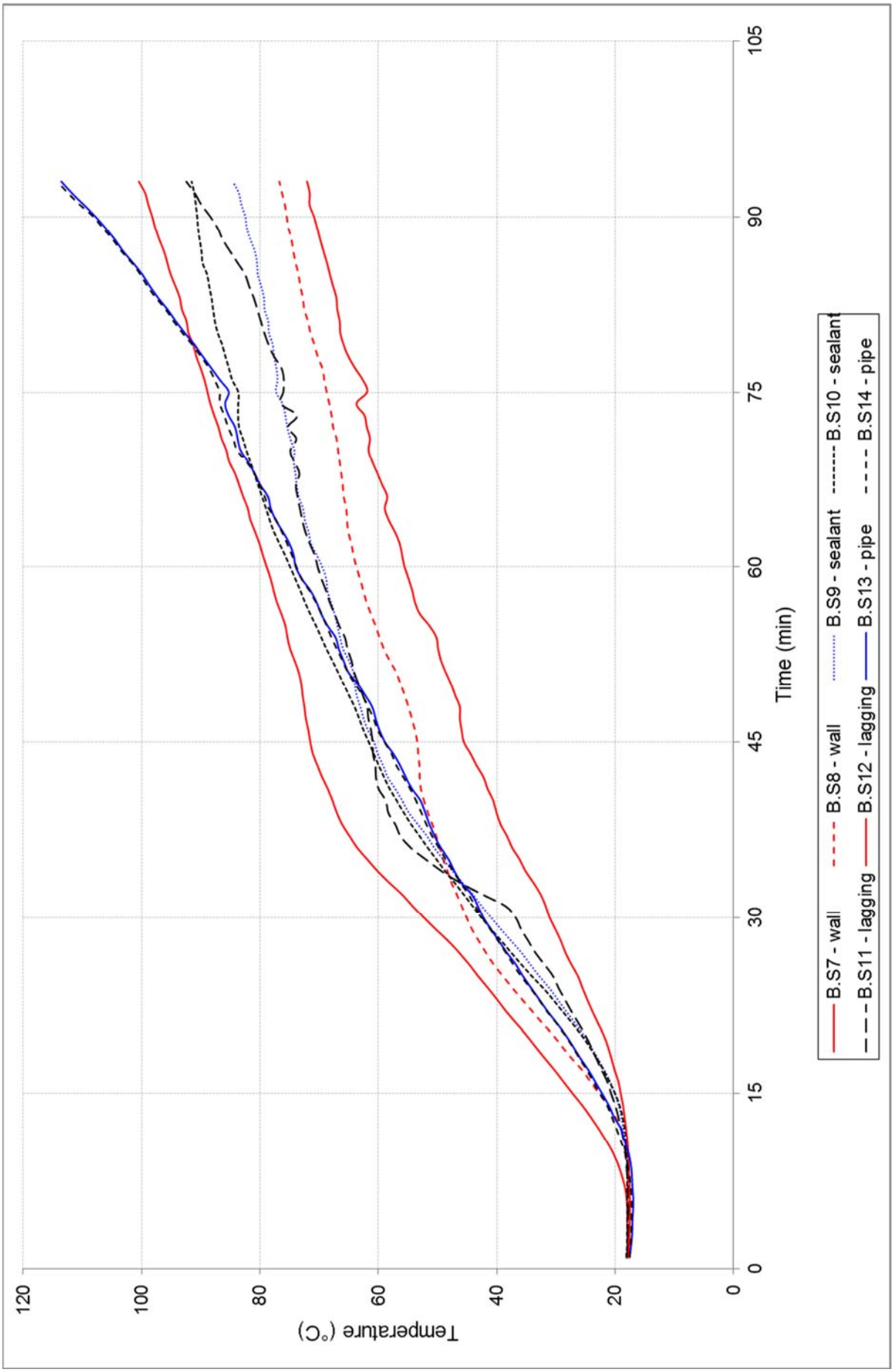


FIGURE 4 – SPECIMEN TEMPERATURE – PENETRATION 2, UNEXPOSED FACE

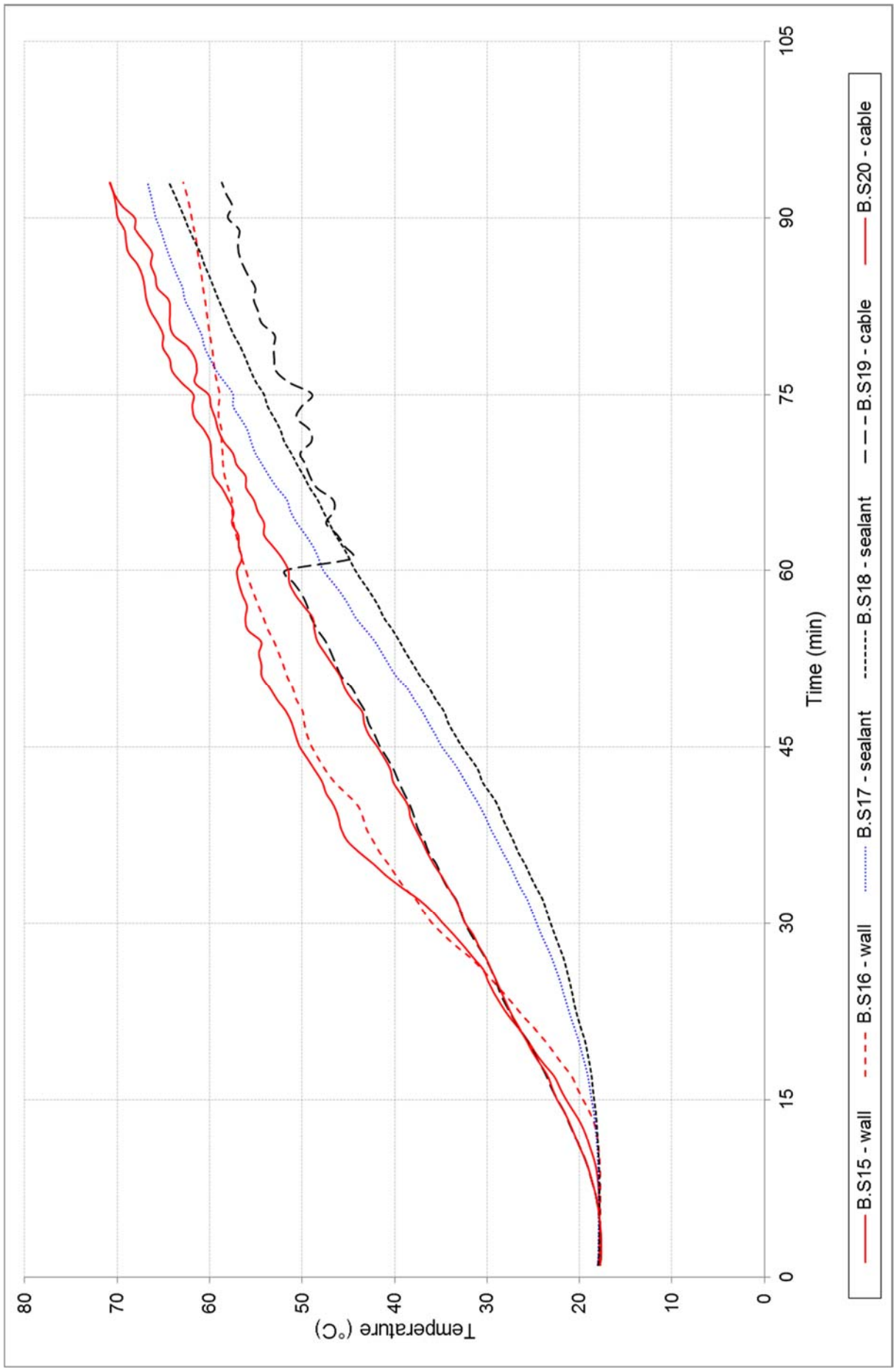


FIGURE 5 – SPECIMEN TEMPERATURE – PENETRATION 3, UNEXPOSED FACE

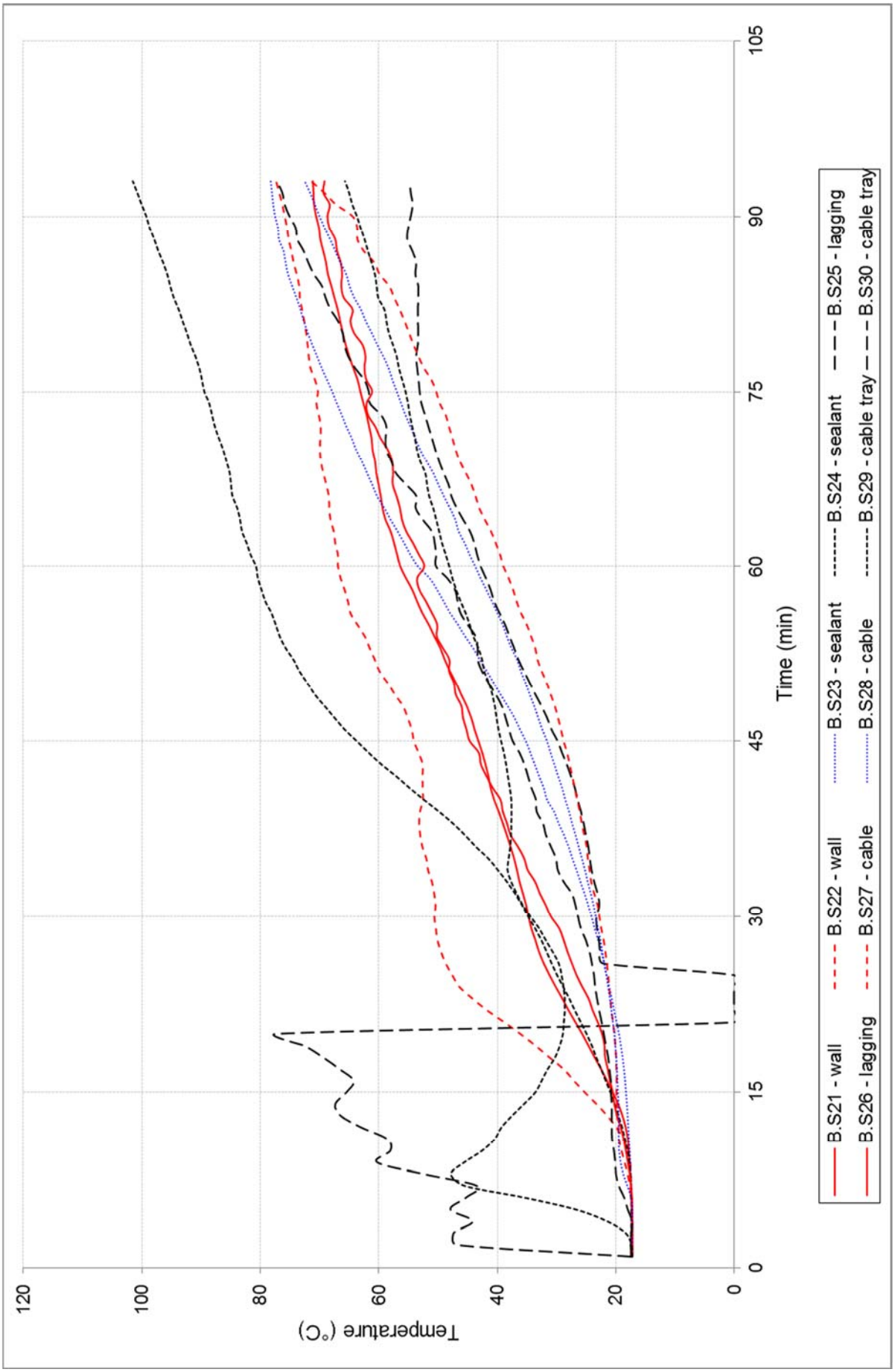


FIGURE 6 – SPECIMEN TEMPERATURE – PENETRATION 4, UNEXPOSED FACE

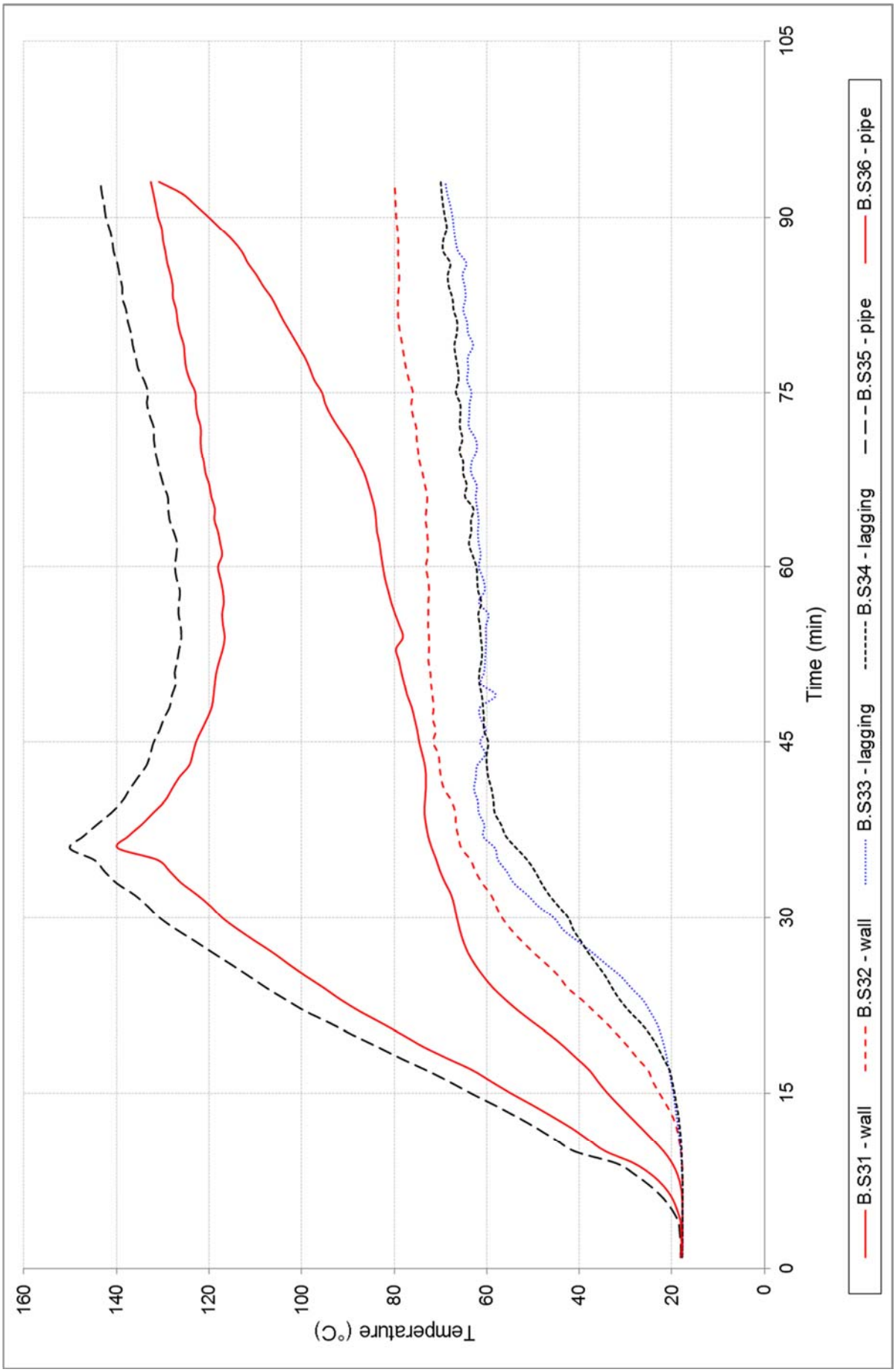


FIGURE 7 – SPECIMEN TEMPERATURE – PENETRATION 5, UNEXPOSED FACE

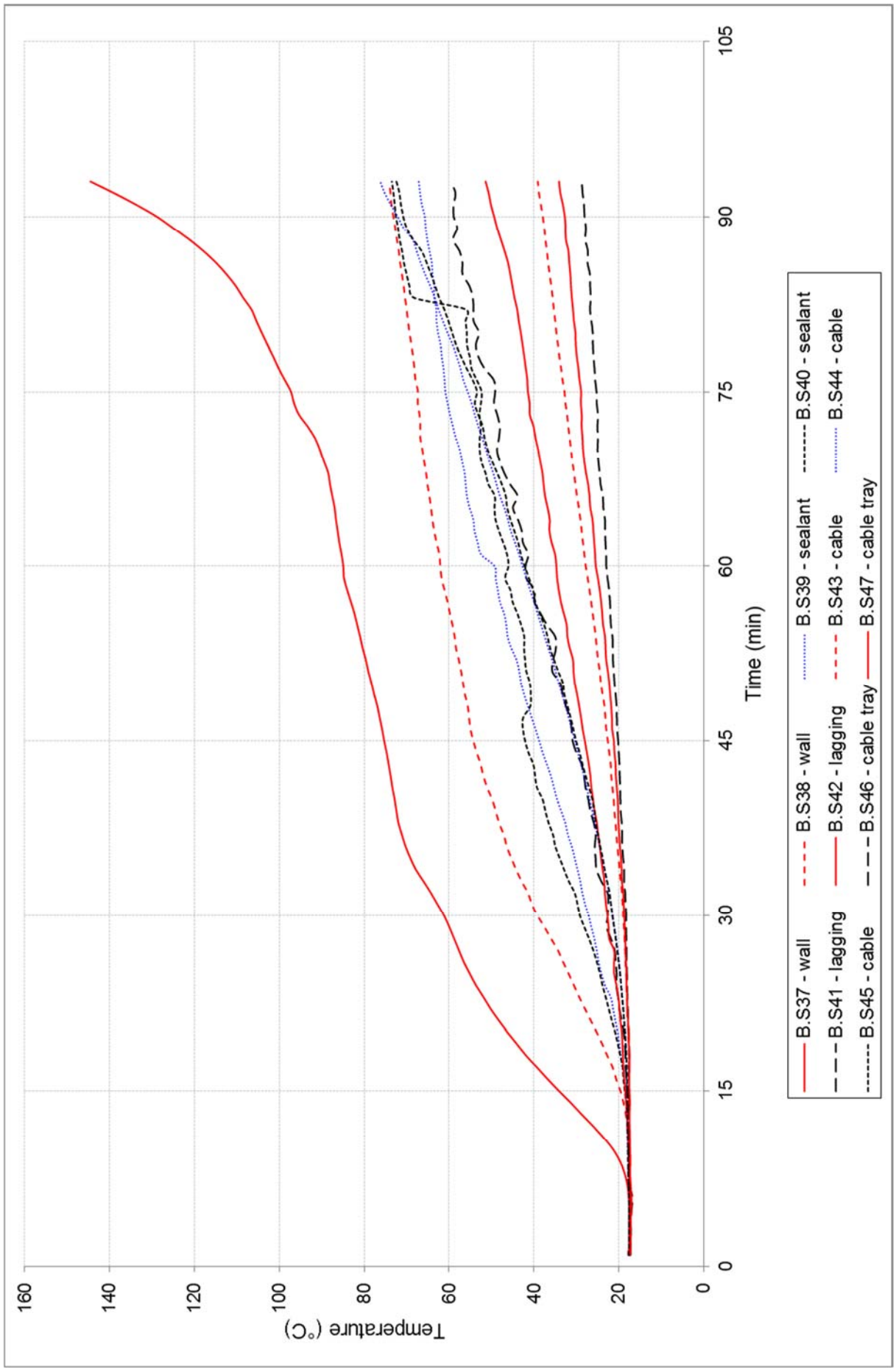


FIGURE 8 – SPECIMEN TEMPERATURE – PENETRATION 6, UNEXPOSED FACE

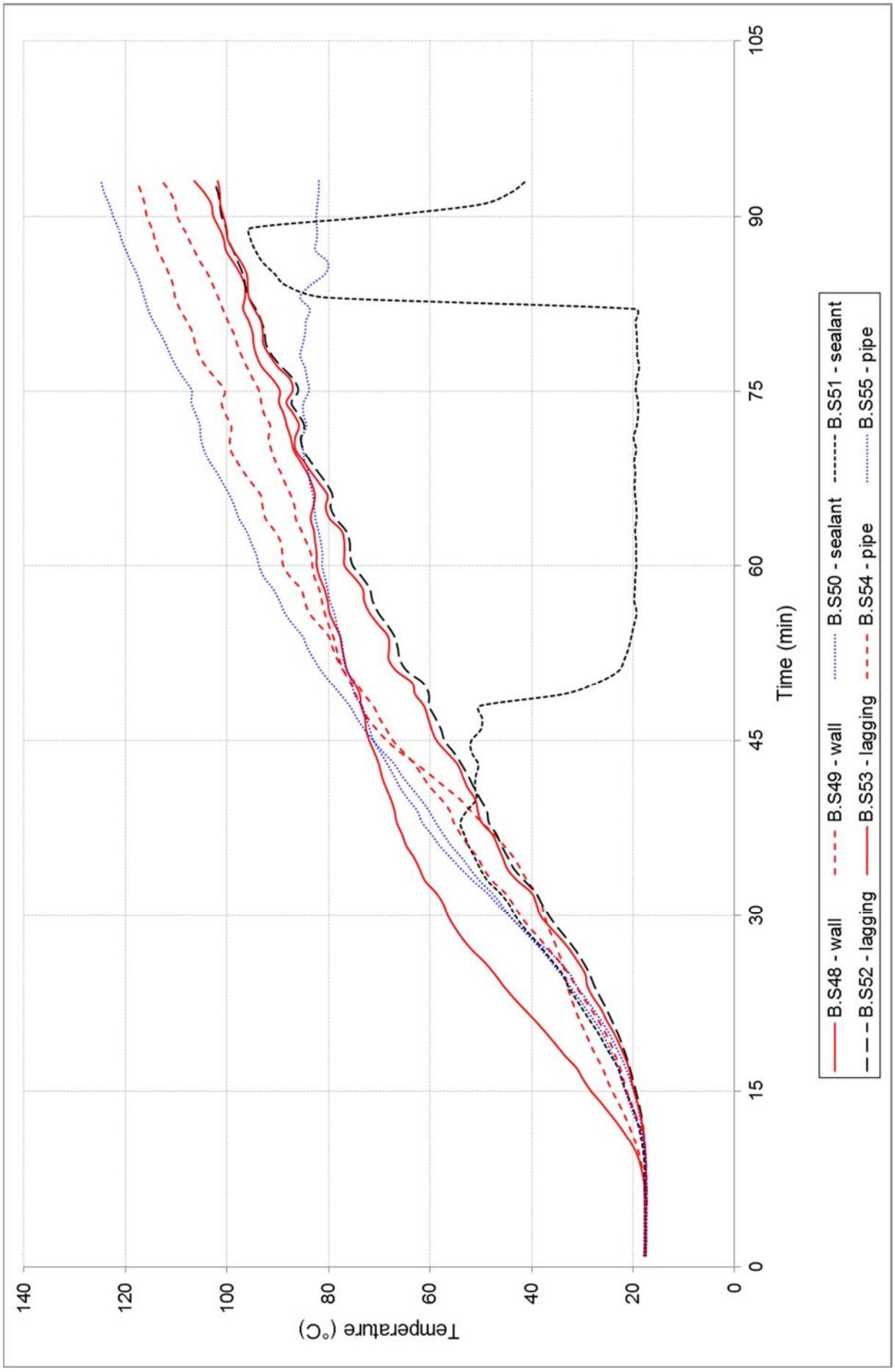
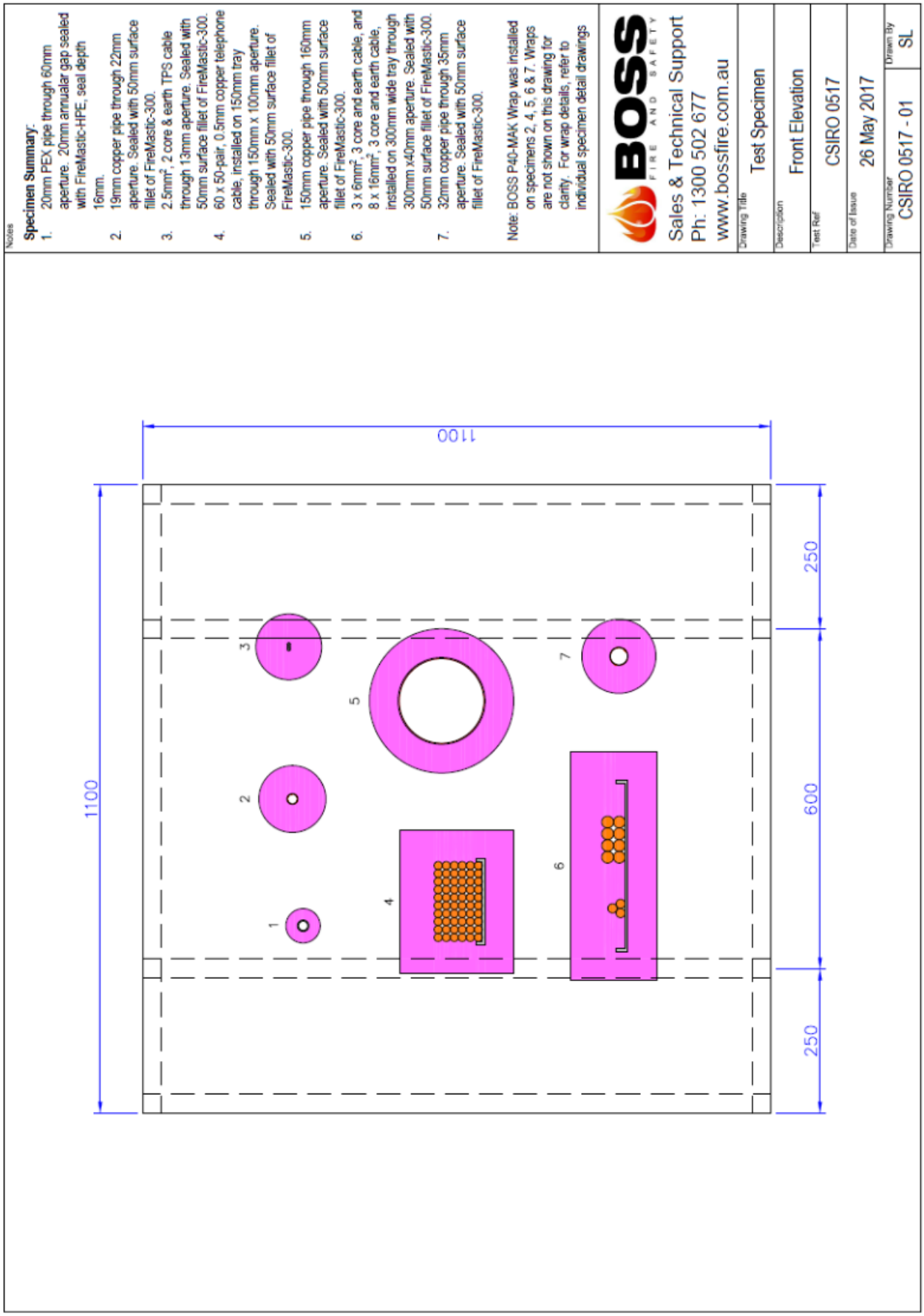
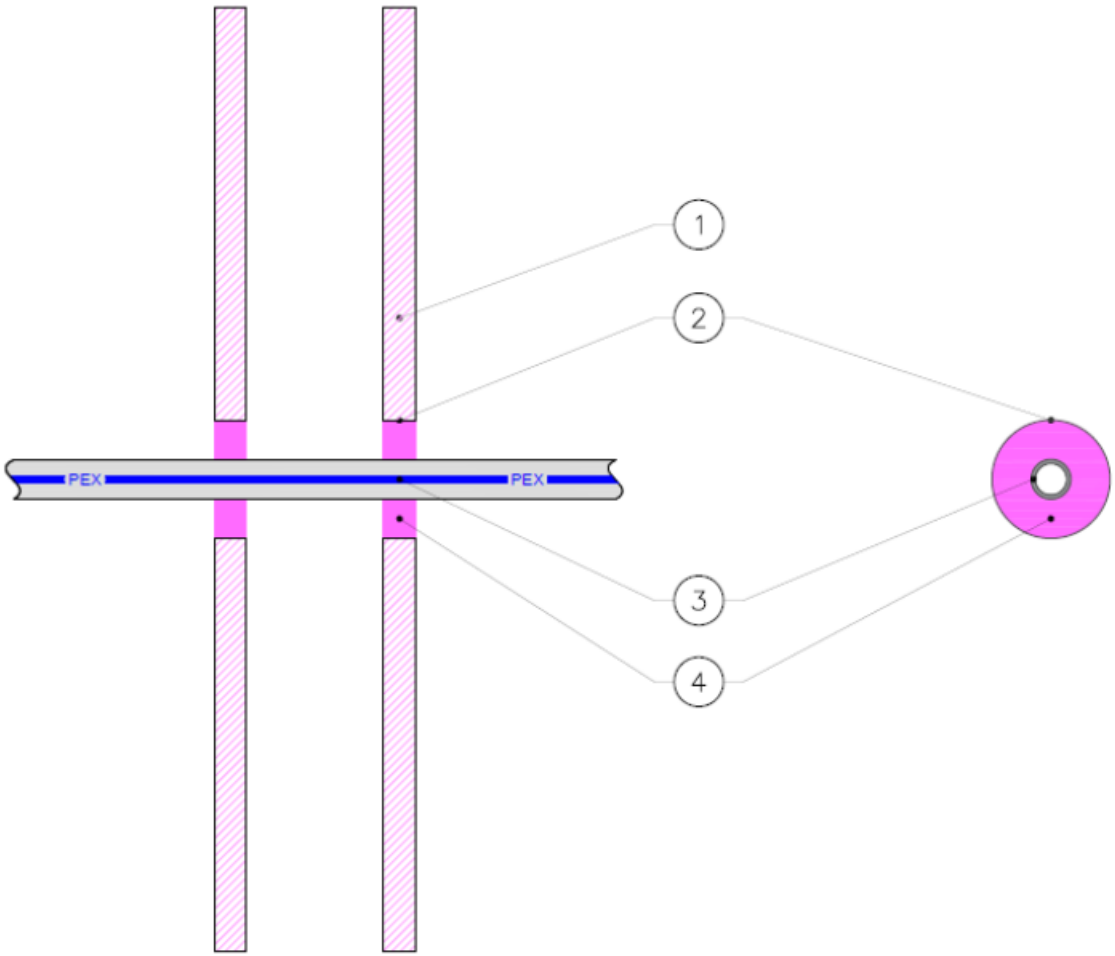


FIGURE 9 – SPECIMEN TEMPERATURE – PENETRATION 7, UNEXPOSED FACE

Appendix D – Specimen drawings



DRAWING NUMBER CSIRO 0517 -01 DATED 26 MAY 2017, BY BOSS FIRE & SAFETY



Notes

Component Summary:

(1) Plasterboard, 16mm fire-rated

(2) Hole size 60mm minimum

(3) 20mm PEX Pipe

(4) BOSS FireMastic-HPE seal, 16mm deep

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www.bossfire.com.au

Drawing Title	PEX Pipe Penetrating 90min Wall
Description	FireMastic-HPE Seal
Test Ref	CSIRO 0517
Date of Issue	26 May 2017
Drawing Number	CSIRO 0517 - 02
Drawn By	SL

DRAWING NUMBER CSIRO 0517 -02 DATED 26 MAY 2017, BY BOSS FIRE & SAFETY

Notes

Component Summary:

(1) Plasterboard, 16mm fire-rated

(2) BOSS FireMastic-300 seal, 50mm surface fillet

(3) Copper pipe, 19.05mm diameter

(4) BOSS P40-MAK Wrap, single layer 300mm from either side of wall.

BOSS FIRE AND SAFETY

Sales & Technical Support
Ph: 1300 502 677
www.bossfire.com.au

Drawing Title	Copper Pipe Penetrating 90min Wall
Description	FireMastic-300 Surface Seal
Test Ref	CSIRO 0517
Date of Issue	26 May 2017
Drawing Number	CSIRO 0517 - 03
Drawn By	SL

DRAWING NUMBER CSIRO 0517 -03 DATED 26 MAY 2017, BY BOSS FIRE & SAFETY

Notes

Component Summary:

(1) Plasterboard, 16mm fire-rated

(2) BOSS FireMastic-300 seal, 50mm surface fillet

(3) TPS cable, 2 core & earth 2.5mm^2

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Sales & Technical Support
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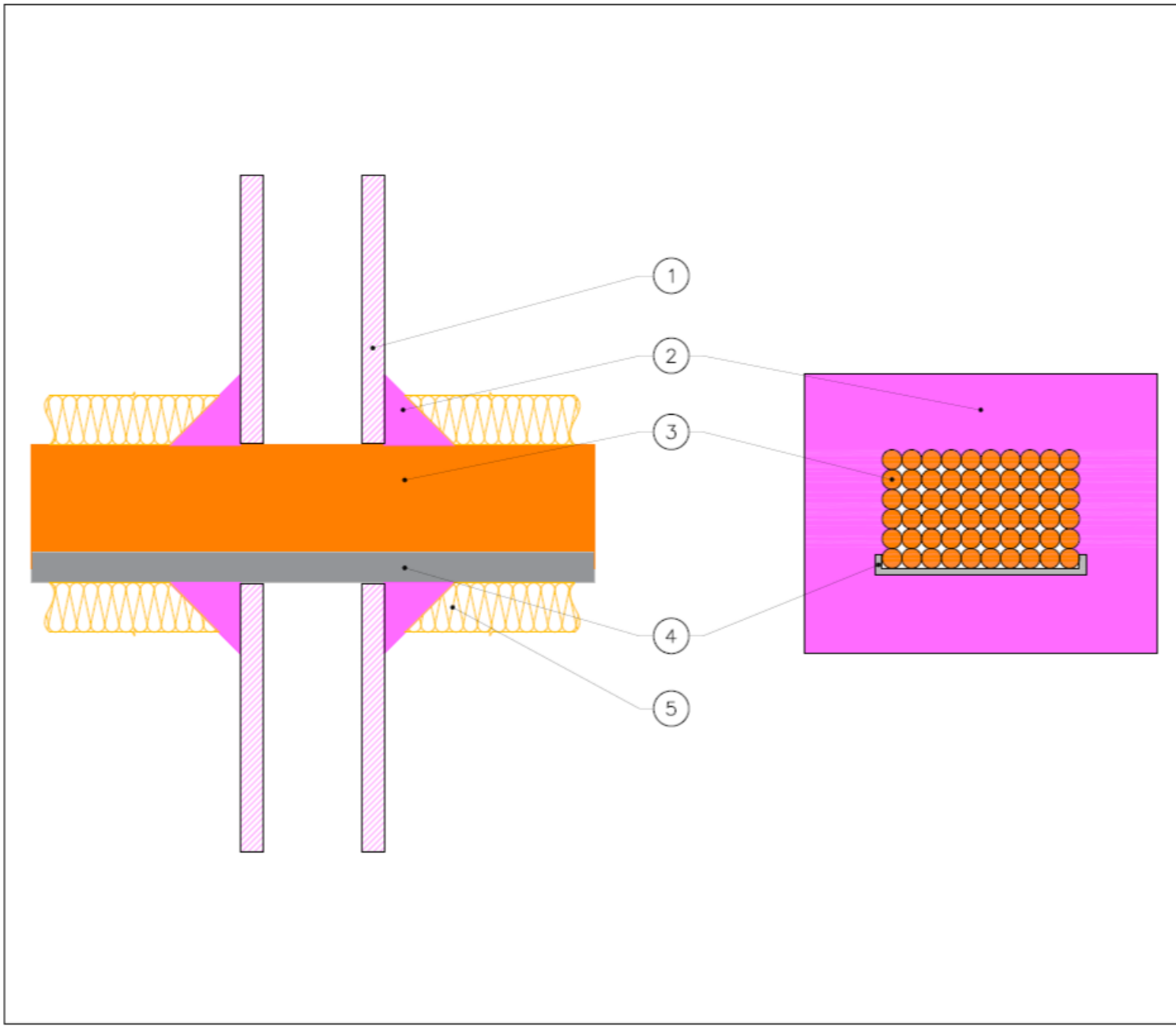
www.bossfire.com.au

Drawing Title	TPS Cable Penetrating 90min Wall
Description	FireMastic-300 Surface Seal
Test Ref	CSIRO 0517
Date of Issue	26 May 2017
Drawing Number	CSIRO 0517 - 04
Drawn by	SL

DRAWING NUMBER CSIRO 0517 -04 DATED 26 MAY 2017, BY BOSS FIRE & SAFETY



Notes

Component Summary:

(1) Plasterboard, 16mm fire-rated

(2) BOSS FireMastic-300 seal, 50mm surface fillet

(3) Telco cables, 60 x 50 pair 100 wires, each wire 0.5mm OD (Appendix D2 - AS1530.4)

(4) Cable tray, 150mm wide

(5) BOSS P40-MAK Wrap, single layer 300mm from either side of wall.

BOSS FIRE AND SAFETY

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www.bossfire.com.au

Drawing Title	Telco Cables Penetrating 90min Wall
Description	FireMastic-300 Surface Seal
Test Ref	CSIRO 0517
Date of Issue	26 May 2017
Drawing Number	CSIRO 0517 - 05
Drawn By	SL

DRAWING NUMBER 0517 -05 DATED 26 MAY 2017, BY BOSS FIRE & SAFETY

Notes

Component Summary:

(1) Plasterboard, 16mm fire-rated

(2) BOSS FireMastic-300 seal, 50mm surface fillet

(3) Copper pipe, 150mm diameter

(4) BOSS P40-MAK Wrap, dual layer 600mm from either side of wall.

BOSS FIRE AND SAFETY

Sales & Technical Support
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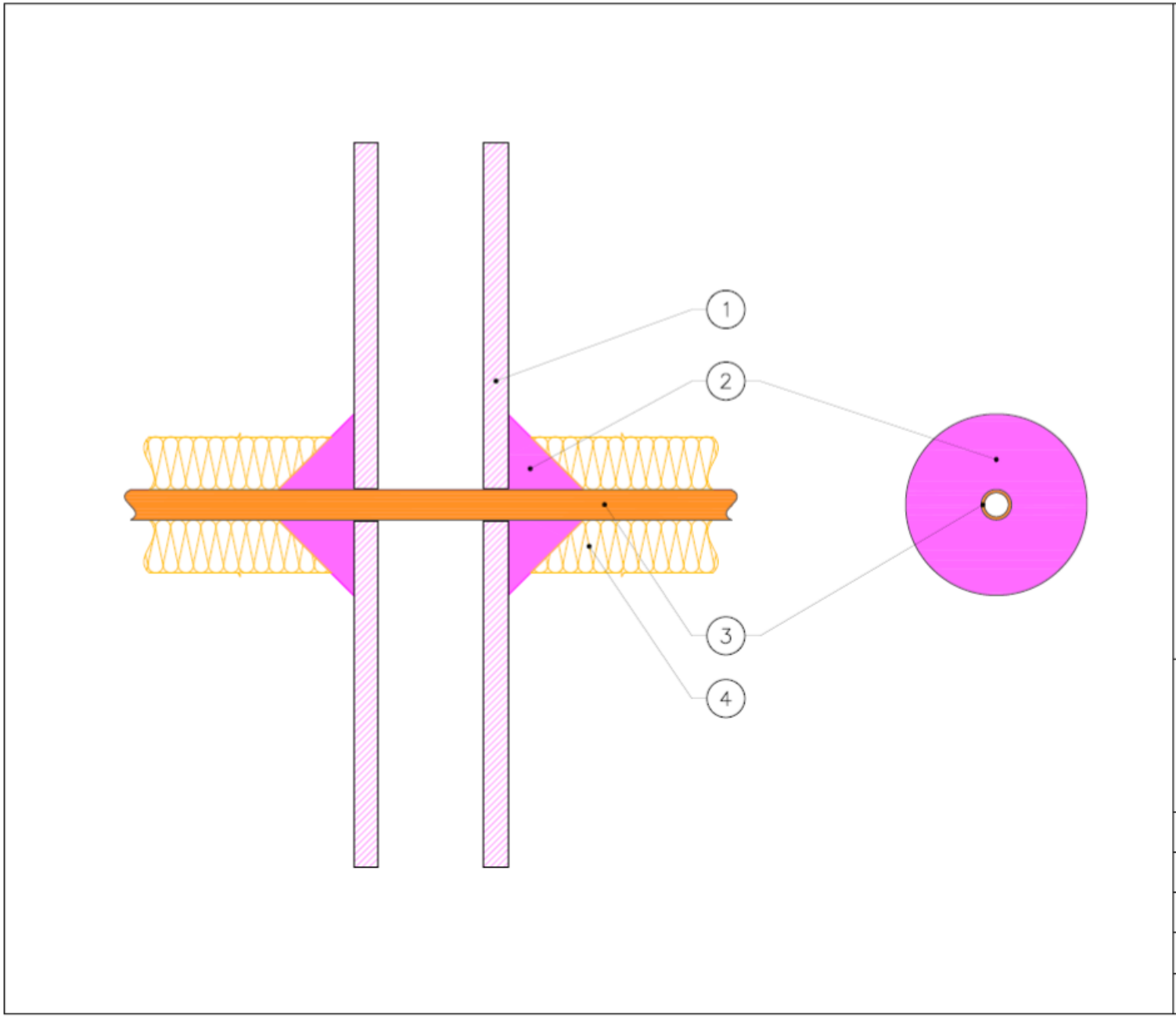
www.bossfire.com.au

Drawing Title	Copper Pipe Penetrating 90min Wall
Description	FireMastic-300 Surface Seal
Test Ref	CSIRO 0517
Date of Issue	26 May 2017
Drawing Number	CSIRO 0517 - 06
Drawn By	SL

DRAWING NUMBER CSIRO 0517 -06 DATED 26 MAY 2017, BY BOSS FIRE & SAFETY

DRAWING NUMBER CSIRO 0517 -07 DATED 26 MAY 2017, BY BOSS FIRE & SAFETY



Notes

Component Summary:

(1) Plasterboard, 16mm fire-rated

(2) BOSS FireMastic-300 seal, 50mm surface fillet

(3) Copper pipe, 32mm diameter

(4) BOSS P40-MAK Wrap, single layer 300mm from either side of wall.

BOSS FIRE AND SAFETY

Sales & Technical Support
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Drawing Title	Copper Pipe Penetrating 90min Wall
Description	FireMastic-300 Surface Seal
Test Ref	CSIRO 0517
Date of Issue	26 May 2017
Drawing Number	CSIRO 0517 - 08
Drawn By	SL

DRAWING NUMBER CSIRO 0517 -08 DATED 26 MAY 2017, BY BOSS FIRE & SAFETY

Appendix E – Certificates of Test

INFRASTRUCTURE TECHNOLOGIES
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14 Julius Avenue, North Ryde NSW 2113
PO Box 52, North Ryde NSW 1670, Australia
T (02) 9490 5444 • **ABN** 41 687 119 230

Certificate of Test

No. 2967

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

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

A full description of the test specimen and the complete test results are detailed in the Division's Sponsored Investigation report numbered FSP 1833.

Product Name: Penetration 1 – FireMastic-HPE sealant protecting a 60-mm diameter aperture penetrated by 20-mm PEX Cross Linked Polyethylene plumbing pipe.

Description: The Sponsor identified the specimen as a plasterboard wall system comprised of Boral Firestop 16-mm plasterboard both sides (with an established FRL of -/90/90) with FireMastic-HPE sealant protecting a 60-mm diameter aperture penetrated by 20-mm PEX Cross Linked Polyethylene plumbing pipe with a wall thickness of 2.3-mm. The service penetrated the unexposed side by 2000-mm and the exposed side by 500-mm. The pipe was sealed on the exposed end using SmarteX P 20-mm Push fit brass Pex cap and left open on the unexposed end. The pipe was supported approximately 500-mm and 1500-mm away from the wall on the unexposed face. The FireMastic-HPE sealant fire stopping system, manufactured by Boss Fire & Safety Pty Ltd is described as a High Pressure Exerting graphite-based thixotropic acrylic sealant. The annular gap of 20-mm between the pipe and the plasterboard on both the exposed and unexposed face were sealed with BOSS FireMastic-HPE to a depth of 16-mm (the full depth of plasterboard walls) and finished flush with the surface of the wall. For a detailed description, refer to drawing titled CSIRO 0517 – 02 dated 26/05/17 by Boss Fire & Safety.

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 -/90/90.

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) are limited to that of the separating element. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.

Testing Officer: Heherson Alarde Date of Test: 9 May 2017

Issued on the 20th day of June 2017 without alterations or additions.

Brett Roddy
Manager, Fire Testing and Assessments

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 - Testing

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14 Julius Avenue, North Ryde NSW 2113
PO Box 52, North Ryde NSW 1670, Australia
T (02) 9490 5444 • **ABN** 41 687 119 230

Certificate of Test

No. 2968

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

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

A full description of the test specimen and the complete test results are detailed in the Division's Sponsored Investigation report numbered FSP 1833.

Product Name: Penetration 2 – FireMastic-300 sealant protecting a 19-mm diameter aperture penetrated by a 19-mm copper pipe lagged with Boss P40-MAK Wrap.

Description: The Sponsor identified the specimen as a plasterboard wall system comprised of Boral Firestop 16-mm plasterboard both sides (with an established FRL of -/90/90) with FireMastic-300 sealant protecting a 19-mm diameter aperture penetrated by a 19-mm copper pipe lagged with Boss P40-MAK Wrap with a wall thickness of 1.02-mm. The service penetrated the unexposed side by 800-mm and the exposed side by 500-mm. The pipe was plugged with Boss FireMastic-300 to a depth of 50-mm on the exposed end and left open on the unexposed end. The pipe was supported approximately 500-mm and 1500-mm away from the wall on the unexposed face. The FireMastic-300 sealant, described as an intumescent Fire-Rated one part acrylic emulsion sealant and Boss P40-MAK wrap fire stopping system, manufactured by Boss Fire & Safety Pty Ltd is described as a mineral fibre lagging 38-mm thick with a density of 40-kg/m^3 wrap and foil lining on one side. A surface seal around the pipe was created with a 50-mm fillet of FireMastic-300 sealant on the exposed and unexposed face. The pipe was then lagged with a sheet of Boss P40-MAK Wrap, wrapped twice around the pipe that extended out 300-mm from the FireMastic-300 on both sides of the wall that was secured with foil tape. There was 200-mm of unprotected pipe on the exposed side. For a detailed description, refer to drawing titled CSIRO 0517 – 03 dated 26/05/17 by Boss Fire & Safety.

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 -/90/90.

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) are limited to that of the separating element. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.

Testing Officer: Heherson Alarde Date of Test: 9 May 2017

Issued on the 20th day of June 2017 without alterations or additions.

B. Roddy

Brett Roddy
Manager, Fire Testing and Assessments

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

A full description of the test specimen and the complete test results are detailed in the Division's Sponsored Investigation report numbered FSP 1833.

Product Name: Penetration 3 – FireMastic-300 sealant protecting a 13-mm diameter aperture penetrated by a single Power Cable.

Description: The Sponsor identified the specimen as a plasterboard wall system comprised of Boral Firestop 16-mm plasterboard both sides (with an established FRL of -/90/90) with FireMastic-300 sealant protecting a 13-mm diameter aperture penetrated by a single Power Cable. Cables on both the exposed and unexposed side were left untreated. The pipe was supported approximately 500-mm away from the wall on the unexposed face. The FireMastic-300 sealant, manufactured by Boss Fire & Safety Pty Ltd, is described as an intumescent Fire-Rated one part acrylic emulsion sealant. A surface seal around the pipe was created with a 50-mm fillet of FireMastic-300 sealant on the exposed and unexposed face. For a detailed description, refer to drawing titled CSIRO 0517 – 04 dated 26/05/17 by Boss Fire & Safety.

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 -/90/90.

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) are limited to that of the separating element. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.

Testing Officer: Heherson Alarde Date of Test: 9 May 2017

Issued on the 20th day of June 2017 without alterations or additions.

B. Roddy

Brett Roddy
Manager, Fire Testing and Assessments

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Certificate of Test

No. 2970

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

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

A full description of the test specimen and the complete test results are detailed in the Division's Sponsored Investigation report numbered FSP 1833.

Product Name: Penetration 4 – FireMastic-300 sealant protecting a 150-mm wide cable tray with 60 cables lagged with Boss P40-MAK Wrap.

Description: The Sponsor identified the specimen as a plasterboard wall system comprised of Boral Firestop 16-mm plasterboard both sides (with an established FRL of -/90/90) with FireMastic-300 sealant protecting a 150-mm wide cable tray with 60 cables lagged with Boss P40-MAK Wrap. The cables are described as a bundle of 60 cables (each cable approximately 14-mm in diameter) secured on a 150-mm cable tray. The services penetrated 500-mm from the exposed side and 800-mm from the unexposed side, measuring 60 x 50 pair, 0.5-mm (as per Appendix D2 – AS 1530.4). Cables on both the exposed and unexposed side were left untreated. The pipe was supported approximately 500-mm away from the wall on the unexposed face. The FireMastic-300 sealant, manufactured by Boss Fire & Safety Pty Ltd, is described as an intumescent Fire-Rated one part acrylic emulsion sealant. The Boss P40-MAK manufactured by Boss Fire & Safety Pty Ltd, is described as a mineral fibre lagging 38-mm thick with a density of 40-kg/m^3 wrap and foil lining on one side. A surface seal around the cable tray was created with a 50mm fillet of FireMastic-300 sealant on the exposed and unexposed face. Boss P40-MAK wrap was wrapped twice around the cable tray on both sides of the wall (to a thickness of approximately 40-mm) which was secured with steel wire and foil tape. The wrap extended 300-mm from the both sides of the wall, flush with the FireMastic fillet. For a detailed description, refer to drawing titled CSIRO 0517 – 05 dated 26/05/17 by Boss Fire & Safety.

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 -/90/90.

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) are limited to that of the separating element. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.

Testing Officer: Heherson Alarde Date of Test: 9 May 2017

Issued on the 20th day of June 2017 without alterations or additions.

B. Roddy

Brett Roddy
Manager, Fire Testing and Assessments

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Certificate of Test

No. 2971

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

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

A full description of the test specimen and the complete test results are detailed in the Division's Sponsored Investigation report numbered FSP 1833.

Product Name: Penetration 5 – FireMastic-300 sealant protecting a 150-mm diameter aperture penetrated by 150-mm Copper pipe lagged with Boss P40-MAK Wrap.

Description: The Sponsor identified the specimen as a plasterboard wall system comprised of Boral Firestop 16-mm plasterboard both sides (with an established FRL of -/90/90) with FireMastic-300 sealant protecting a 150-mm diameter aperture penetrated by 150-mm Copper pipe with a wall thickness of 1.02-mm lagged with Boss P40-MAK Wrap. The Copper pipe extends 500-mm on the exposed side and 1100-mm on the unexposed side. The pipe was supported approximately 500-mm away from the wall on the unexposed face. The FireMastic-300 sealant, manufactured by Boss Fire & Safety Pty Ltd, is described as an intumescent Fire-Rated one part acrylic emulsion sealant. The Boss P40-MAK manufactured by Boss Fire & Safety Pty Ltd, is described as a mineral fibre lagging 38-mm thick with a density of 40-kg/m^3 wrap and foil lining on one side. A surface seal around the pipe was created with a 50mm fillet of FireMastic-300 sealant on the exposed and unexposed face. Two layers of Boss P40-MAK wrap was wrapped approximately twice around the copper pipe to a thickness of 40-mm that were secured with steel wire and foil tape. The wrap extended 300-mm from the exposed side, and 600-mm from the unexposed side; flush with the FireMastic fillet. For a detailed description, refer to drawing titled CSIRO 0517 – 06 dated 26/05/17 by Boss Fire & Safety.

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 -/90/90.

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) are limited to that of the separating element. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.

Testing Officer: Heherson Alarde Date of Test: 9 May 2017

Issued on the 20th day of June 2017 without alterations or additions.

B. Roddy

Brett Roddy
Manager, Fire Testing and Assessments

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Certificate of Test

No. 2972

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

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

A full description of the test specimen and the complete test results are detailed in the Division's Sponsored Investigation report numbered FSP 1833.

Product Name: Penetration 6 – FireMastic-300 sealant protecting a 300-mm wide cable tray with a set of 3 and 8 bundle cables lagged with Boss P40-MAK Wrap.

Description: The Sponsor identified the specimen as a plasterboard wall system comprised of Boral Firestop 16-mm plasterboard both sides (with an established FRL of -/90/90) with FireMastic-300 sealant protecting a 300-mm wide cable tray with a set of 3 and 8 bundle cables lagged with Boss P40-MAK Wrap. The services penetrated 500-mm from the exposed side and 800-mm from the unexposed side. Measurements of penetrating service are 3 x 6-mm^2, 3 core and earth, 8 x 16-mm^2, 3-core and earth on a 300-mm wide tray. Tested cables represent the smaller two cable bundles and arrangement as per Appendix D1- AS1530.4 (the 4x185mm^2 and the 1 x 630mm^2 cable from Appendix D1 were omitted. Cables on both exposed and unexposed side were left untreated. The penetrating services was supported approximately 500-mm from the unexposed side. The FireMastic-300 sealant, manufactured by Boss Fire & Safety Pty Ltd, is described as an intumescent Fire-Rated one part acrylic emulsion sealant. The Boss P40-MAK manufactured by Boss Fire & Safety Pty Ltd, is described as a mineral fibre lagging 38-mm thick with a density of 40-kg/m^3 wrap and foil lining on one side. A surface seal around the pipe was created with a 50mm fillet of FireMastic-300 sealant on the exposed and unexposed face. Boss P40-MAK wrap was wrapped twice (to a thickness of about 40-mm) around the cable tray and secured with steel wire and foil tape. The wrap extended 300-mm from both sides of wall flush with the FireMastic fillet. For a detailed description, refer to drawing titled CSIRO 0517 – 07 dated 26/05/17 by Boss Fire & Safety.

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 -/90/90.

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) are limited to that of the separating element. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.

Testing Officer: Heherson Alarde Date of Test: 9 May 2017

Issued on the 20th day of June 2017 without alterations or additions.

B. Roddy

Brett Roddy
Manager, Fire Testing and Assessments

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 - Testing

COPY OF CERTIFICATE OF TEST – NO. 2972

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Certificate of Test

No. 2973

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

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

A full description of the test specimen and the complete test results are detailed in the Division's Sponsored Investigation report numbered FSP 1833.

Product Name: Penetration 7 – FireMastic-300 sealant protecting a 32-mm diameter aperture penetrated by a 32-mm Copper pipe lagged with Boss P40-MAK Wrap.

Description: The Sponsor identified the specimen as a plasterboard wall system comprised of Boral Firestop 16-mm plasterboard both sides (with an established FRL of -/90/90) with FireMastic-300 sealant protecting a 32-mm diameter aperture penetrated by a 32-mm Copper pipe with a wall thickness of 1.22-mm. The services extended 500-mm from exposed side and 800-mm from the unexposed side. The penetrating service was plugged with Boss FireMastic-300 to a depth of 50-mm on the exposed end and left open on the unexposed end. The penetrating service was supported approximately 500-mm from the unexposed side. The FireMastic-300 sealant, manufactured by Boss Fire & Safety Pty Ltd, is described as an intumescent Fire-Rated one part acrylic emulsion sealant. The Boss P40-MAK manufactured by Boss Fire & Safety Pty Ltd, is described as a mineral fibre lagging 38-mm thick with a density of 40-kg/m^3 wrap and foil lining on one side. A surface seal around the pipe was created with a 50mm fillet of FireMastic-300 sealant on the exposed and unexposed face. Boss P40-MAK wrap was wrapped approximately twice around the copper pipe to a thickness of around 40-mm that were secured with foil tape. The wrap extended 300-mm from both sides of the wall flush with the FireMastic fillet. For a detailed description, refer to drawing titled CSIRO 0517 – 08 dated 26/05/17 by Boss Fire & Safety.

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 -/90/90.

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) are limited to that of the separating element. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.

Testing Officer: Heherson Alarde Date of Test: 9 May 2017

Issued on the 20th day of June 2017 without alterations or additions.

B. Roddy

Brett Roddy
Manager, Fire Testing and Assessments

This document is issued in accordance with NATA's accreditation requirements.
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References

The following informative documents are referred to in this Report:

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

END OF REPORT

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FOR FURTHER INFORMATION

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