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

Test Report

Author: Chris Wojcik
Report number: FSV 1731
Date: 3 June 2016

Client: H.B. Fuller Company Australia Pty Ltd

Commercial-in-confidence

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

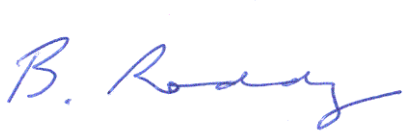
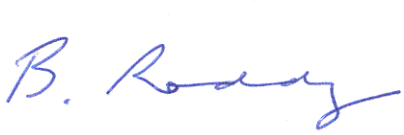
Inquiries should be address to:

Fire Testing and Assessments	Author	The Client
NATA Registered Laboratory 14 Julius Avenue North Ryde, NSW 2113 Telephone +61 2 9490 5444	Infrastructure Technologies 14 Julius Avenue North Ryde, NSW 2113 Telephone +61 2 9490 5500	H.B. Fuller Company Australia Pty Ltd 16-22 Red Gum Drive Dandenong South VIC 3175 Telephone +61 0409 946 197

Report Status and Revision History:

VERSION	STATUS	DATE	DISTRIBUTION	ISSUE NUMBER
Revision A	Draft for internal review	18/05/2016	CSIRO/CLIENT	FSV 1731
Revision B	Final for issue	03/06/2016	CSIRO/CLIENT	FSV 1731

Report Authorization:

AUTHOR	REVIEWED BY	AUTHORISED BY
Chris Wojcik	Brett Roddy	Brett Roddy
		
3 June 2016	3 June 2016	3 June 2016

Use of this Report

Use of Reports – Testing

This report is subject to binding obligations under which it was prepared. In particular, the Report must not be used:

- *as a means of endorsement; or*
- *in a company prospectus or notification to a Stock Exchange document for capital raising, without the prior written consent of CSIRO.*

The Report may be published verbatim and in full, provided that a statement is included on the publication that it is a copy of the Report issued by CSIRO.

Excerpts of the Report may not be published.

Use of Reports – Consultancy

This report is subject to binding obligations under which it was prepared. In particular, the Report may only be used for the following purposes:

- *the information in the Report may be used by the party that commissioned the Report for its internal business operations (but not licensing to third parties);*
- *the report may be copied for distribution within the organisation that commissioned the Report;*
- *copies of the Report (or extracts of the Report) may be distributed to contractors and agents of the organisation that commissioned the Report who have a need for the Report for its internal business operations. Any extracts of the Report distributed for this purpose must clearly note that the extract is part of a larger Report held by the organisation that commissioned the Report and which has been prepared by CSIRO.*

The name, trade mark or logo of the CSIRO must not be used without the prior written consent of CSIRO.

The Report must not be used as a means of endorsement without the prior written consent of CSIRO.

Copyright and disclaimer

Important disclaimer

Contents

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

Sponsored Investigation No. FSV 1731

1 Introduction

1.1 Identification of specimen

The sponsor identified the specimens as a number of services penetrating a panel wall system and protected by a combination of sealants, fire collars and cable tray fire stopping systems.

1.2 Sponsor

H.B. Fuller Company Australia Pty Ltd
16-22 Red Gum Drive
Dandenong South VIC 3175

1.3 Objective

The objective of this test is:

i. to establish the fire performance of previously tested fire damper installed into a Speedpanel wall system with an established FRL of -/120/120 using modified installation methods; and
ii. to establish the Fire-Resistance Level (FRL) of services penetrating a Speedpanel wall system.

1.4 Test standards

Australian Standard 1530, Methods for fire tests on building materials, components and structures, Part 4-2005 & 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 FS4543/3891.

1.7 Test date

The fire-resistance test was conducted on 16 December 2015.

2 Description of specimen

2.1 General

The specimens comprised one fire damper installation, twelve pipe penetrations, one unsupported cable penetration and two cable tray penetrations, all installed in a Speedpanel panel wall system and protected by a combination of sealants, fire collars and cable tray fire stopping systems.

For the purpose of the test, the specimens were referenced as Specimen 1 to 16.

In addition to the above, six different wall deflection detail variations were installed, which were documented and instrumented for the purpose of a separate assessment report, as shown in photograph 2 (referenced H1 to H6).

Wall System

The 3000-mm high x 3000-mm wide x 78-mm thick Speedpanel wall was built using twelve nominally 285-mm wide interlocking (tongue and groove) panels.

The panels consisted of a lightweight concrete core with 0.44-mm thick galvanised steel sheathing.

The FRL of the wall system (in accordance with AS1530 Part 4 – 1997) as stated in BRANZ report numbered FR3754 was -/240/120.

Wall head detail variations

Wall head detail #1:

Total length of detail: 500-mm

Unexposed side detail: no variation, bare panel.

Exposed side detail: 120-mm wide 13-mm fire-grade plasterboard screw fixed to the panel, hard up against the lintel. Fullers Firesound sealant applied with 15-mm fillet finish along the edge of the plasterboard following contours of the panel.

Wall head detail #2:

Total length of detail: 500-mm

Unexposed side detail: no variation, bare panel.

Exposed side detail: 120-mm wide galvanised steel flashing screw fixed to the panel, hard up against the lintel.

Wall head detail #3:

Total length of detail: 500-mm

Unexposed side detail: 120-mm wide galvanised steel flashing screw fixed to the panel, hard up against the lintel.

Exposed side detail: no variation, bare panel.

Wall head detail #4:

Total length of detail: 500-mm

Unexposed side detail: 120-mm wide 13-mm fire-grade plasterboard screw fixed to the panel, hard up against the lintel. Fullers Firesound sealant applied with 15-mm fillet finish along the edge of the plasterboard following contours of the panel.

Exposed side detail: no variation, bare panel.

Wall head detail #5:

Total length of detail: 500-mm

Unexposed side detail: Fullers Firesound sealant applied with 15-mm fillet finish along the edge of the C-track and the panel following contours of the panel, as well as along the C-track and the concrete lintel.

Exposed side detail: no variation, bare panel.

Wall head detail #6:

Total length of detail: 500-mm

Unexposed side detail: no variation, bare panel.

Exposed side detail: Fullers Firesound sealant applied with 15-mm fillet finish along the edge of the C-track and the panel following contours of the panel, as well as along the C-track and the concrete lintel.

Specimen 1 – Blendair SHD Series Curtain type fire damper installation

SEPERATING ELEMENT		
78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754		
SIZE OF OPENING		
490-mm wide x 490-mm high		
FIRE DAMPER		
Trade name	Blendair SHD Series Curtain type fire damper with an established FRL of -/120/0, as stated in CSIRO test report numbered FSV0931	
Manufacturer	Riley Air Controls Pty Ltd	
Size	450-mm x 450-mm	
Description	The damper casing was made from 1.5-mm thick roll formed stainless steel. The curtain consisted of 0.9-mm thick stainless steel slats. The slats were nominally 75-mm high x the full width of the damper and were positioned central to the depth of the casing. The curtain was restrained in place by a fusible link rated at 70°C.	
Installation	The cut-out in the wall was lined with 83-mm wide x 58-mm high x 1.2-mm thick Speedpanel C-track, and the interface to the wall was sealed with Fullers Firesound sealant. The damper was retained in the opening using 35-mm x 50-mm steel angles fixed to the damper casing on both sides of the wall using 10g lag screws	
Photograph		
Drawing	Drawings numbered 1 and 2, both dated 15 February 2016.	

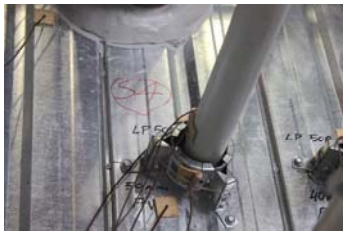
Specimen 2 – H.B. Fuller Firesound sealant protecting a 240-mm ID opening penetrated by 202-mm OD copper pipe

SEPERATING ELEMENT	
78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754	
TYPE AND SIZE OF CONSTRUCTION	
240-mm ID opening	
PENETRATING SERVICE	
Description	200-mm nominal copper pipe
Size	202-mm OD x 2-mm wall thickness extending 700-mm away from the wall and 500-mm into the furnace chamber
End conditions	Capped on the exposed end using a copper cap, and left open on the unexposed end
Supports	Approximately 100-mm and 500-mm away from the wall
FIRE STOPPING SYSTEM	
Brand name	H.B. Fuller Firesound Fire and Acoustic sealant
Manufacturer	H.B. Fuller
Description	Water based acrylic sealant
Application	20-mm annular gap around the pipe sealed on both sides of the wall with Firesound sealant to a nominal depth of 20-mm controlled by open cell polyurethane backing rod, and finished with a 50-mm fillet.
Photograph	 
Drawing	Drawing numbered 3, dated 15 February 2016.

Specimen 3 – H.B. Fuller Firesound sealant protecting a 136-mm ID opening penetrated by 102-mm OD copper pipe

SEPERATING ELEMENT	
78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754	
TYPE AND SIZE OF CONSTRUCTION	
136-mm ID opening	
PENETRATING SERVICE	
Description	100-mm nominal copper pipe
Size	102-mm OD x 3-mm wall thickness extending 720-mm away from the wall and 500-mm into the furnace chamber
End conditions	Capped on the exposed end using a copper cap, and left open on the unexposed end
Supports	Approximately 100-mm and 500-mm away from the wall
FIRE STOPPING SYSTEM	
Brand name	H.B. Fuller Firesound Fire and Acoustic sealant
Manufacturer	H.B. Fuller
Description	Water based acrylic sealant
Application	17-mm annular gap around the pipe sealed on both sides of the wall with Firesound sealant to a nominal depth of 20-mm controlled by open cell polyurethane backing rod, and finished with a 50-mm fillet.
Photograph	 
Drawing	Drawing numbered 4, dated 15 February 2016.

Specimen 4 – Snap LP50R Retrofit fire collar and H.B. Fuller Firesound sealant protecting a 57-mm ID opening penetrated by 57-mm OD uPVC pipe

SEPERATING ELEMENT	
78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754	
TYPE AND SIZE OF CONSTRUCTION	
57-mm ID opening	
PENETRATING SERVICE	
Description	50-mm nominal uPVC pipe
Size	57-mm OD x 2.5-mm wall thickness extending 2000-mm away from the wall and 500-mm into the furnace chamber
End conditions	Capped on the exposed end using a uPVC cap, and left open on the unexposed end
Supports	Approximately 500-mm and 1500-mm away from the wall
FIRE STOPPING SYSTEM	
Brand names	Snap
	H.B. Fuller Firesound Fire and Acoustic sealant
Manufacturers	Snap Fire Systems and H.B. Fuller
Description	Fire collar - Snap LP50 R Retrofit fire collar comprised a 0.75-mm steel casing with a 69-mm inner diameter. The 62-mm high collar casing incorporated a strip of 255-mm x 58-mm x 4-mm thick Intumesh intumescent material. The closing mechanism comprised three stainless steel springs, with nylon fuse links and a 260-mm x 58-mm stainless steel mesh.
	Sealant - water based acrylic sealant
Application	Fire collars were fitted around the pipe on both sides of the wall and fixed to the wall through the collar's three mounting tabs using 14-10 x 65-mm long hex head screws. Annular gaps around the pipe and the base of the collars were sealed on both sides of the wall with a bead of Firesound sealant.
Photograph	
Drawing	Drawing numbered LP 50 R-T, dated 14 September 2014, by Snap Fire Systems Pty Ltd. Drawing numbered 5, dated 15 February 2016.

Specimen 5 – Snap LP50R Retrofit fire collar and H.B. Fuller Firesound sealant protecting a 43-mm ID opening penetrated by 43-mm OD uPVC pipe

SEPERATING ELEMENT	
78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754	
TYPE AND SIZE OF CONSTRUCTION	
43-mm ID opening	
PENETRATING SERVICE	
Description	40-mm nominal uPVC pipe
Size	43-mm OD x 2-mm wall thickness extending 2000-mm away from the wall and 500-mm into the furnace chamber
End conditions	Capped on the exposed end using a uPVC cap, and left open on the unexposed end
Supports	Approximately 500-mm and 1500-mm away from the wall
FIRE STOPPING SYSTEM	
Brand names	Snap
	H.B. Fuller Firesound Fire and Acoustic sealant
Manufacturers	Snap Fire Systems and H.B. Fuller
Description	Fire collar - Snap LP50 R Retrofit fire collar comprised a 0.75-mm steel casing with a 69-mm inner diameter. The 62-mm high collar casing incorporated a strip of 255-mm x 58-mm x 4-mm thick Intumesh intumescent material. The closing mechanism comprised three stainless steel springs, with nylon fuse links and a 260-mm x 58-mm stainless steel mesh.
	Sealant - water based acrylic sealant
Application	Fire collars were fitted around the pipe on both sides of the wall and fixed to the wall through the collar's three mounting tabs using 14-10 x 65-mm long hex head screws. Annular gaps around the pipe and the base of the collars were sealed on both sides of the wall with a bead of Firesound sealant.
Photograph	
Drawing	Drawing numbered LP 50 R-T, dated 14 September 2014, by Snap Fire Systems Pty Ltd. Drawing numbered 6, dated 15 February 2016.

Specimen 6 – Snap LP50R Retrofit fire collar and H.B. Fuller Firesound sealant protecting a 58-mm ID opening penetrated by 57-mm OD HDPE pipe

SEPERATING ELEMENT	
78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754	
TYPE AND SIZE OF CONSTRUCTION	
58-mm ID opening	
PENETRATING SERVICE	
Description	50-mm nominal HDPE pipe
Size	57-mm OD x 3.5-mm wall thickness extending 2000-mm away from the wall and 500-mm into the furnace chamber
End conditions	Capped on the exposed end using a ceramic fibre plug, and left open on the unexposed end
Supports	Approximately 500-mm and 1500-mm away from the wall
FIRE STOPPING SYSTEM	
Brand names	Snap
	H.B. Fuller Firesound Fire and Acoustic sealant
Manufacturers	Snap Fire Systems and H.B. Fuller
Description	Fire collar - Snap LP50 R Retrofit fire collar comprised a 0.75-mm steel casing with a 69-mm inner diameter. The 62-mm high collar casing incorporated a strip of 255-mm x 58-mm x 4-mm thick Intumesh intumescent material. The closing mechanism comprised three stainless steel springs, with nylon fuse links and a 260-mm x 58-mm stainless steel mesh.
	Sealant - water based acrylic sealant
Application	Fire collars were fitted around the pipe on both sides of the wall and fixed to the wall through the collar's three mounting tabs using 14-10 x 65-mm long hex head screws. Annular gaps around the pipe and the base of the collars were sealed on both sides of the wall with a bead of Firesound sealant.
Photograph	
Drawing	Drawing numbered LP 50 R-T, dated 14 September 2014, by Snap Fire Systems Pty Ltd. Drawing numbered 7, dated 15 February 2016.

Specimen 7 – Snap HP150R Retrofit fire collar and H.B. Fuller Firesound sealant protecting a 168-mm ID opening penetrated by 157-mm OD uPVC pipe

SEPERATING ELEMENT	
78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754	
TYPE AND SIZE OF CONSTRUCTION	
168-mm ID opening	
PENETRATING SERVICE	
Description	150-mm nominal uPVC pipe
Size	157-mm OD x 4.5-mm wall thickness extending 2000-mm away from the wall and 500-mm into the furnace chamber
End conditions	Capped on the exposed end using a ceramic fibre plug, and left open on the unexposed end
Supports	Approximately 500-mm and 1500-mm away from the wall
FIRE STOPPING SYSTEM	
Brand names	Snap
	H.B. Fuller Firesound Fire and Acoustic sealant
Manufacturers	Snap Fire Systems and H.B. Fuller
Description	Fire collar - Snap HP150 R Retrofit fire collar comprised a 0.95-mm steel casing with a 175-mm inner diameter. The 117-mm high collar casing incorporated a strip of 570-mm x 112-mm x 8-mm thick Intumesh intumescent material. The closing mechanism comprised four stainless steel springs, with nylon fuse links and a 596-mm x 112-mm stainless steel mesh.
	Sealant - water based acrylic sealant
Application	Fire collars were fitted around the pipe on both sides of the wall and fixed to the wall through the collar's three mounting tabs using 14-10 x 65-mm long hex head screws. Annular gaps around the pipe and the base of the collars were sealed on both sides of the wall with a bead of Firesound sealant.
Photograph	
Drawing	Drawing numbered HP 150 R-T, dated 2 October 2015, by Snap Fire Systems Pty Ltd. Drawing numbered 8, dated 15 February 2016.

Specimen 8 – Snap LP100R-C Retrofit fire collar and H.B. Fuller Firesound sealant protecting a 114-mm ID opening penetrated by 110-mm OD uPVC pipe

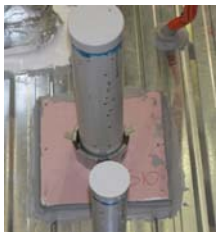
SEPERATING ELEMENT	
78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754	
TYPE AND SIZE OF CONSTRUCTION	
114-mm ID opening	
PENETRATING SERVICE	
Description	100-mm nominal uPVC pipe
Size	110-mm OD x 3.5-mm wall thickness extending 2000-mm away from the wall and 500-mm into the furnace chamber
End conditions	Capped on the exposed end using a uPVC cap, and left open on the unexposed end
Supports	Approximately 500-mm and 1500-mm away from the wall
FIRE STOPPING SYSTEM	
Brand names	Snap
	H.B. Fuller Firesound Fire and Acoustic sealant
Manufacturers	Snap Fire Systems and H.B. Fuller
Description	Fire collar - Snap LP100 R-C Retrofit fire collar comprised a 0.95-mm steel casing with a 122-mm inner diameter. The 65-mm high collar casing incorporated two strips of different intumescent materials, intumescent A measured 422-mm x 60-mm x 3-mm thick, and intumescent B measured 401-mm x 60-mm x 3-mm thick. The closing mechanism comprised four stainless steel springs, with nylon fuse links and a 414-mm x 58-mm stainless steel mesh and a 433-mm x 58-mm stainless steel mesh.
	Sealant - water based acrylic sealant
Application	Fire collars were fitted around the pipe on both sides of the wall and fixed to the wall through the collar's three mounting tabs using 14-10 x 65-mm long hex head screws. Annular gaps around the pipe and the base of the collars were sealed on both sides of the wall with a bead of Firesound sealant.
Photograph	
Drawing	Drawing numbered LP 100 R-C-T, dated 18 February 2016, by Snap Fire Systems Pty Ltd. Drawing numbered 9, dated 15 February 2016.

Specimen 9 – Snap LP110R-C Retrofit fire collar and H.B. Fuller Firesound sealant protecting a 86-mm ID opening penetrated by 83-mm OD uPVC pipe

SEPERATING ELEMENT	
78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754	
TYPE AND SIZE OF CONSTRUCTION	
86-mm ID opening	
PENETRATING SERVICE	
Description	80-mm nominal uPVC pipe
Size	83-mm OD x 3-mm wall thickness extending 2000-mm away from the wall and 500-mm into the furnace chamber
End conditions	Capped on the exposed end using a uPVC cap, and left open on the unexposed end
Supports	Approximately 500-mm and 1500-mm away from the wall
FIRE STOPPING SYSTEM	
Brand names	Snap
	H.B. Fuller Firesound Fire and Acoustic sealant
Manufacturers	Snap Fire Systems and H.B. Fuller
Description	Fire collar - Snap LP100 R-C Retrofit fire collar comprised a 0.95-mm steel casing with a 122-mm inner diameter. The 65-mm high collar casing incorporated two strips of different intumescent materials, intumescent A measured 422-mm x 60-mm x 3-mm thick, and intumescent B measured 401-mm x 60-mm x 3-mm thick. The closing mechanism comprised four stainless steel springs, with nylon fuse links and a 414-mm x 58-mm stainless steel mesh and a 433-mm x 58-mm stainless steel mesh.
	Sealant - water based acrylic sealant
Application	Fire collars were fitted around the pipe on both sides of the wall and fixed to the wall through the collar's three mounting tabs using 14-10 x 65-mm long hex head screws. Annular gaps around the pipe and the base of the collars were sealed on both sides of the wall with a bead of Firesound sealant.
Photograph	
Drawing	Drawing numbered LP 100 R-C-T, dated 18 February 2016, by Snap Fire Systems Pty Ltd. Drawing numbered 10, dated 15 February 2016.

Specimen 10 – Snap 110R Retrofit fire collar and H.B. Fuller Firesound sealant protecting a 114-mm ID opening penetrated by 110-mm OD uPVC pipe

SEPERATING ELEMENT	
78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754	
TYPE AND SIZE OF CONSTRUCTION	
114-mm ID opening	
PENETRATING SERVICE	
Description	100-mm nominal uPVC pipe
Size	110-mm OD x 3.5-mm wall thickness extending 2000-mm away from the wall and 500-mm into the furnace chamber
End conditions	Capped on the exposed end using a uPVC cap, and left open on the unexposed end
Supports	Approximately 500-mm and 1500-mm away from the wall
FIRE STOPPING SYSTEM	
Brand names	Snap
	H.B. Fuller Firesound Fire and Acoustic sealant
Manufacturers	Snap Fire Systems and H.B. Fuller
Description	Fire collar - Snap 110R Retrofit fire collar comprised a 0.75-mm steel casing with a 122-mm inner diameter. The 62-mm high collar casing incorporated three strips of different intumescent materials, intumescent A measured 424-mm x 58-mm x 2.5-mm thick, intumescent B measured 407-mm x 58-mm x 2.5-mm thick and intumescent C measured 389-mm x 58-mm x 2.5-mm thick. Stainless steel wire mesh 398-mm x 58-mm was sandwiched between the inner and middle strips of intumescent.
	Sealant - water based acrylic sealant
Application	Fire collars were fitted around the pipe on both sides of the wall and fixed to the wall through the collar's three mounting tabs using 10g x 38-mm long hex head screws. On the exposed side of the wall, the face was lined with two layers of 13-mm thick plasterboard and the fire collar was fixed directly to the plasterboard. Annular gaps around the pipe and the base of the collars were sealed on both sides of the wall with a bead of Firesound sealant.

Photograph		
Drawing	Drawing numbered 110 R-T, dated 9 October 2015, by Snap Fire Systems Pty Ltd. Drawing numbered 11, dated 15 February 2016.	

Specimen 11 – Snap LP110R-C Retrofit fire collar and H.B. Fuller Firesound sealant protecting a 70-mm ID opening penetrated by 70-mm OD uPVC pipe

SEPERATING ELEMENT	
78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754	
TYPE AND SIZE OF CONSTRUCTION	
70-mm ID opening	
PENETRATING SERVICE	
Description	65-mm nominal uPVC pipe
Size	70-mm OD x 3.5-mm wall thickness extending 2000-mm away from the wall and 500-mm into the furnace chamber
End conditions	Capped on the exposed end using a uPVC cap, and left open on the unexposed end
Supports	Approximately 500-mm and 1500-mm away from the wall
FIRE STOPPING SYSTEM	
Brand names	Snap
	H.B. Fuller Firesound Fire and Acoustic sealant
Manufacturers	Snap Fire Systems and H.B. Fuller
Description	Fire collar - Snap LP100 R-C Retrofit fire collar comprised a 0.95-mm steel casing with a 122-mm inner diameter. The 65-mm high collar casing incorporated two strips of different intumescent materials, intumescent A measured 422-mm x 60-mm x 3-mm thick, and intumescent B measured 401-mm x 60-mm x 3-mm thick. The closing mechanism comprised four stainless steel springs, with nylon fuse links and a 414-mm x 58-mm stainless steel mesh and a 433-mm x 58-mm stainless steel mesh.
	Sealant - water based acrylic sealant
Application	Fire collars were fitted around the pipe on both sides of the wall and fixed to the wall through the collar's three mounting tabs using 14-10 x 65-mm long hex head screws. Annular gaps around the pipe and the base of the collars were sealed on both sides of the wall with a bead of Firesound sealant.
Photograph	
Drawing	Drawing numbered LP 100 R-C-T, dated 18 February 2016, by Snap Fire Systems Pty Ltd. Drawing numbered 12, dated 15 February 2016.

Specimen 12 – Snap LP100R-C Retrofit fire collar and H.B. Fuller Firesound sealant protecting a 114-mm ID opening penetrated by 110-mm OD HDPE pipe

SEPERATING ELEMENT	
78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754	
TYPE AND SIZE OF CONSTRUCTION	
114-mm ID opening	
PENETRATING SERVICE	
Description	100-mm nominal HDPE pipe
Size	110-mm OD x 5.5-mm wall thickness extending 2000-mm away from the wall and 500-mm into the furnace chamber
End conditions	Capped on the exposed end using a ceramic fibre plug, and left open on the unexposed end
Supports	Approximately 500-mm and 1500-mm away from the wall
FIRE STOPPING SYSTEM	
Brand names	Snap
	H.B. Fuller Firesound Fire and Acoustic sealant
Manufacturers	Snap Fire Systems and H.B. Fuller
Description	Fire collar - Snap LP100 R-C Retrofit fire collar comprised a 0.95-mm steel casing with a 122-mm inner diameter. The 65-mm high collar casing incorporated two strips of different intumescent materials, intumescent A measured 422-mm x 60-mm x 3-mm thick, and intumescent B measured 401-mm x 60-mm x 3-mm thick. The closing mechanism comprised four stainless steel springs, with nylon fuse links and a 414-mm x 58-mm stainless steel mesh and a 433-mm x 58-mm stainless steel mesh.
	Sealant - water based acrylic sealant
Application	Fire collars were fitted around the pipe on both sides of the wall and fixed to the wall through the collar's three mounting tabs using 14-10 x 65-mm long hex head screws. Annular gaps around the pipe and the base of the collars were sealed on both sides of the wall with a bead of Firesound sealant.
Photograph	
Drawing	Drawing numbered LP 100 R-C-T, dated 18 February 2016, by Snap Fire Systems Pty Ltd. Drawing numbered 13, dated 15 February 2016.

Specimen 13 – H.B. Fuller Firesound sealant protecting a 58-mm ID opening penetrated by 43-mm OD steel pipe

SEPERATING ELEMENT	
78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754	
TYPE AND SIZE OF CONSTRUCTION	
58-mm ID opening	
PENETRATING SERVICE	
Description	32-mm nominal steel pipe
Size	43-mm OD x 3-mm wall thickness extending 700-mm away from the wall and 500-mm into the furnace chamber
End conditions	Capped on the exposed end using a copper cap, and left open on the unexposed end
Supports	Approximately 100-mm and 500-mm away from the wall
FIRE STOPPING SYSTEM	
Brand name	H.B. Fuller Firesound Fire and Acoustic sealant
Manufacturer	H.B. Fuller
Description	Water based acrylic sealant
Application	annular gap around the pipe sealed on both sides of the wall with Firesound sealant to a nominal depth of 20-mm controlled by open cell polyurethane backing rod, and finished with a 50-mm fillet.
Photograph	
Drawing	Drawing numbered 14, dated 15 February 2016.

Specimen 14 – H.B. Fuller Firesound sealant protecting a 40-mm ID opening penetrated by a bunch of 5 x 11-mm OD four-core electrical cables

SEPERATING ELEMENT	
78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754	
TYPE AND SIZE OF CONSTRUCTION	
40-mm ID opening	
PENETRATING SERVICE	
Description	bunch of five electrical cables
Size	bunch of 5 x 11-mm OD four-core electrical cables extending 700-mm away from the wall and 500-mm into the furnace chamber
Supports	Approximately 100-mm and 500-mm away from the wall
FIRE STOPPING SYSTEM	
Brand name	H.B. Fuller Firesound Fire and Acoustic sealant
Manufacturer	H.B. Fuller
Description	Water based acrylic sealant
Application	annular gap around the cable bunch sealed on both sides of the wall with Firesound sealant to a nominal depth of 20-mm controlled by open cell polyurethane backing rod, and finished with a 50-mm fillet.
Photograph	
Drawing	Drawing numbered 15, dated 15 February 2016.

Specimen 15 – Boss Batt and Boss "P40 MAK-Wrap" blanket protecting a 600-mm x 200-mm opening penetrated by a cable tray with cable arrangement Group A specified in AS1530.4 Appendix D2

SEPERATING ELEMENT	
78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754	
TYPE AND SIZE OF CONSTRUCTION	
300-mm x 250-mm opening, the cut-out in the wall was lined with 83-mm wide x 58-mm high x 1.2-mm thick Speedpanel C-track	
PENETRATING SERVICE	
Description	cable arrangement Group A specified in AS1530.4 Appendix D2 on a metal cable tray
Size	one single core 630 mm^2 cable, one three core 185 mm^2 cable, bunch of three 6 mm^2 cables and a bunch of eight 16 mm^2 cables all mounted onto a 470-mm wide cable tray extending 700-mm away from the wall and 500-mm into the furnace chamber
Supports	Approximately 100-mm and 500-mm away from the wall
FIRE STOPPING SYSTEM	
Brand names	Boss Bulkhead Batt, Boss "P40 MAK-Wrap" blanket and Boss Ablative Coating
Manufacturer	Boss Fire Safety
Descriptions	Boss Bulkhead Batt – 50-mm thick mineral fibre board with a stated density of 160 kg/m^3
	Boss "P40 MAK-Wrap" blanket – foil faced 38-mm thick 96 kg/m^3 mineral fibre blanket
	Boss Ablative Coating – water based acrylic coating
	H.B. Fuller Firesound Fire and Acoustic sealant - water based acrylic sealant
Application	The C-track lined opening was sealed with one layer of the Boss batt, friction fitted flush with the exposed side of the wall. A contoured cut-out was then cut in the batt to accommodate the installation of the cable tray. A second batt 780-mm long x 350-mm wide was fitted around the cable tray and fixed to the unexposed face of wall using M4 x 65-mm long self-tapping screws at 100-mm centres. Firesound sealant applied to all the gaps between the trimming channel in the opening and the wall itself, as well as around the cables and the Boss batts. The cables together with the cable tray were then wrapped with Boss "P40 MAK-Wrap" blanket, which extended 300-mm from the each side of the wall. The Boss batts were then coated with 1-mm thick Boss Ablative Coating.

Photograph		
Drawing	Drawings numbered 2016-002, sheets 1 and 2, dated 16th March 2016, by Boss Fire and Safety.	

Specimen 16 – Boss Batt and Boss “P40 MAK-Wrap” blanket protecting a 300-mm x 250-mm opening penetrated by a cable tray with cable arrangement Group B specified in AS1530.4 Appendix D2

SEPERATING ELEMENT	
78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754	
TYPE AND SIZE OF CONSTRUCTION	
300-mm x 250-mm opening, the cut-out in the wall was lined with 83-mm wide x 58-mm high x 1.2-mm thick Speedpanel C-track	
PENETRATING SERVICE	
Description	cable arrangement Group B specified in AS1530.4 Appendix D2 on a metal cable tray
Size	bunch of 60 x 15-mm OD telecommunication cables mounted onto a 180-mm wide cable tray extending 700-mm away from the wall and 500-mm into the furnace chamber
End conditions	Capped on the exposed end using a copper cap, and left open on the unexposed end
Supports	Approximately 100-mm and 500-mm away from the wall
FIRE STOPPING SYSTEM	
Brand names	Boss Bulkhead Batt, Boss “P40 MAK-Wrap” blanket and Boss Ablative Coating
Manufacturer	Boss Fire Safety
Descriptions	Boss Bulkhead Batt – 50-mm thick mineral fibre board with a stated density of 160 kg/m^3
	Boss “P40 MAK-Wrap” blanket – foil faced 38-mm thick 96 kg/m^3 mineral fibre blanket
	Boss Ablative Coating – water based acrylic coating
	H.B. Fuller Firesound Fire and Acoustic sealant - water based acrylic sealant
Application	The C-track lined opening was sealed with one layer of the Boss batt, friction fitted flush with the exposed side of the wall. A contoured cut-out was then cut in the batt to accommodate the installation of the cable tray. A second batt 500-mm long x 400-mm wide was fitted around the cable tray and fixed to the unexposed face of wall using M4 x 65-mm long self-tapping screws at 100-mm centres. Firesound sealant applied to all the gaps between the trimming channel in the opening and the wall itself, as well as around the cables and the Boss batts. The cables together with the cable tray were then wrapped with Boss “P40 MAK-Wrap” blanket, which extended 300-mm from

	the each side of the wall. The Boss batts were then coated with 1-mm thick Boss Ablative Coating.	
Photograph		
Drawing	Drawings numbered 2016-002, sheets 3 and 4, dated 16th March 2016, by Boss Fire and Safety.	

2.2 Orientation

The wall system and fire stopping systems were of symmetrical construction and installation, apart from Specimen 10 and the various head details.

2.3 Dimensions

The wall specimen was nominally 3000-mm wide x 3000-mm high x 78-mm thick. All dimensions are nominal.

2.4 Restraints

The wall was unrestrained along one of the vertical sides. The resulting gap along the unrestrained edge was sealed with compressed ceramic fibre.

2.5 Conditioning

The specimen wall was constructed on in the period between 30 October 2015 and 20 November 2015.

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

The construction 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:

- Drawing numbered sp_1001, dated 12 April 2016, by Speedpanel Pty Ltd.
- Drawing numbered LP 50 R-T, dated 14 January 2015, by Snap Fire Systems.
- Drawing numbered LP 100 R-C-T, dated 18 February 2016, by Snap Fire Systems.
- Drawing numbered 100R-T, dated 9 October 2015, by Snap Fire Systems.
- Drawing numbered HP 150 R-T, dated 2 October 2015, by Snap Fire Systems.
- Drawing numbered 2016-002, sheets 1-4, all dated 16 March 2016, by Boss Fire and Safety.
- Drawings numbered 1 to 15, all dated 15 February 2016, by Snap Fire Systems.

Confidential information about the test specimen has been submitted and is retained at CSIRO Infrastructure Technologies.

4 Equipment

4.1 Furnace

The furnace had a nominal opening of 3000-mm x 3000-mm for attachment of vertical specimens.

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

4.2 Temperature

The temperature in the furnace chamber was measured by eight type K, 3-mm diameter, 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.

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

4.3 Pressure

The furnace pressure was measured by a differential low-pressure transducer with a range of ± 50 Pa.

A pressure of 15±3 Pa was established at the centre of the lowest penetration.

The pressure probe was located approximately 1000-mm above the sill of the furnace, where the pressure was controlled at 8 Pa.

4.4 Measurement system

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

5 Ambient temperature:

The temperature of the test area was 22°C at the commencement of the test.

6 Departure from standard:

There were no departures from the requirements of AS 1530.4-2005.

7 Termination of the test:

The test was terminated at 121 minutes by the agreement with the sponsor.

8 Test results

8.1 Critical observations

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

2 minutes -	Smoke is emitted from around Specimen 16 (cable tray). Smoke has started to flue from the end of Specimen 4.
3 minutes -	Smoke has started to flue from the end of Specimens 8 & 9.
4 minutes -	Smoke has started to flue from the end of Specimens 5, 7, 10 & 12.
8 minutes -	All of the plastic pipes have ceased fluing smoke.
12 minutes -	Insulation Failure of Specimen 1 – maximum temperature rise of 180 degrees Celsius is exceeded on top of the damper casing.
15 minutes -	Light smoke continues to be emitted from the around Specimen 16 (cable tray).

17 minutes - Insulation Failure of Specimen 2 – maximum temperature rise of 180 degrees Celsius is exceeded on the unexposed face of the pipe, 25-mm away from the collar.

Smoke has started to flue from the end of Specimens 7 & 8.

20 minutes - Insulation Failure of Specimen 3 – maximum temperature rise of 180 degrees Celsius is exceeded on the unexposed face of the pipe, 25-mm away from the sealant.

29 minutes - Smoke has started to flue from the end of Specimen 4.

34 minutes - Specimen 4 is starting to deform. Sealant around the copper pipe specimens is staring to swell (photograph 4).

54 minutes - Specimens 9 & 11 are starting to deform at the fire collar.

55 minutes - Amount of smoke emitted from Specimens 4 & 7 has reduced. Smoke continues to be emitted from the end of Specimen 7.

Specimens 9 & 11 are starting to deform at the fire collar (photograph 6).

64 minutes - Smoke has started to flue from the end of Specimen 7. Smoke is also evident around the fire collars of Specimens 7 & 8.

Specimen 10 is starting to deform at the fire collar.

69 minutes - Specimens 8 & 12 are starting to deform at the fire collar (photographs 7 & 8).

71 minutes - Glow is visible at the base of Specimen 12.

74 minutes - Integrity Failure of Specimen 8 - cotton wool pad test applied over the glow near the fire collar – ignition of cotton noted.

76 minutes - Insulation Failure of Specimen 8 – maximum temperature rise of 180 degrees Celsius is exceeded on top of the collar.

Intumescent in the fire collar of Specimen 5 is starting to swell.

77 minutes - Integrity Failure of Specimen 12 - cotton wool pad test applied over the glow near the fire collar – ignition of cotton noted (photograph 9).

82 minutes - Insulation Failure of Specimen 12 – maximum temperature rise of 180 degrees Celsius is exceeded on top of the collar.

89 minutes - Smoke is no longer fluing from Specimen 8.

90 minutes - Specimen 9 has completely separated from the fire collar.

102 minutes - Specimen 6 has separated at the collar, small amount of smoke is emitted from inside its collar.

104 minutes - Insulation Failure of Specimen 11 – maximum temperature rise of 180 degrees Celsius is exceeded on top of the collar.

Insulation Failure of Specimen 13 – maximum temperature rise of 180 degrees Celsius is exceeded on the unexposed face of the pipe, 25-mm away from the collar.

105 minutes - Integrity Failure of Specimen 6 - cotton wool pad test applied over the glow near the fire collar – ignition of cotton noted.

107 minutes - Insulation Failure of Specimen 6 – maximum temperature rise of 180 degrees Celsius is exceeded on top of the collar.

108 minutes - Specimen 11 has separated at the collar.

110 minutes - Integrity Failure of Specimen 11 - cotton wool pad test applied over the glow near the fire collar – ignition of cotton noted (photograph 11).

114 minutes - Cotton wool pad test applied over the glow near the fire collar of Specimen 10 – no ignition of cotton noted.

115 minutes - Insulation Failure of Specimen 7 – maximum temperature rise of 180 degrees Celsius is exceeded on the wall, 25-mm above the sealant.

Insulation Failure of Specimen 9 – maximum temperature rise of 180 degrees Celsius is exceeded on the wall, 25-mm above the sealant.

Insulation Failure of Specimen 10 – maximum temperature rise of 180 degrees Celsius is exceeded on top of the collar.

120 minutes - Insulation Failure of Specimen 14 – maximum temperature rise of 180 degrees Celsius is exceeded on top of the cables.

121 minutes - Test terminated.

8.2 Furnace temperature

Figure 1 shows the standard curves of temperature versus time for heating the furnace chamber and the actual curves of average and maximum temperature versus time recorded during the heating period.

8.3 Furnace severity

Figure 2 shows the curve of furnace severity versus time during the heating period.

8.4 Furnace pressure

Figure 3 shows the curve of average pressure versus time inside the furnace chamber recorded during the heating period.

8.5 Specimen temperature

Figures 4 to 13 show curves of temperature versus time recorded on the unexposed face of specimens 1 to 16.

8.6 Performance

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

	SPECIMEN 1	
Structural adequacy	-	not applicable
Integrity	-	no failure at 121 minutes
Insulation	-	12 minutes
	SPECIMEN 2	
Structural adequacy	-	not applicable
Integrity	-	no failure at 121 minutes
Insulation	-	17 minutes
	SPECIMEN 3	
Structural adequacy	-	not applicable
Integrity	-	no failure at 121 minutes
Insulation	-	20 minutes

SPECIMEN 4

Structural adequacy	-	not applicable
Integrity	-	no failure at 121 minutes
Insulation	-	no failure at 121 minutes

SPECIMEN 5

Structural adequacy	-	not applicable
Integrity	-	no failure at 121 minutes
Insulation	-	no failure at 121 minutes

SPECIMEN 6

Structural adequacy	-	not applicable
Integrity	-	105 minutes
Insulation	-	107 minutes

SPECIMEN 7

Structural adequacy	-	not applicable
Integrity	-	no failure at 121 minutes
Insulation	-	115 minutes

SPECIMEN 8

Structural adequacy	-	not applicable
Integrity	-	74 minutes
Insulation	-	76 minutes

SPECIMEN 9

Structural adequacy	-	not applicable
Integrity	-	no failure at 121 minutes
Insulation	-	115 minutes

SPECIMEN 10

Structural adequacy	-	not applicable
Integrity	-	no failure at 121 minutes
Insulation	-	115 minutes

SPECIMEN 11

Structural adequacy	-	not applicable
Integrity	-	110 minutes
Insulation	-	104 minutes

SPECIMEN 12

Structural adequacy	-	not applicable
Integrity	-	77 minutes
Insulation	-	82 minutes

SPECIMEN 13

Structural adequacy	-	not applicable
Integrity	-	no failure at 121 minutes
Insulation	-	104 minutes

SPECIMEN 14

Structural adequacy	-	not applicable
Integrity	-	no failure at 121 minutes
Insulation	-	120 minutes

SPECIMEN 15

Structural adequacy	-	not applicable
Integrity	-	no failure at 121 minutes
Insulation	-	no failure at 121 minutes

SPECIMEN 16

Structural adequacy	-	not applicable
Integrity	-	no failure at 121 minutes
Insulation	-	no failure at 121 minutes

This report details methods of construction, the test conditions and the results obtained when 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 FRLs of the test specimens were as follows:

Specimen 2: -/120/0;
Specimen 3: -/120/0;
Specimen 4: -/120/120;
Specimen 5: -/120/120;
Specimen 6: -/90/90;
Specimen 7: -/120/90;
Specimen 8: -/60/60;
Specimen 9: -/120/90;
Specimen 10: -/120/90;
Specimen 11: -/90/90;
Specimen 12: -/60/60;
Specimen 13: -/120/90;
Specimen 14: -/120/120;
Specimen 15: -/120/120, and
Specimen 16: -/120/120.

The fire-resistance levels of the specimen are applicable when the system is exposed to fire from the either direction.

For the purposes of AS 1530.4-2005 & 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 3.8 of AS1530.4-2005 & 2014, have been made provided no individual component is removed or reduced.

11 Tested by:

Chris Wojcik
Testing Officer

Appendices

Appendix A – Measurement location

Measurement Location		
Group location	**T/C Position**	**T/C designation**
Specimen		
Specimen 1 – fire damper	On the wall – 25-mm above the damper opening	S1
	On the wall – 25-mm adjacent to the damper opening	S2
	On the opening lining angles – 25-mm above the damper opening	S3
	On the opening lining angles – 25-mm adjacent to the damper opening	S4
	On top of the damper casing	S5
	On the side of the damper casing	S6
Specimen 2 – 200-mm copper pipe	On the wall – 25-mm above the sealant	S7
	On the wall – 25-mm adjacent to the sealant	S8
	On the sealant above the pipe	S9
	On the sealant adjacent to the pipe	S10
	On top of the pipe – 25-mm from the sealant	S11
	On the pipe – 25-mm from the sealant	S12
Specimen 3 – 100-mm copper pipe	On the wall – 25-mm above the sealant	S13
	On the wall – 25-mm adjacent to the sealant	S14
	On the sealant above the pipe	S15
	On the sealant adjacent to the pipe	S16
	On top of the pipe – 25-mm from the sealant	S17
	On the pipe – 25-mm from the sealant	S18
Specimen 4 – LP50R – 50-mm uPVC pipe	On the wall – 25-mm above the sealant	S19
	On the wall – 25-mm adjacent to the sealant	S20
	On top of the collar	S21
	On the collar	S22
	On top of the pipe – 25-mm from the sealant	S23
	On the pipe – 25-mm from the sealant	S24
Specimen 5 – LP50R – 40-mm uPVC pipe	On the wall – 25-mm above the sealant	S25
	On the wall – 25-mm adjacent to the sealant	S26
	On top of the collar	S27
	On the collar	S28
	On top of the pipe – 25-mm from the sealant	S29
	On the pipe – 25-mm from the sealant	S30
Specimen 6 – LP50R – 56-mm HDPE pipe	On the wall – 25-mm above the sealant	S31

	On the wall – 25-mm adjacent to the sealant	S32
	On top of the collar	S33
	On the collar	S34
	On top of the pipe – 25-mm from the sealant	S35
	On the pipe – 25-mm from the sealant	S36
Specimen 7 – HP150R – 150-mm uPVC pipe	On the wall – 25-mm above the sealant	S37
	On the wall – 25-mm adjacent to the sealant	S38
	On top of the collar	S39
	On the collar	S40
	On top of the pipe – 25-mm from the sealant	S41
	On the pipe – 25-mm from the sealant	S42
Specimen 8 – LP100R-C – 100-mm uPVC pipe	On the wall – 25-mm above the sealant	S43
	On the wall – 25-mm adjacent to the sealant	S44
	On top of the collar	S45
	On the collar	S46
	On top of the pipe – 25-mm from the sealant	S47
	On the pipe – 25-mm from the sealant	S48
Specimen 9 – LP100R-C – 80-mm uPVC pipe	On the wall – 25-mm above the sealant	S49
	On the wall – 25-mm adjacent to the sealant	S50
	On top of the collar	S51
	On the collar	S52
	On top of the pipe – 25-mm from the sealant	S53
	On the pipe – 25-mm from the sealant	S54
Specimen 10 – 110R – 100-mm uPVC pipe	On the wall – 25-mm above the sealant	S55
	On the wall – 25-mm adjacent to the sealant	S56
	On top of the collar	S57
	On the collar	S58
	On top of the pipe – 25-mm from the sealant	S59
	On the pipe – 25-mm from the sealant	S60
Specimen 11 – LP100R-C – 65-mm uPVC pipe	On the wall – 25-mm above the sealant	S61
	On the wall – 25-mm adjacent to the sealant	S62
	On top of the collar	S63
	On the collar	S64
	On top of the pipe – 25-mm from the sealant	S65
	On the pipe – 25-mm from the sealant	S66
Specimen 12 – LP100R-C – 110-mm HDPE pipe	On the wall – 25-mm above the sealant	S67
	On the wall – 25-mm adjacent to the sealant	S68
	On top of the collar	S69
	On the collar	S70

	On top of the pipe – 25-mm from the sealant	S71
	On the pipe – 25-mm from the sealant	S72
Specimen 13 – 32-mm steel pipe	On the wall – 25-mm above the sealant	S73
	On the wall – 25-mm adjacent to the sealant	S74
	On the sealant above the pipe	S75
	On the sealant adjacent to the pipe	S76
	On top of the pipe – 25-mm from the sealant	S77
	On the pipe – 25-mm from the sealant	S78
Specimen 14 – 4 cables	On the wall – 25-mm above the sealant	S79
	On the wall – 25-mm adjacent to the sealant	S80
	On the sealant above the cables	S81
	On the sealant adjacent to the cables	S82
	On top of the cables – 25-mm from the sealant	S83
	On the cables – 25-mm from the sealant	S84
Specimen 15 – large cable tray	On the wall – 25-mm above the insulation batt	S85
	On the wall – 25-mm adjacent to the insulation batt	S86
	On the insulation batt – above the tray	S87
	On the insulation batt – adjacent to the tray	S88
	On top of the insulation – 25-mm from the batt	S89
	On top of the insulation – 25-mm from the batt	S90
	On the side of the tray – 25-mm from the insulation	S91
	On the side of the tray – 25-mm from the insulation	S92
	On top of the black cable – 25-mm from the insulation	S93
	On top of the orange cable – 25-mm from the insulation	S94
	On top of the bunch of 3 cables – 25-mm from the insulation	S95
	On top of the bunch of 8 cables – 25-mm from the insulation	S96
Specimen 16 – small cable tray	On the wall – 25-mm above the insulation batt	S97
	On the wall – 25-mm adjacent to the insulation batt	S98
	On the insulation batt – above the tray	S99
	On the insulation batt – adjacent to the tray	S100
	On top of the insulation – 25-mm from the batt	S101
	On the insulation – 25-mm from the batt	S102
	On the side of the tray – 25-mm from the insulation	S103

	On the side of the tray – 25-mm from the insulation	S104
	On top of the bunch of cable – 25-mm from the insulation	S105
	On the side of the bunch of cables – 25-mm from the insulation	S106
Head 1 – P/B fire side		S107
Head 2 – flashing fire side		S108
Head 3 – flashing non-fire side		S109
Head 4 – P/B non-fire side		S110
Head 5 – bare panel sealant non-fire side		S111
Head 6 – bare panel sealant fire side		S112
Rover 1		
Rover 2		
Ambient		

Appendix B – Test photographs

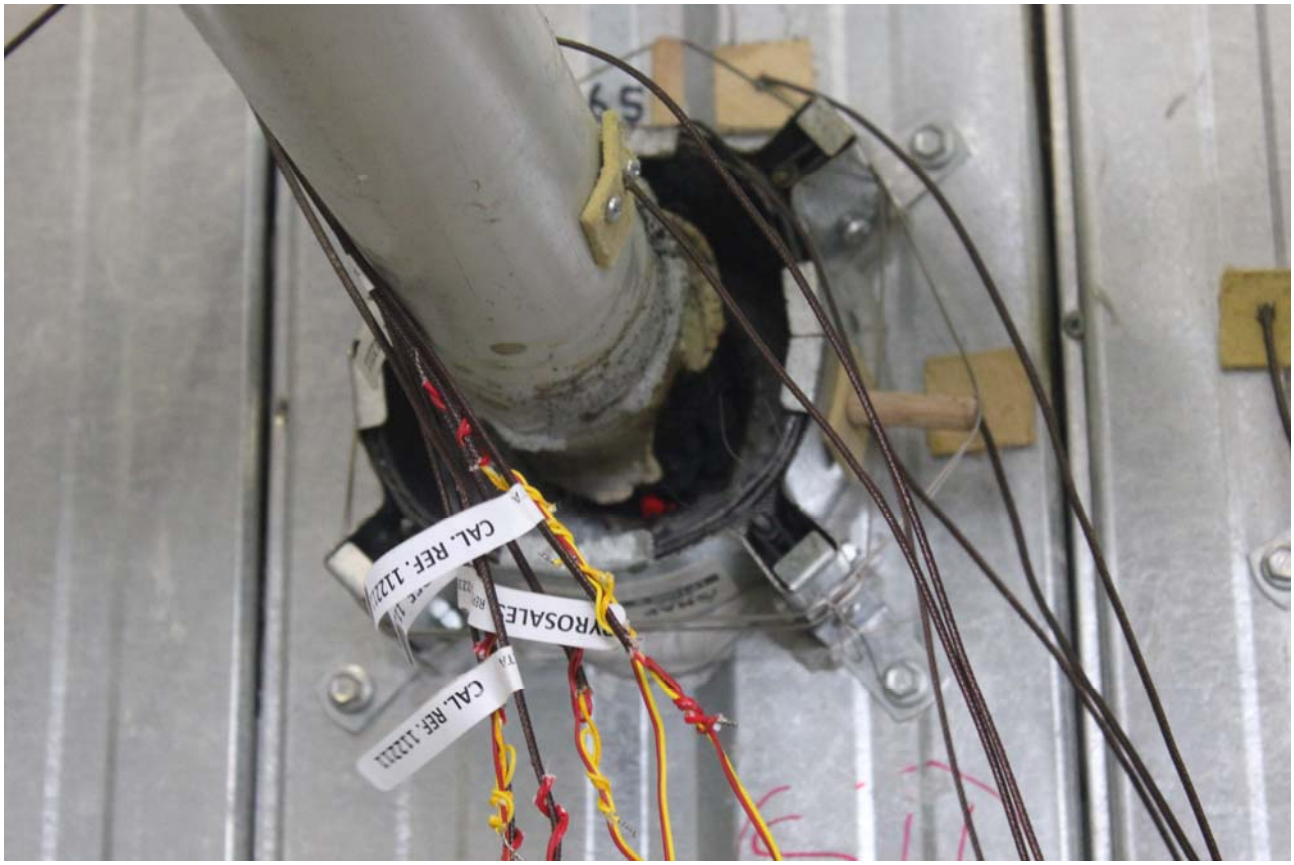
PHOTOGRAPH 1 – EXPOSED FACE OF THE SPECIMEN PRIOR TO TEST

PHOTOGRAPH 2 – UNEXPOSED FACE OF THE SPECIMEN PRIOR TO TESTING

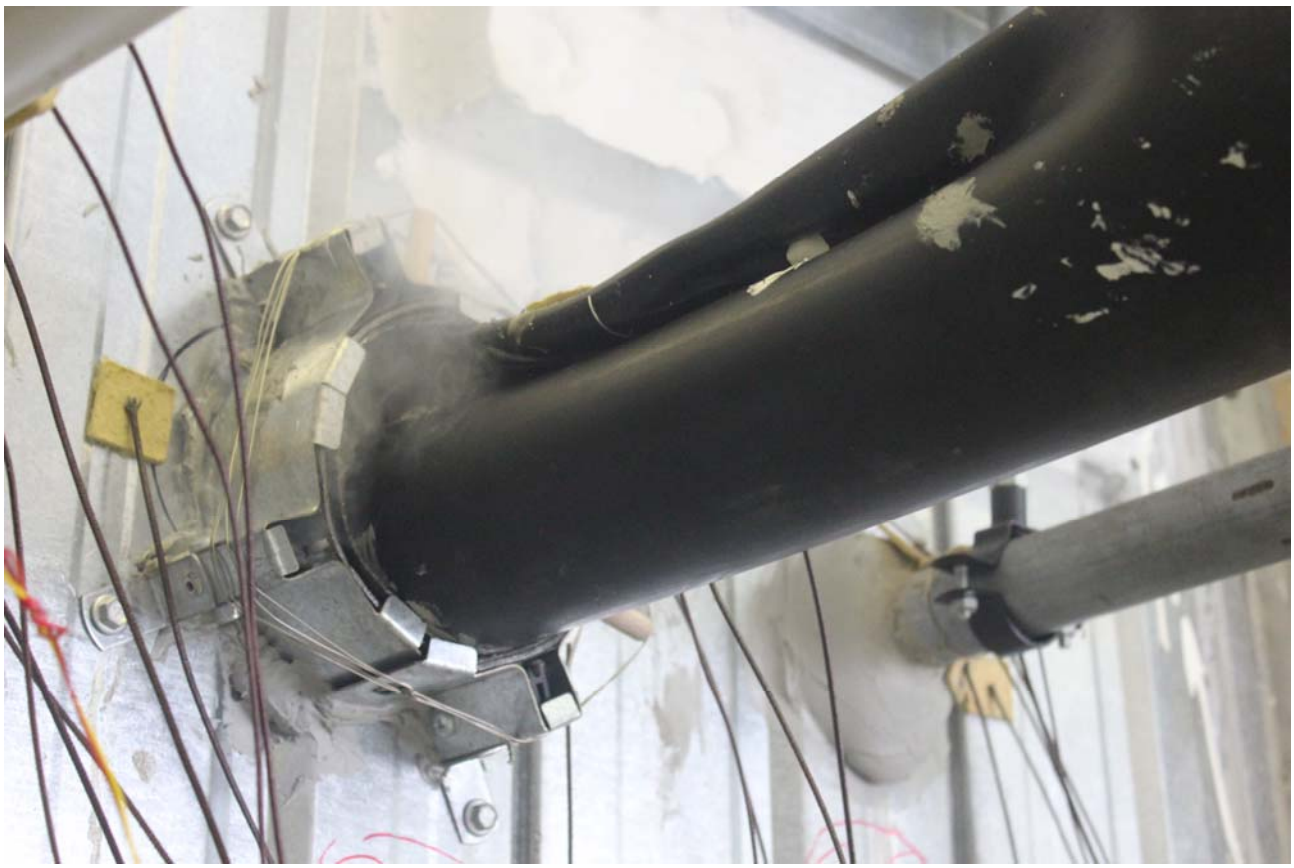
PHOTOGRAPH 3 – SPECIMENS AT 31 MINUTES INTO THE TEST

PHOTOGRAPH 4 – SPECIMENS 2 & 3 AT 53 MINUTES INTO THE TEST

PHOTOGRAPH 5 – SPECIMENS AT 60 MINUTES INTO THE TEST



PHOTOGRAPH 6 – SPECIMEN 11 AT 61 MINUTES INTO THE TEST

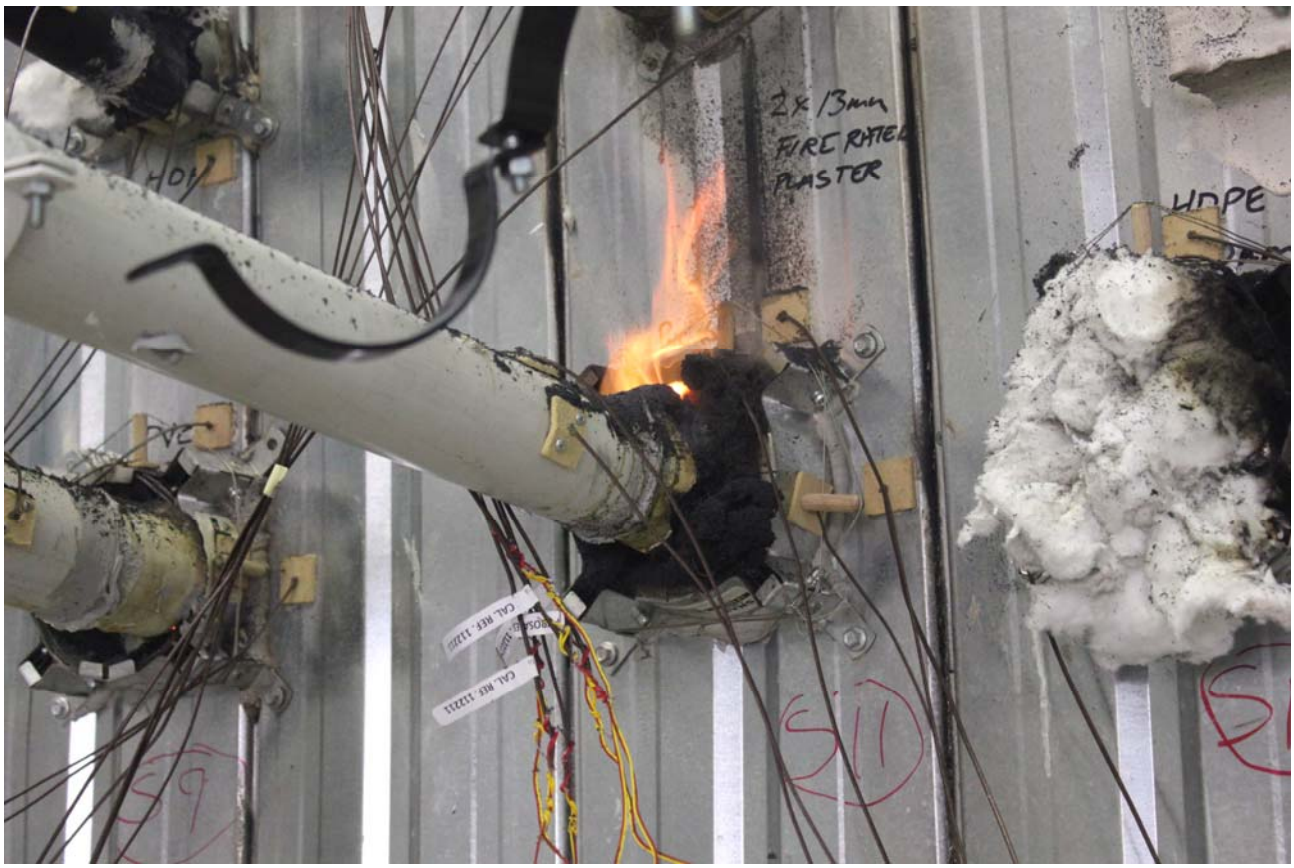


PHOTOGRAPH 7 – SPECIMEN 12 AT 71 MINUTES INTO THE TEST

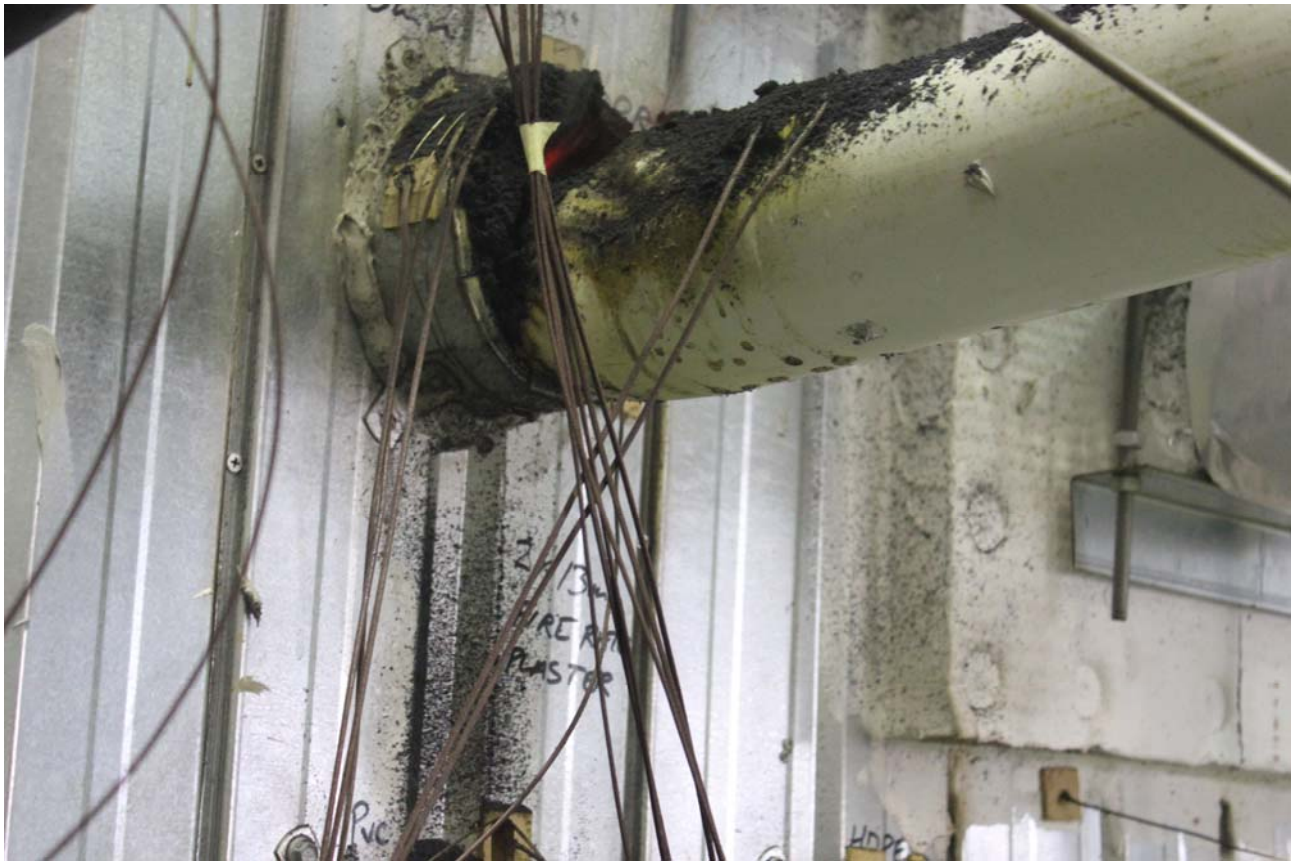
PHOTOGRAPH 8 – SPECIMEN 8 AT 72 MINUTES INTO THE TEST

PHOTOGRAPH 9 – SPECIMEN 12 AT 80 MINUTES INTO THE TEST

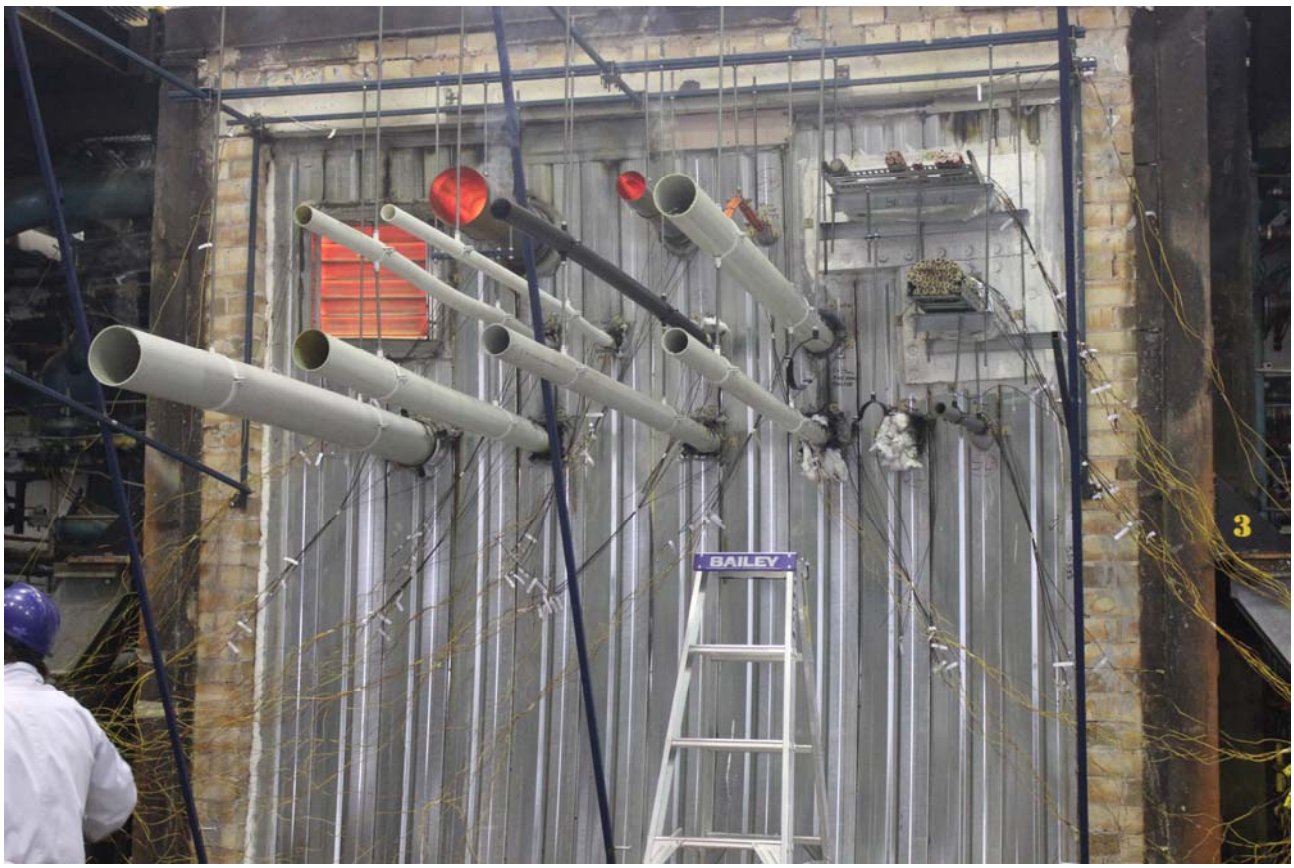
PHOTOGRAPH 10 – SPECIMENS AT 90 MINUTES INTO THE TEST



PHOTOGRAPH 11 – SPECIMEN 11 AT 110 MINUTES INTO THE TEST



PHOTOGRAPH 12 – SPECIMEN 10 AT 113 MINUTES INTO THE TEST



PHOTOGRAPH 13 – SPECIMENS AT THE CONCLUSION OF TESTING

PHOTOGRAPH 14 – EXPOSED FACE OF THE SPECIMEN AFTER THE CONCLUSION OF TESTING

Appendix C – Test data charts

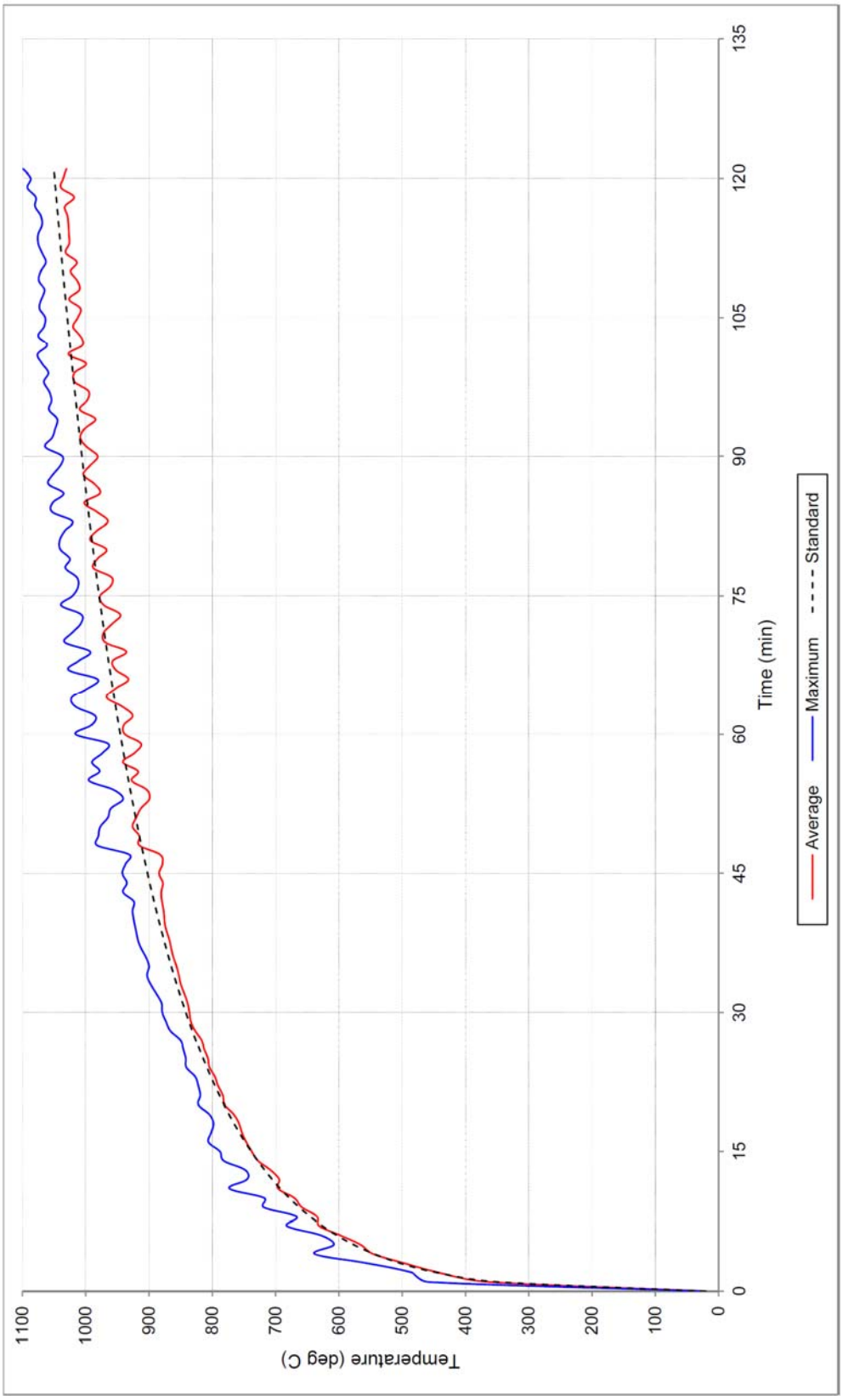


FIGURE 1 – FURNACE TEMPERATURE

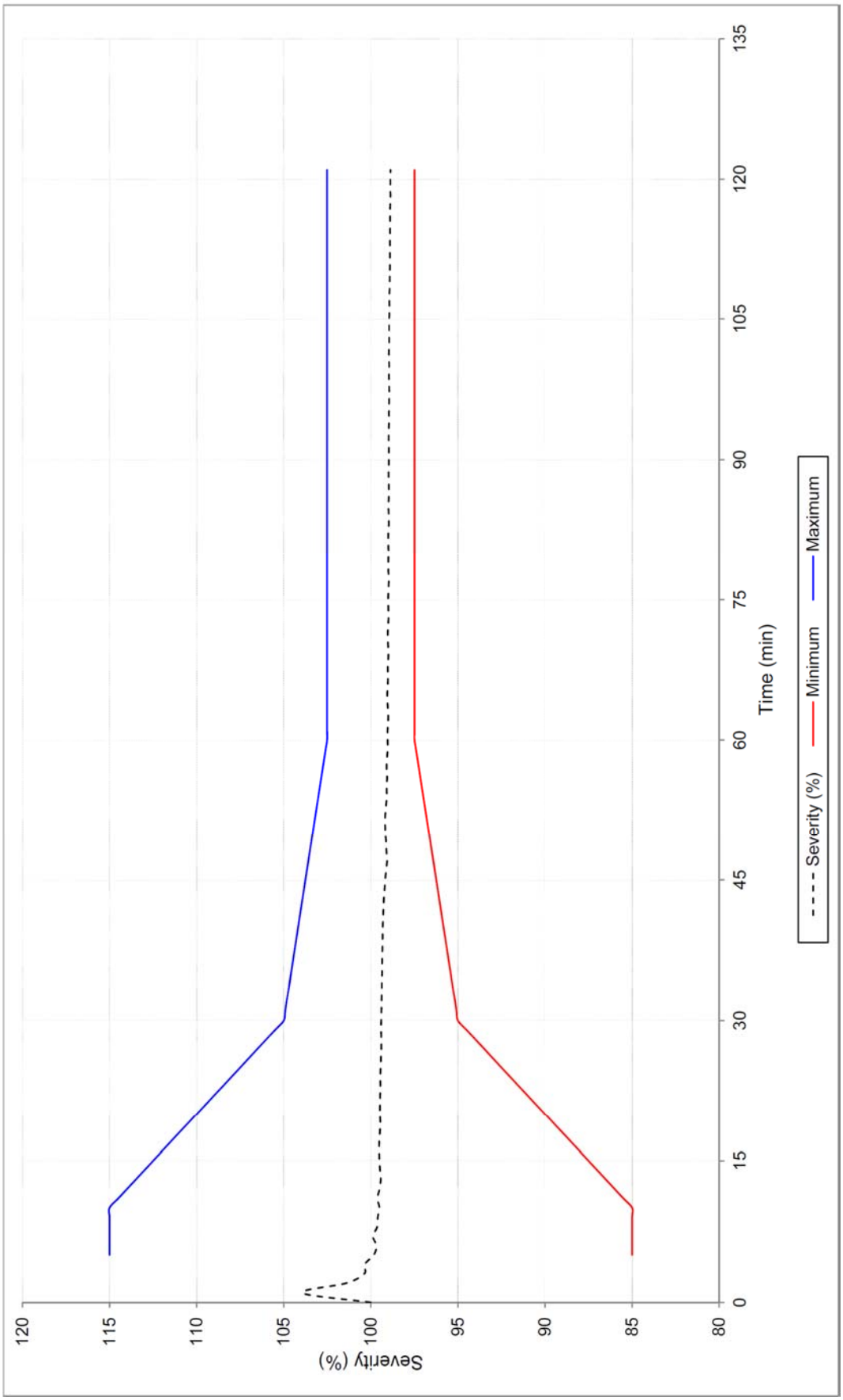


FIGURE 2 – FURNACE SEVERITY

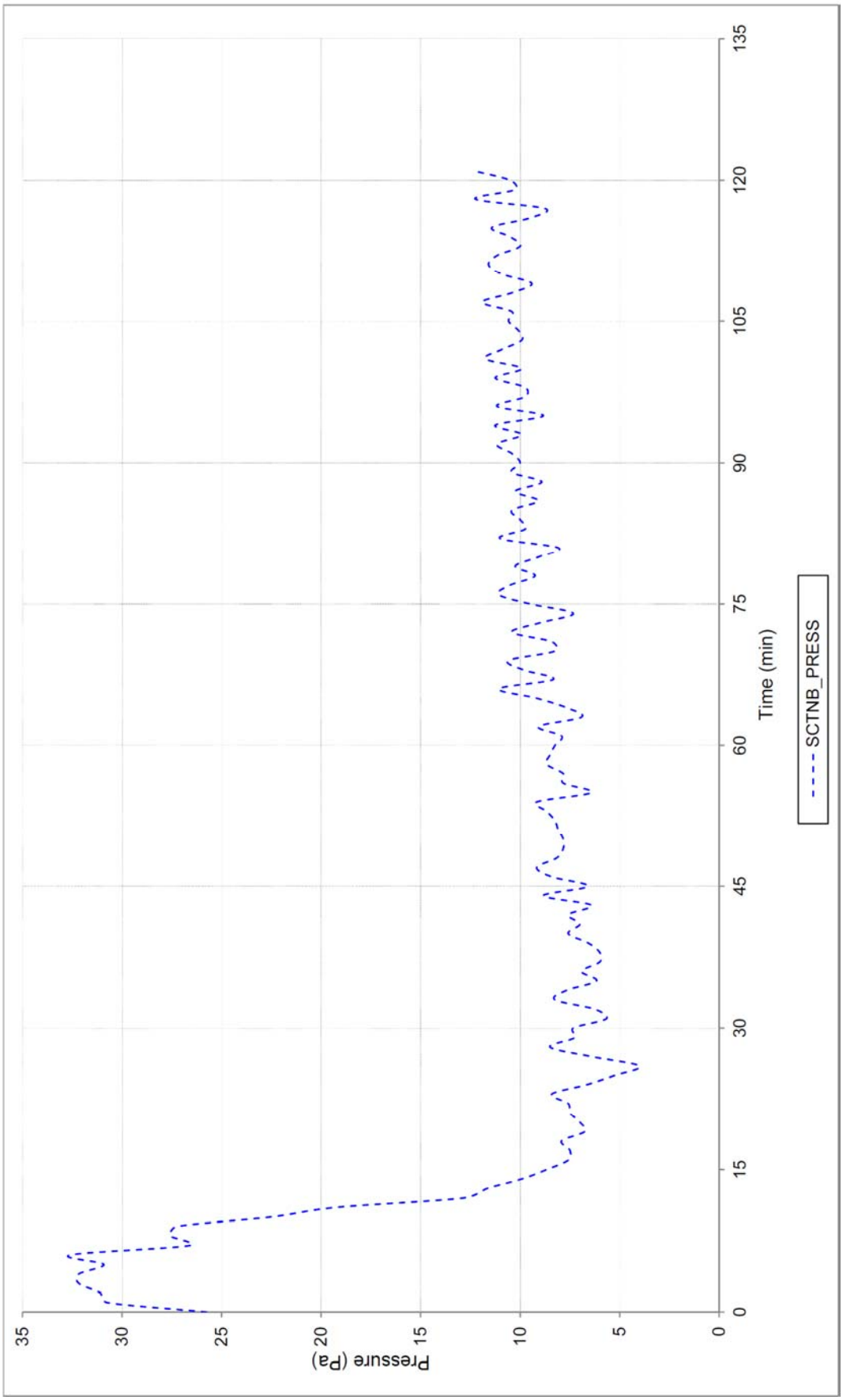


FIGURE 3 – FURNACE PRESSURE

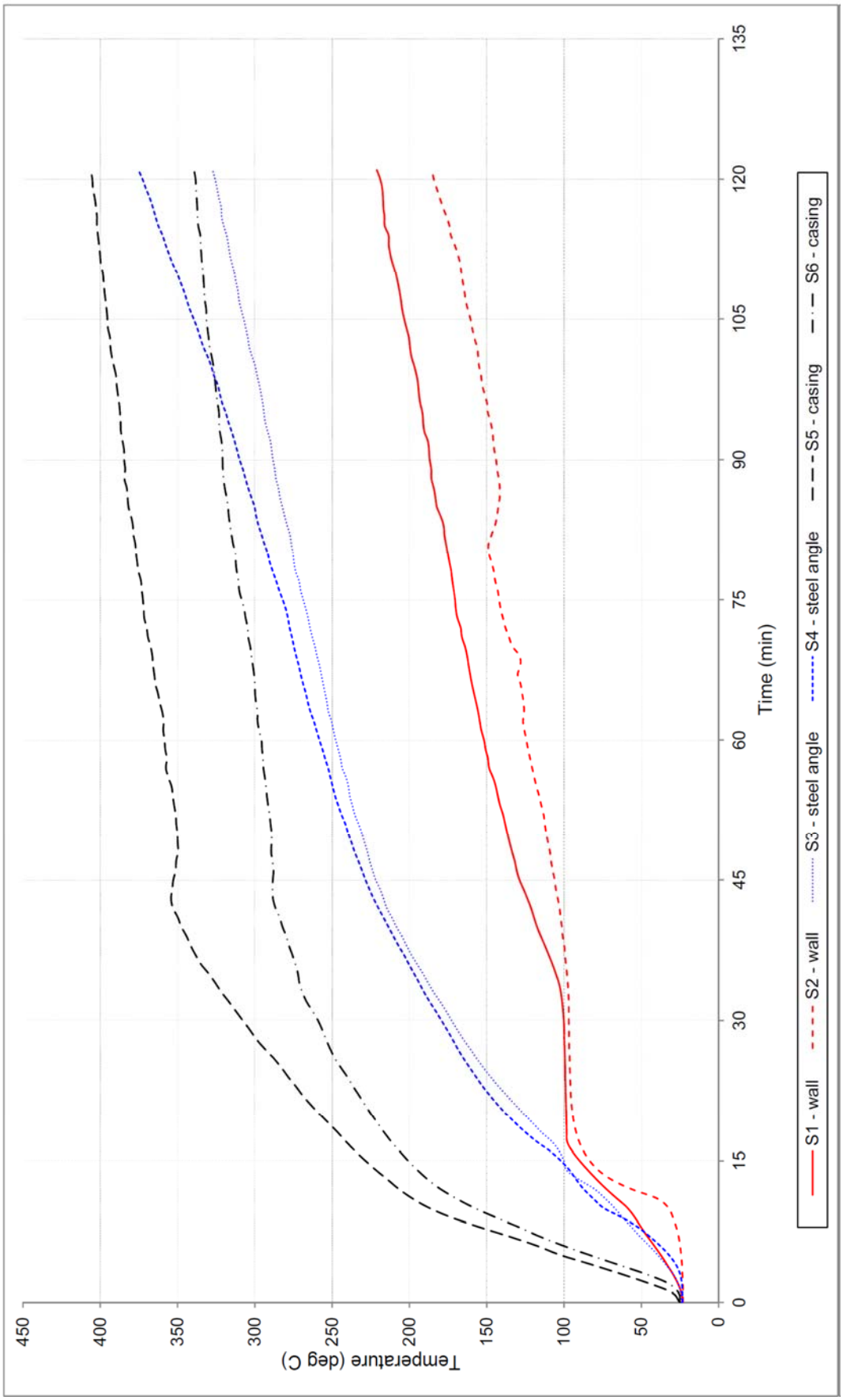


FIGURE 4 – SPECIMEN TEMPERATURE – UNEXPOSED FACE OF THE SPECIMEN 1

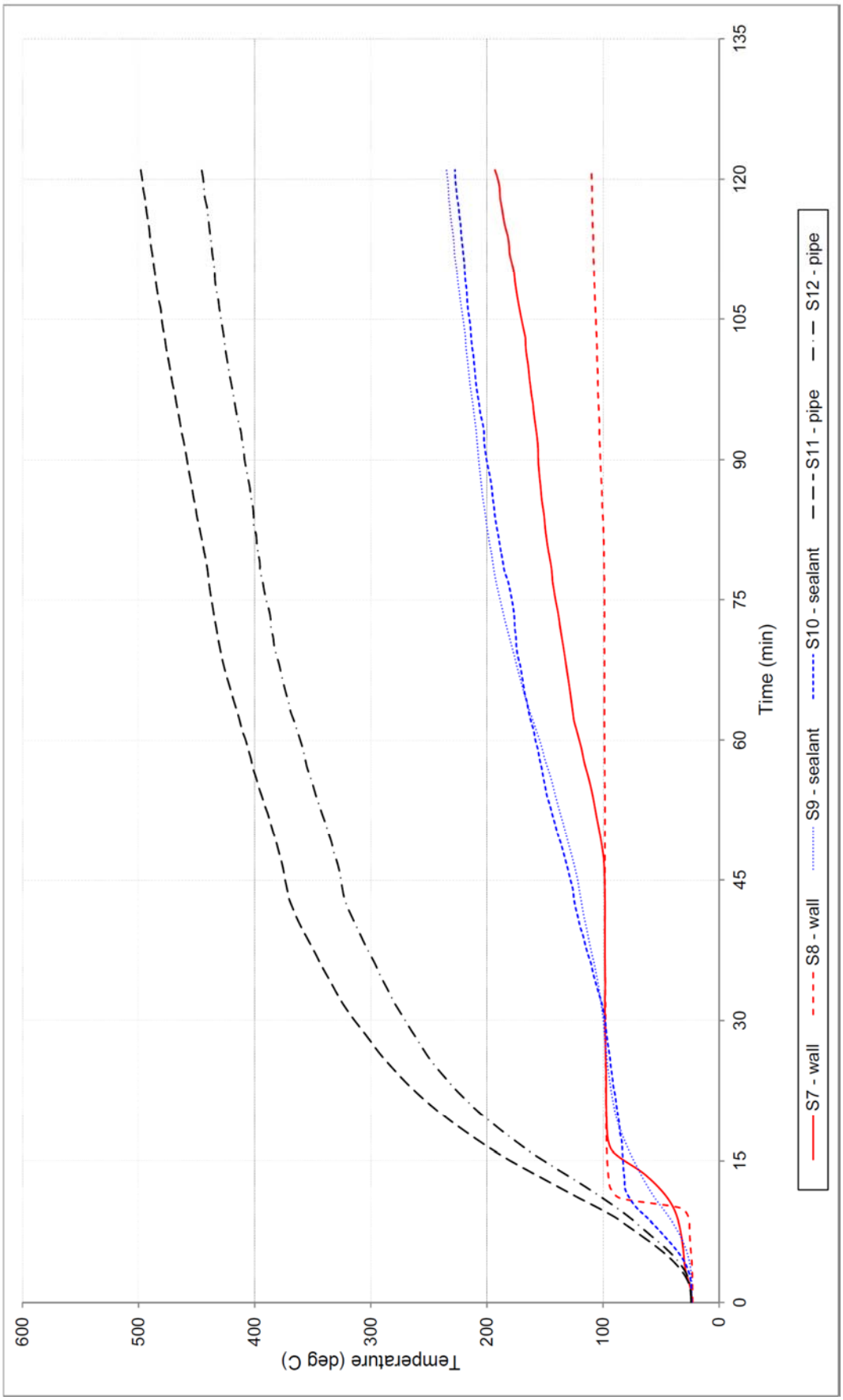


FIGURE 5 – SPECIMEN TEMPERATURE – UNEXPOSED FACE OF THE SPECIMEN 2

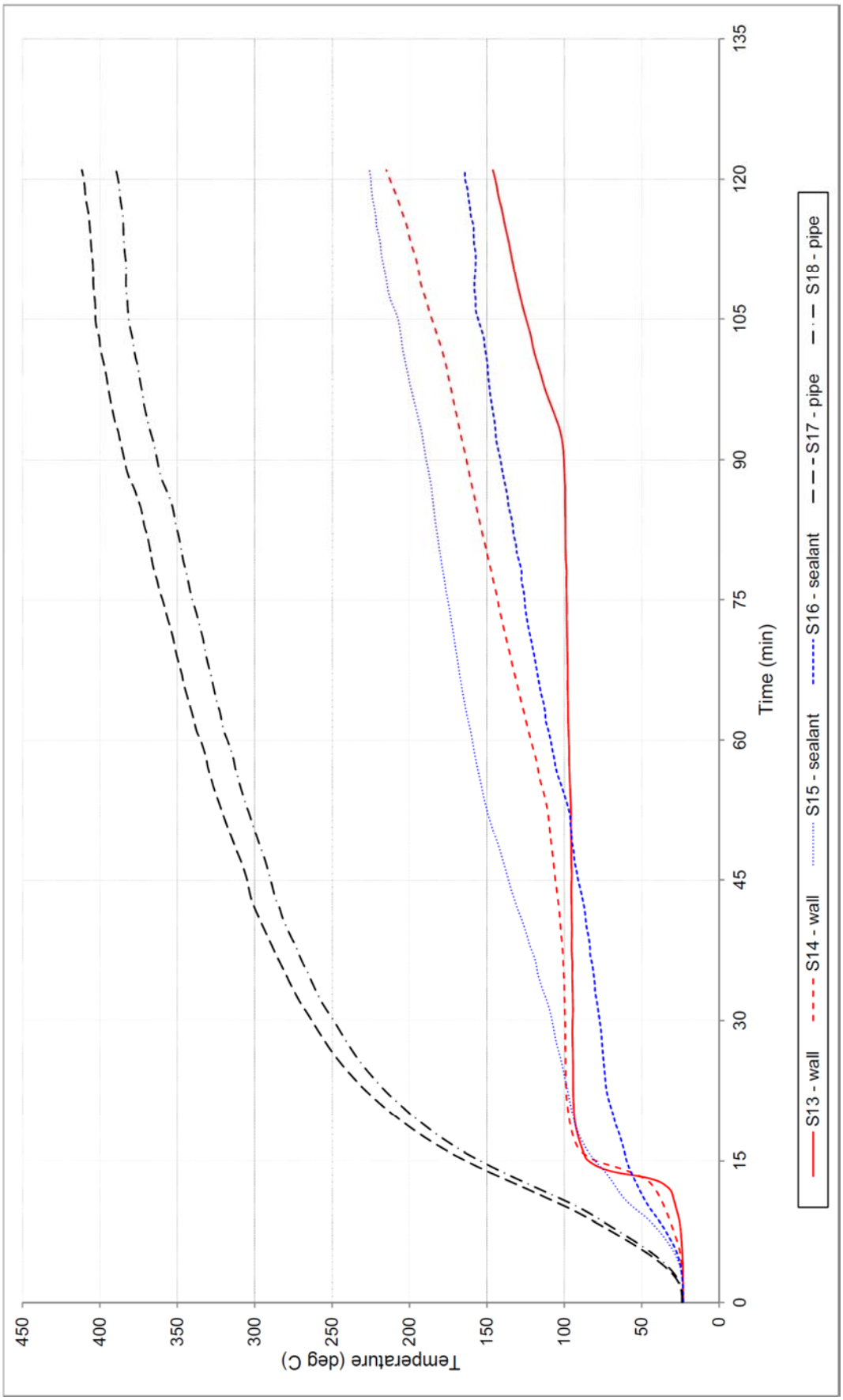


FIGURE 6 – SPECIMEN TEMPERATURE – UNEXPOSED FACE OF THE SPECIMEN 3

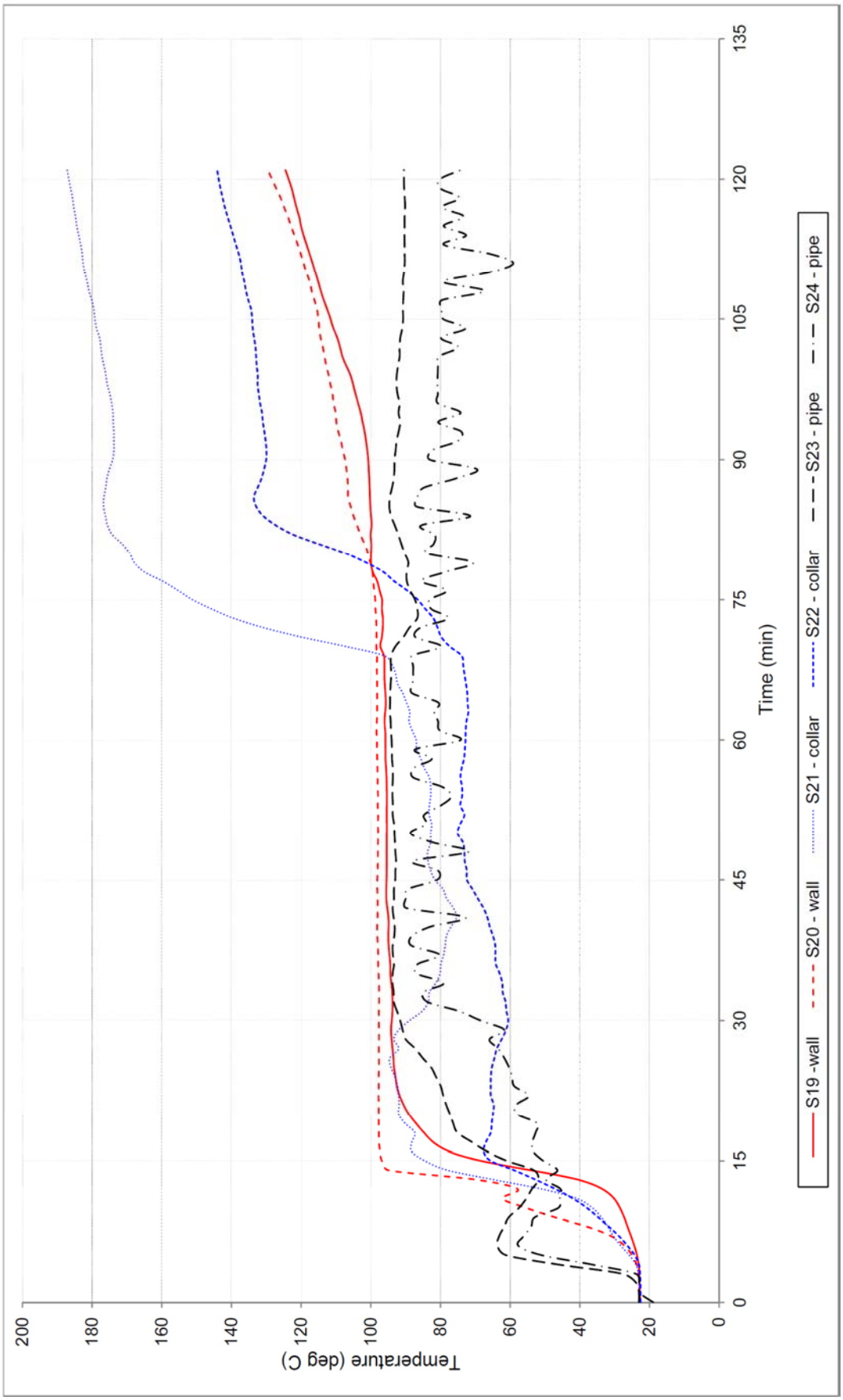


FIGURE 7 – SPECIMEN TEMPERATURE – UNEXPOSED FACE OF THE SPECIMEN 4

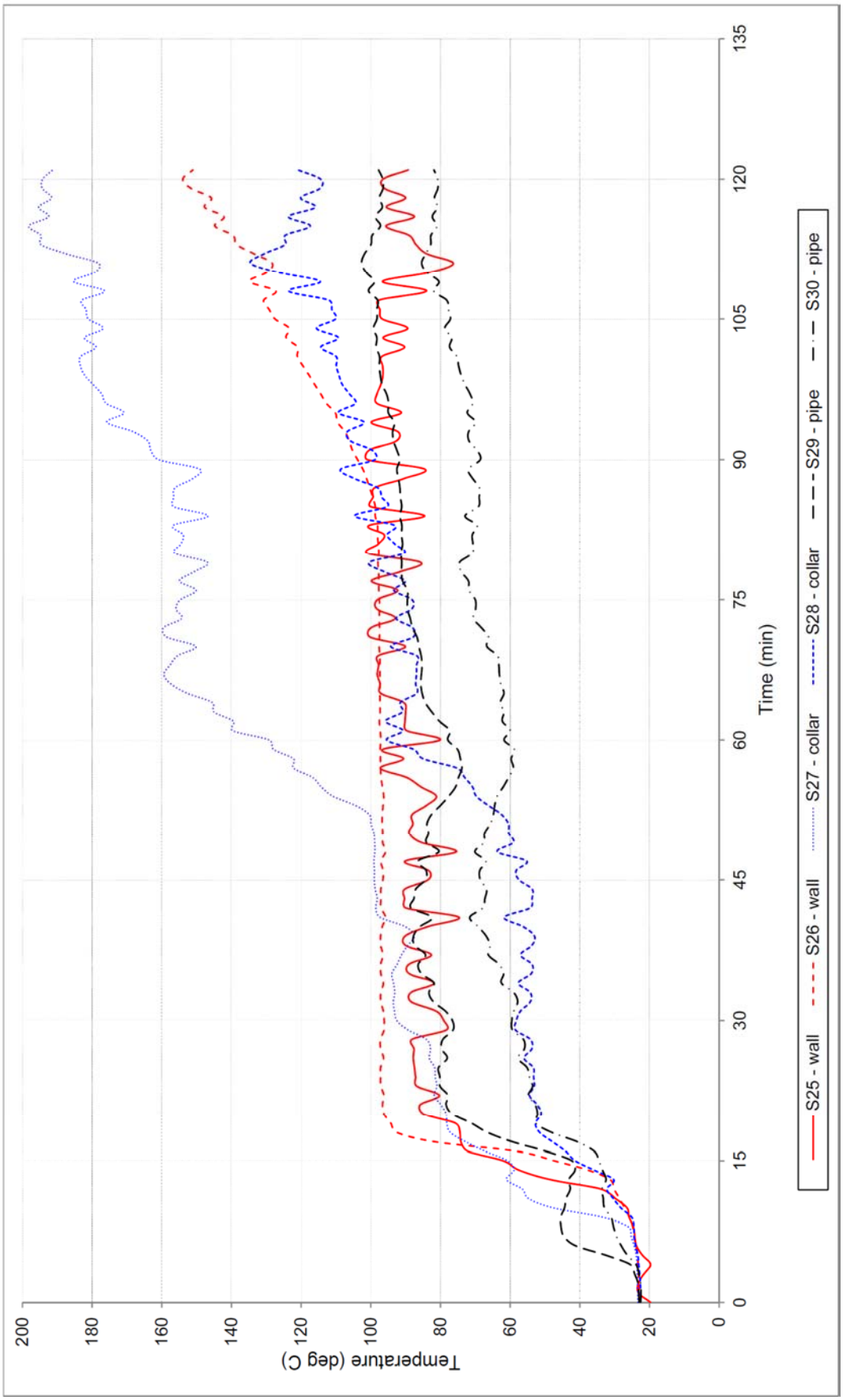


FIGURE 8 – SPECIMEN TEMPERATURE – UNEXPOSED FACE OF THE SPECIMEN 5

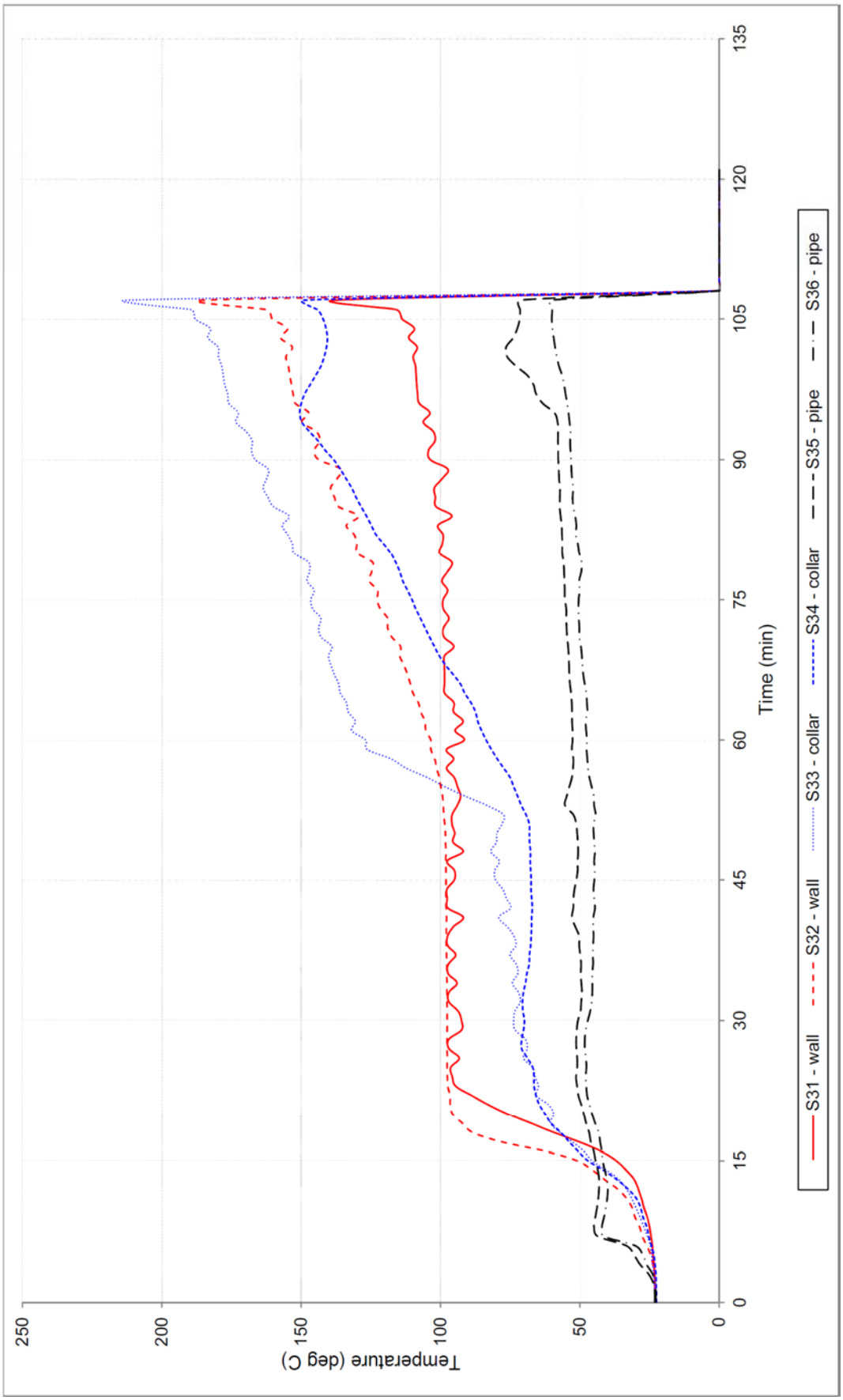


FIGURE 9 – SPECIMEN TEMPERATURE – UNEXPOSED FACE OF THE SPECIMEN 6

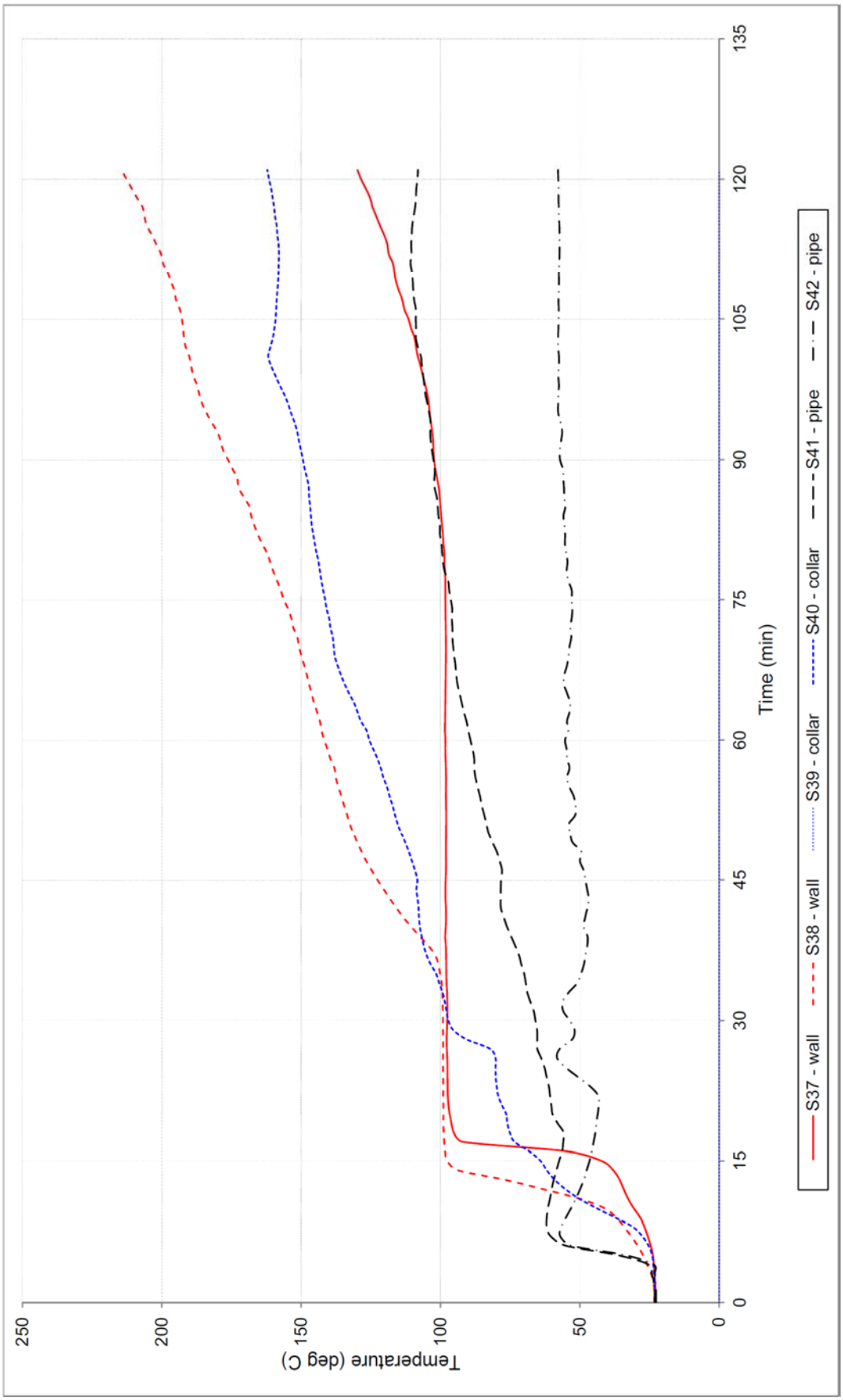


FIGURE 10 – SPECIMEN TEMPERATURE – UNEXPOSED FACE OF THE SPECIMEN 7

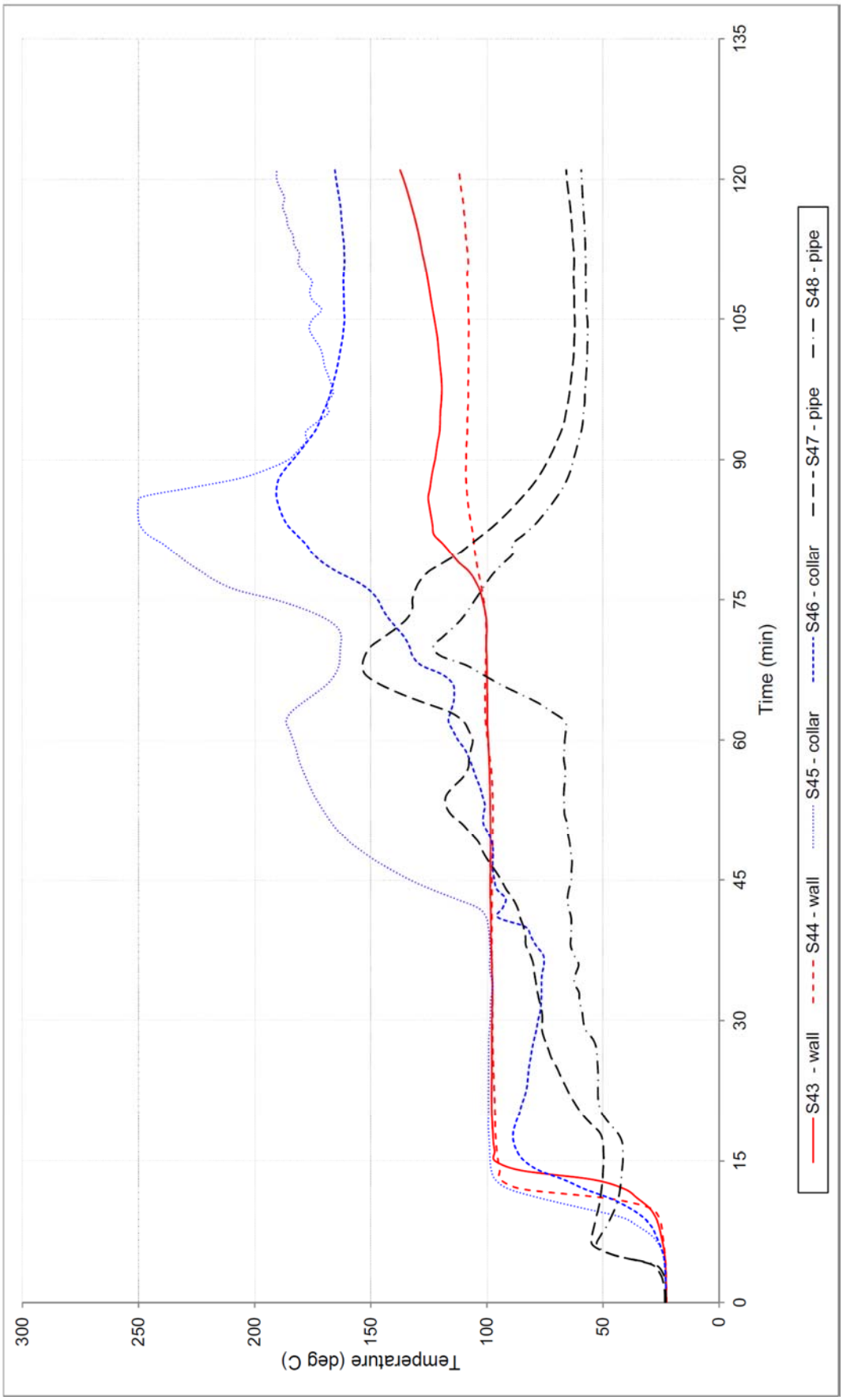


FIGURE 11 – SPECIMEN TEMPERATURE – UNEXPOSED FACE OF THE SPECIMEN 8

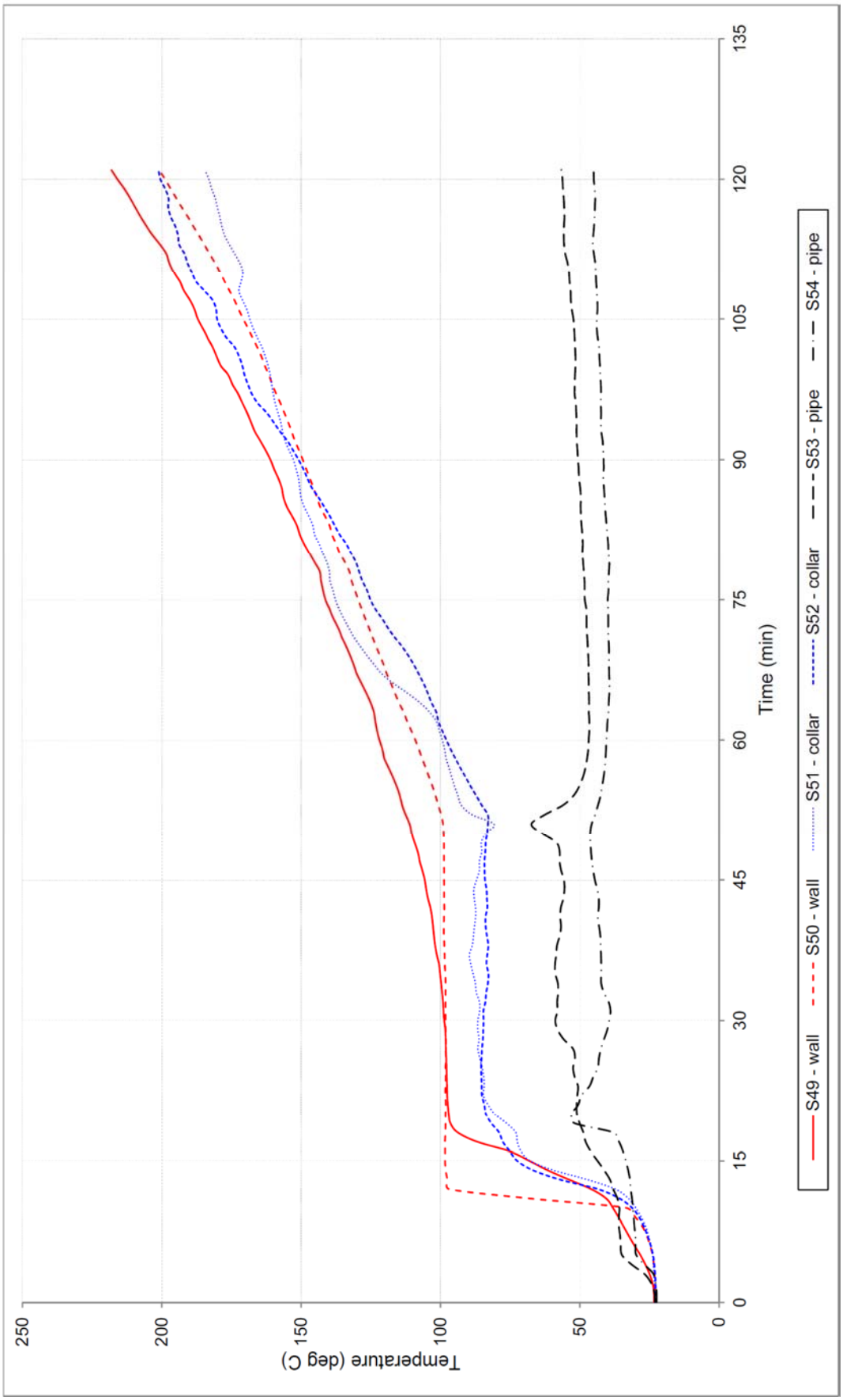


FIGURE 12 – SPECIMEN TEMPERATURE – UNEXPOSED FACE OF THE SPECIMEN 9

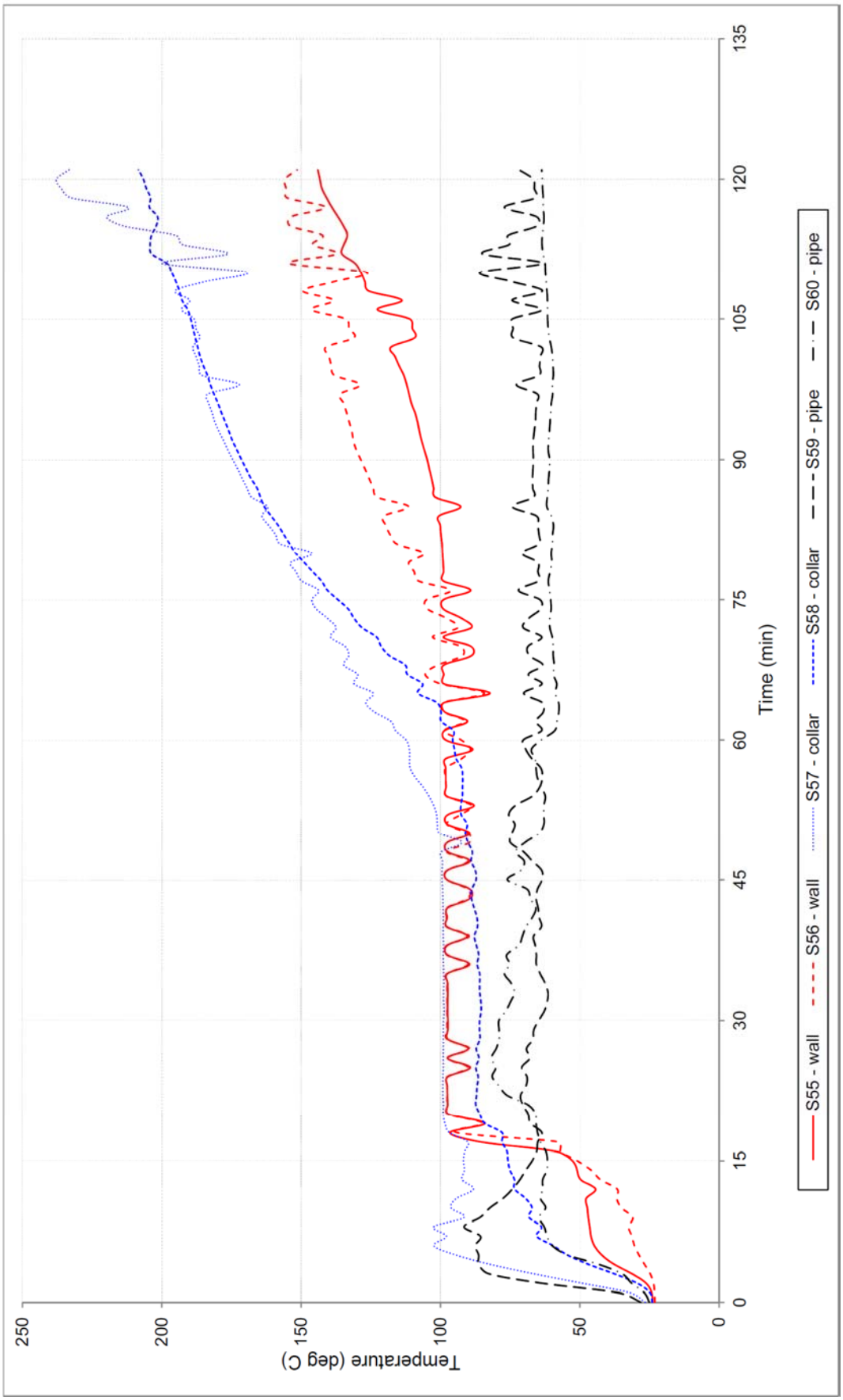


FIGURE 13 – SPECIMEN TEMPERATURE – UNEXPOSED FACE OF THE SPECIMEN 10

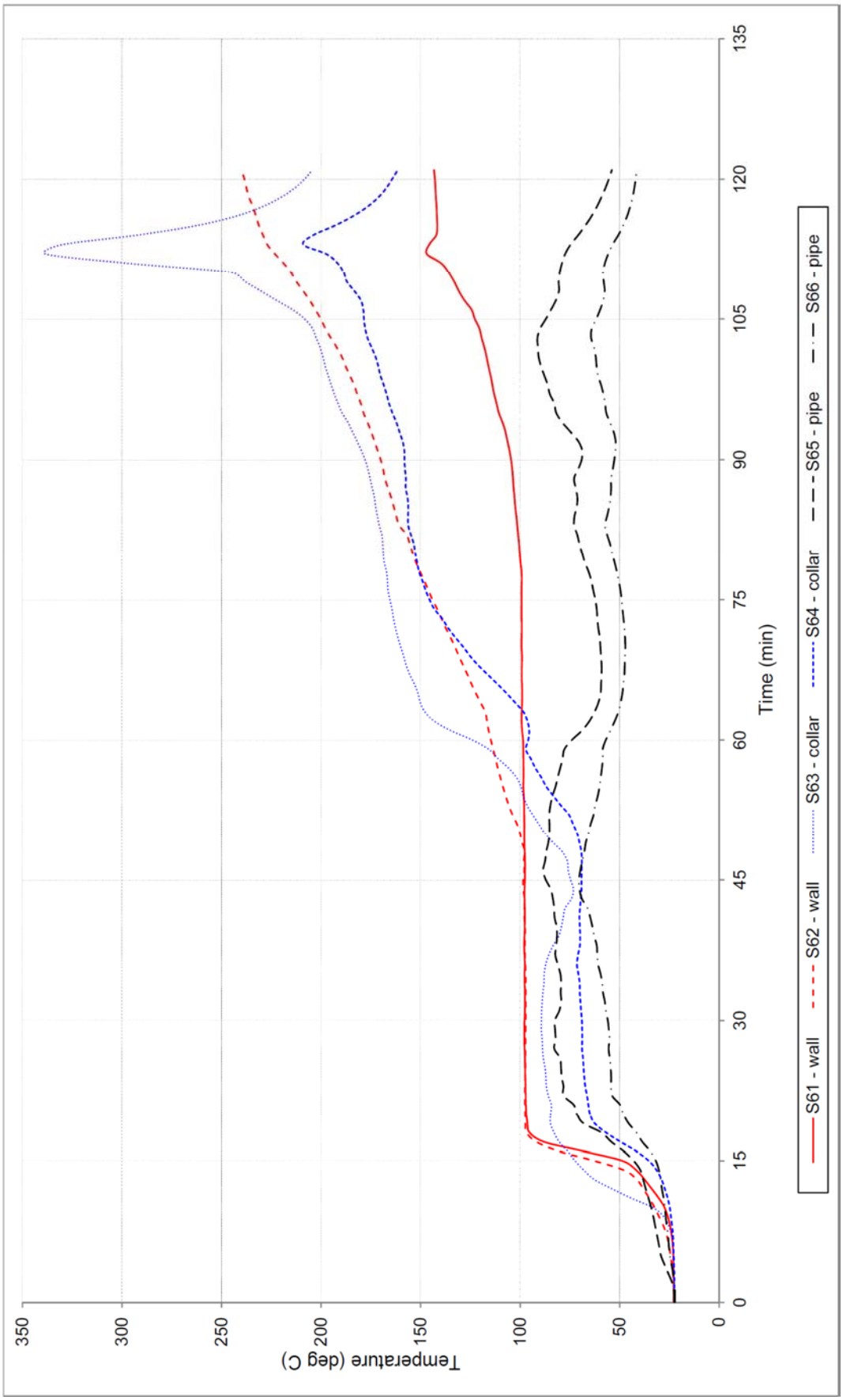


FIGURE 14 – SPECIMEN TEMPERATURE – UNEXPOSED FACE OF THE SPECIMEN 11

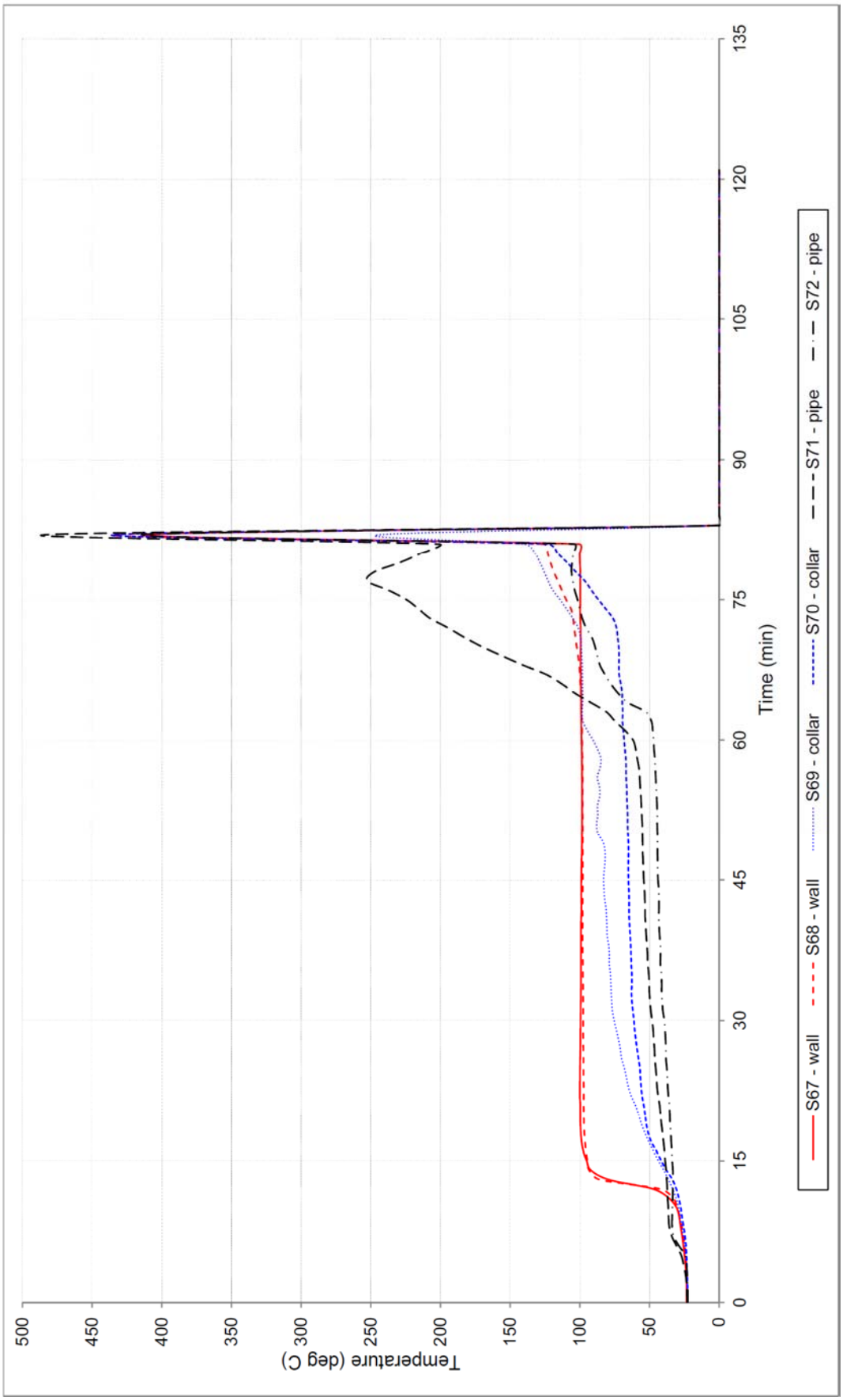


FIGURE 15 – SPECIMEN TEMPERATURE – UNEXPOSED FACE OF THE SPECIMEN 12

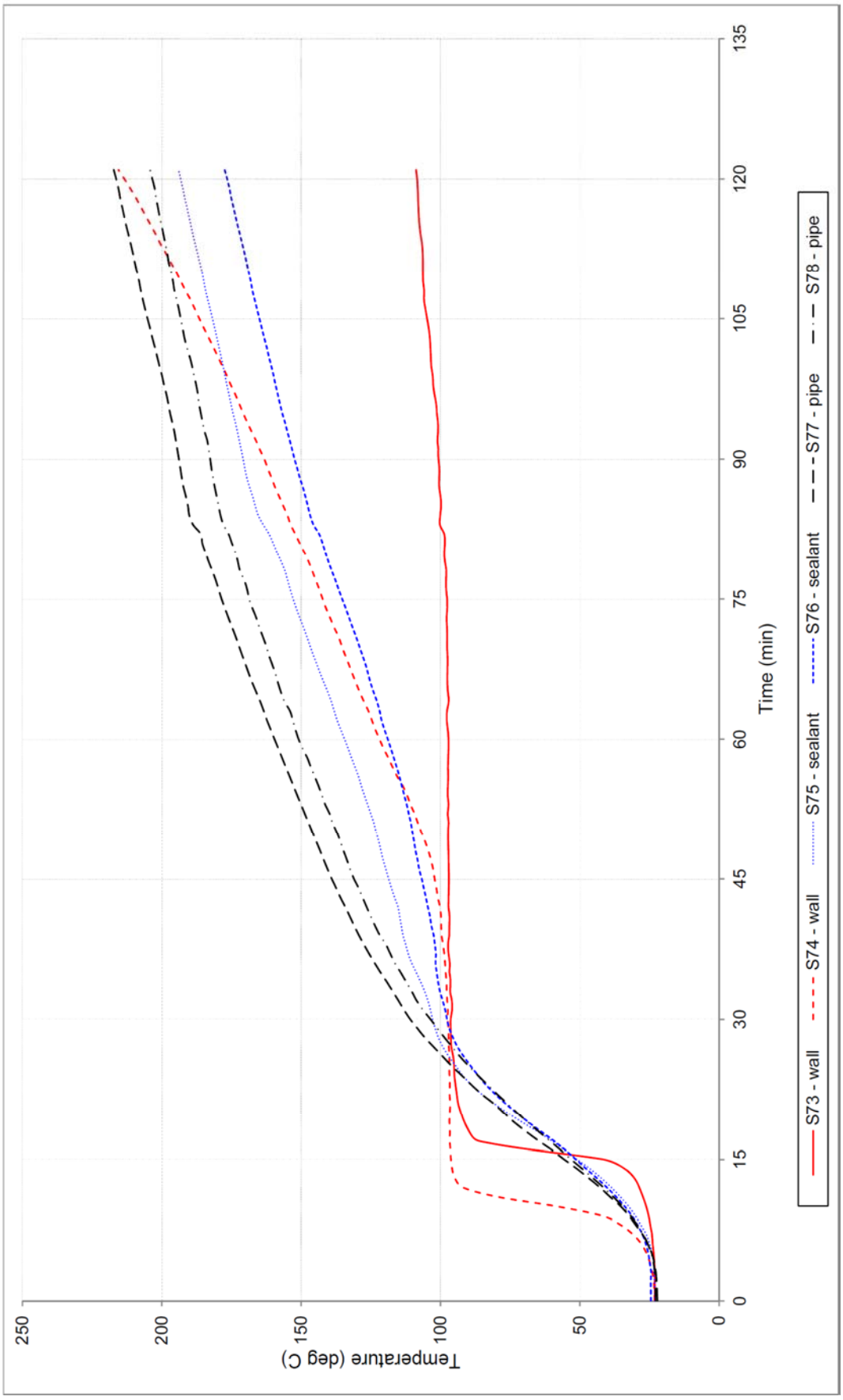


FIGURE 16 – SPECIMEN TEMPERATURE – UNEXPOSED FACE OF THE SPECIMEN 13

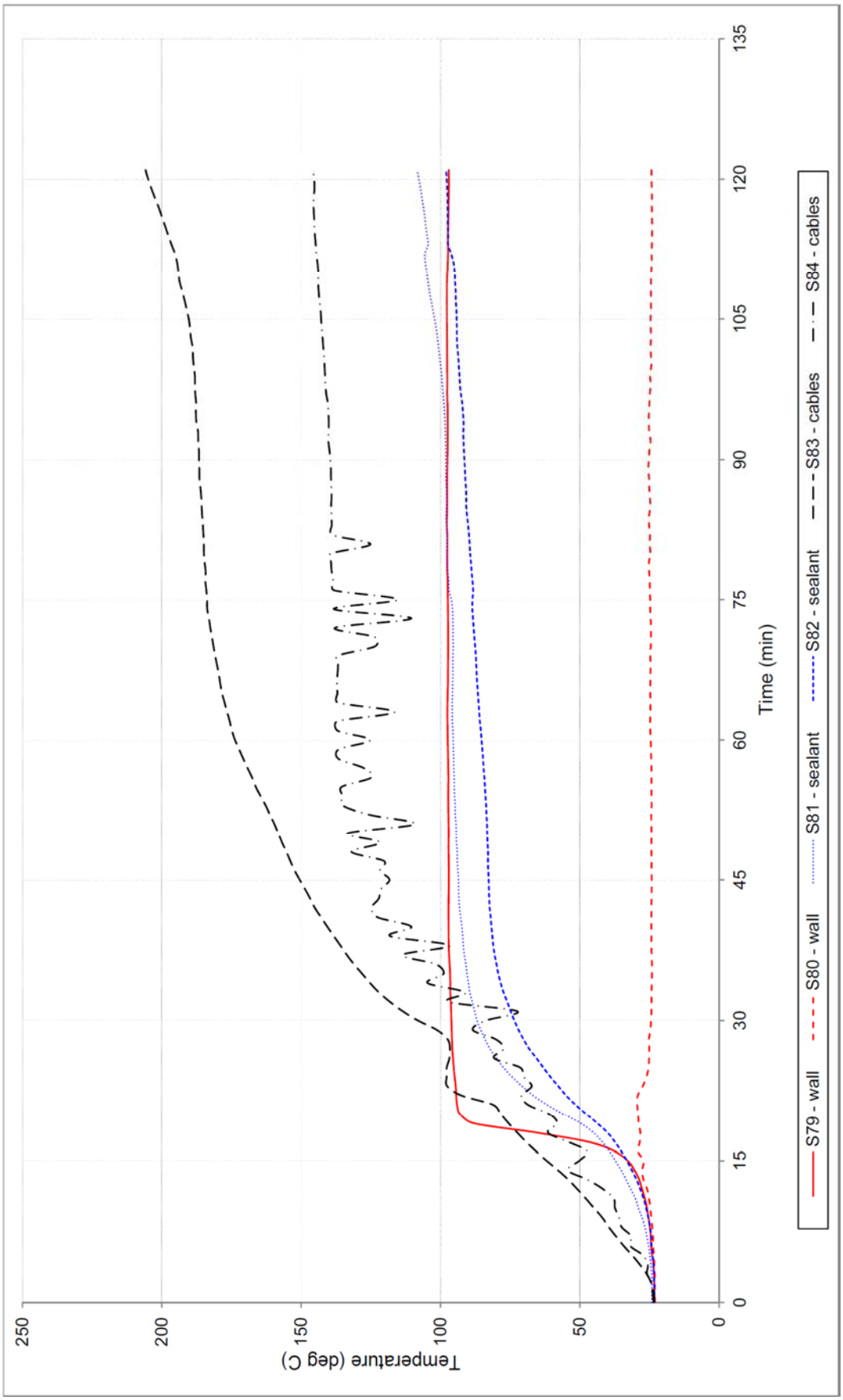


FIGURE 17 – SPECIMEN TEMPERATURE – UNEXPOSED FACE OF THE SPECIMEN 14

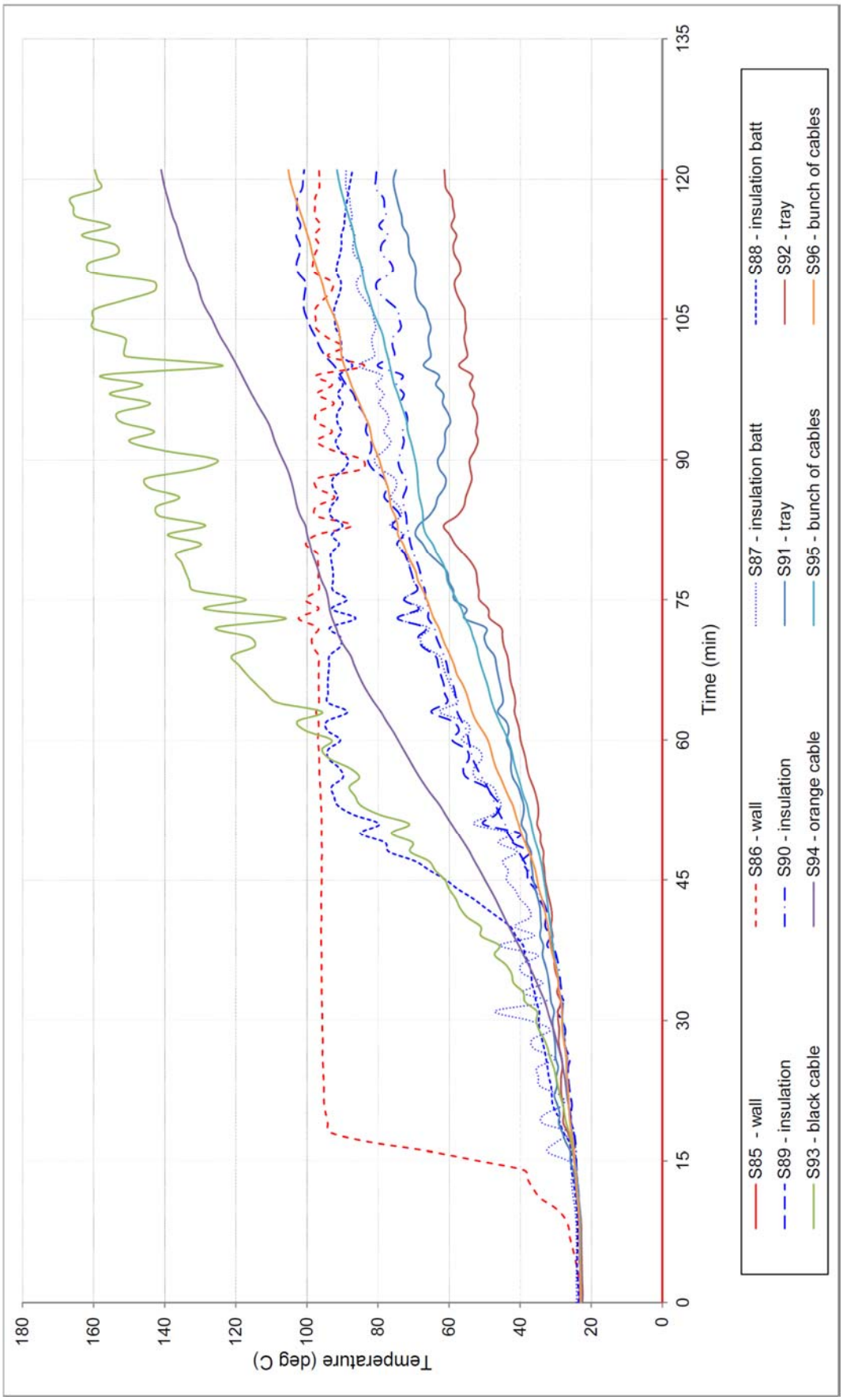


FIGURE 18 – SPECIMEN TEMPERATURE – UNEXPOSED FACE OF THE SPECIMEN 15

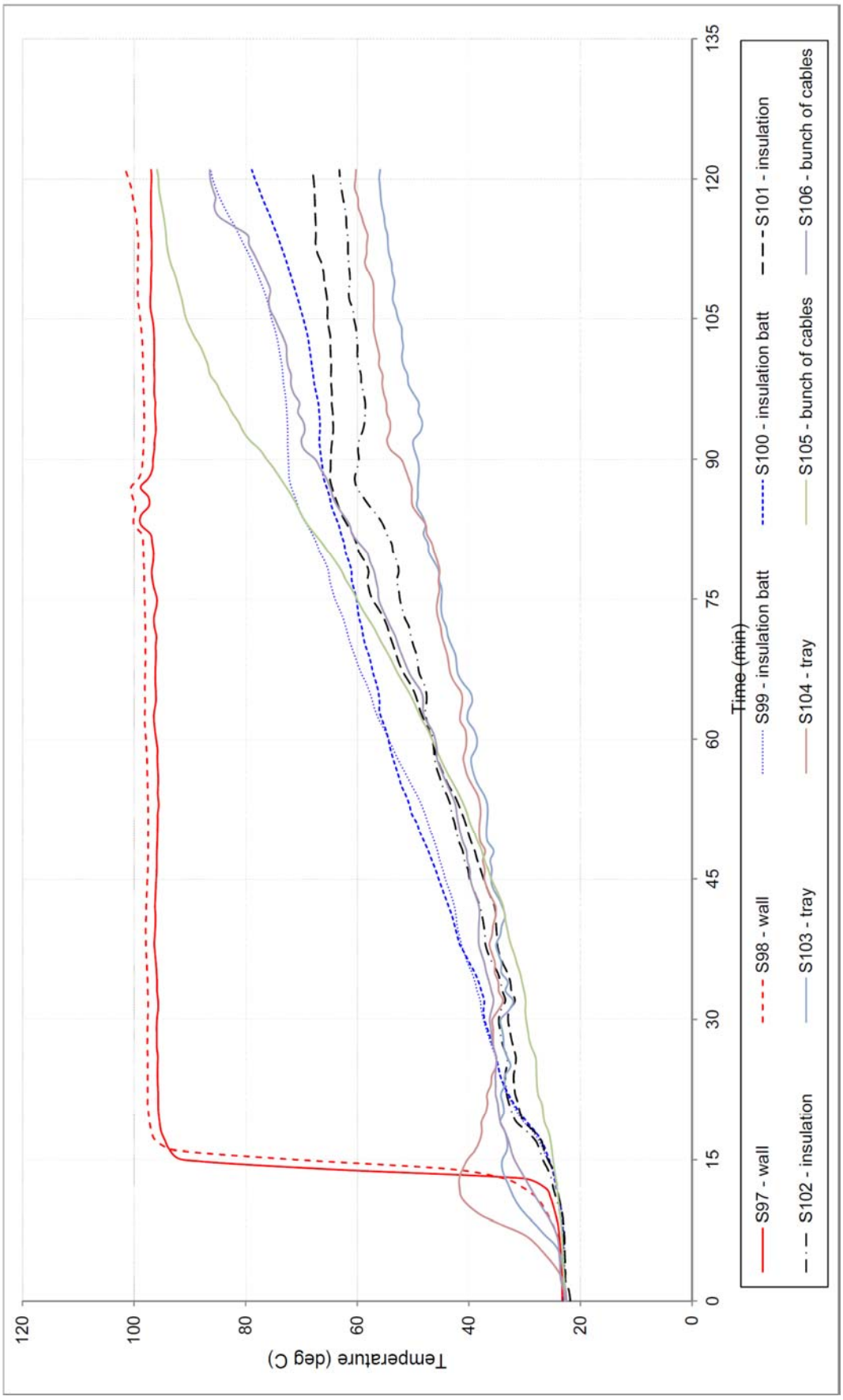


FIGURE 19 – SPECIMEN TEMPERATURE – UNEXPOSED FACE OF THE SPECIMEN 16

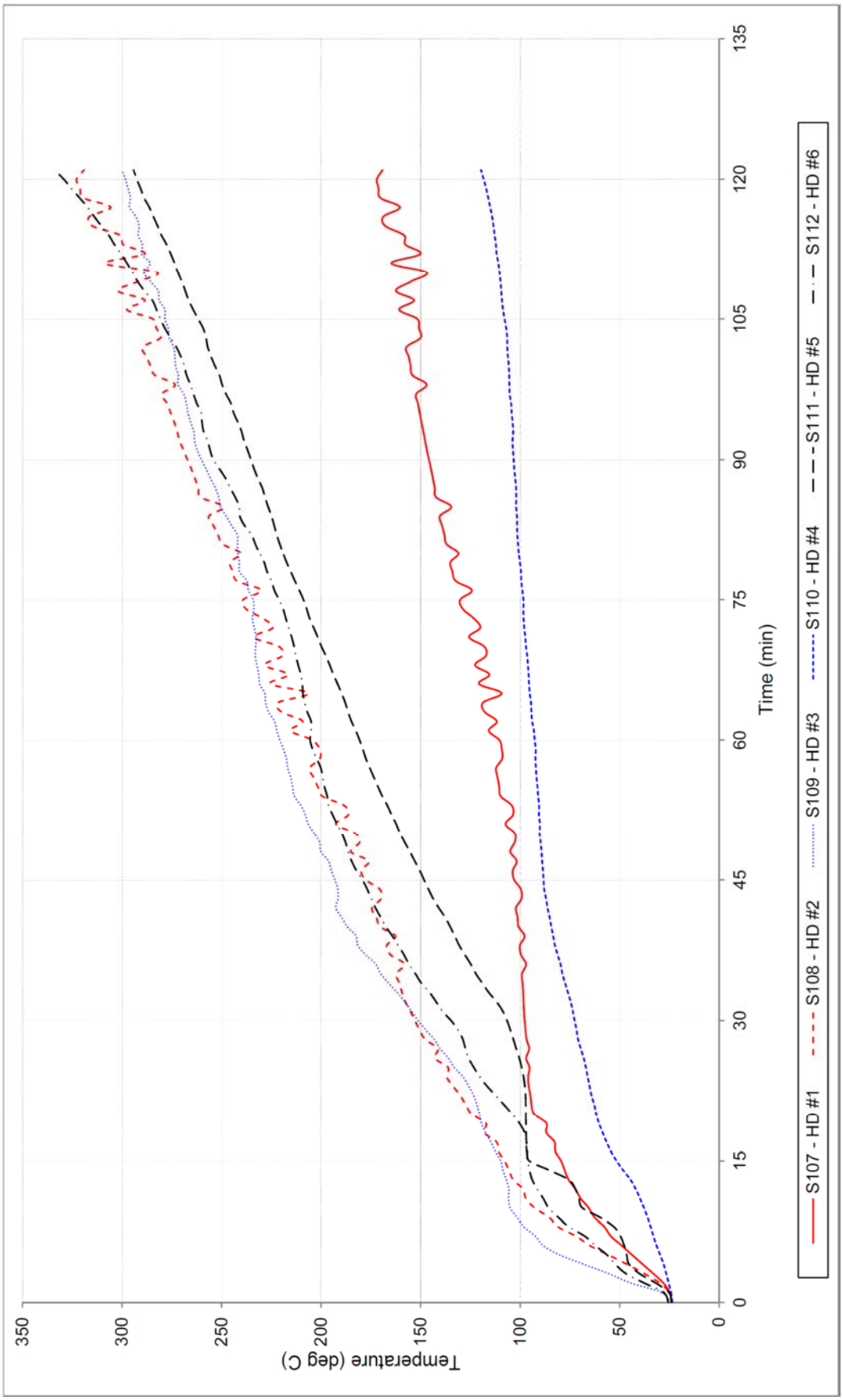
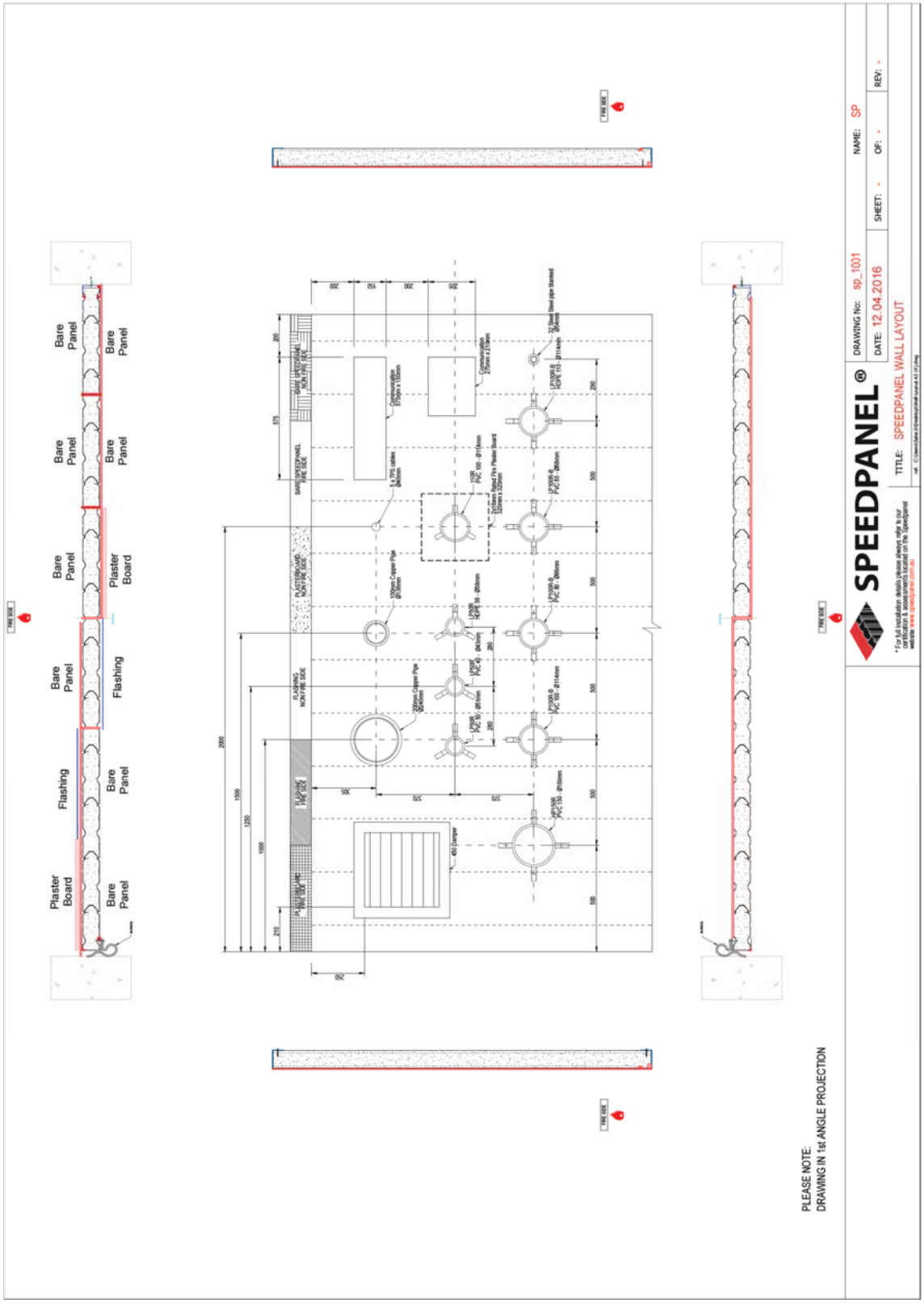
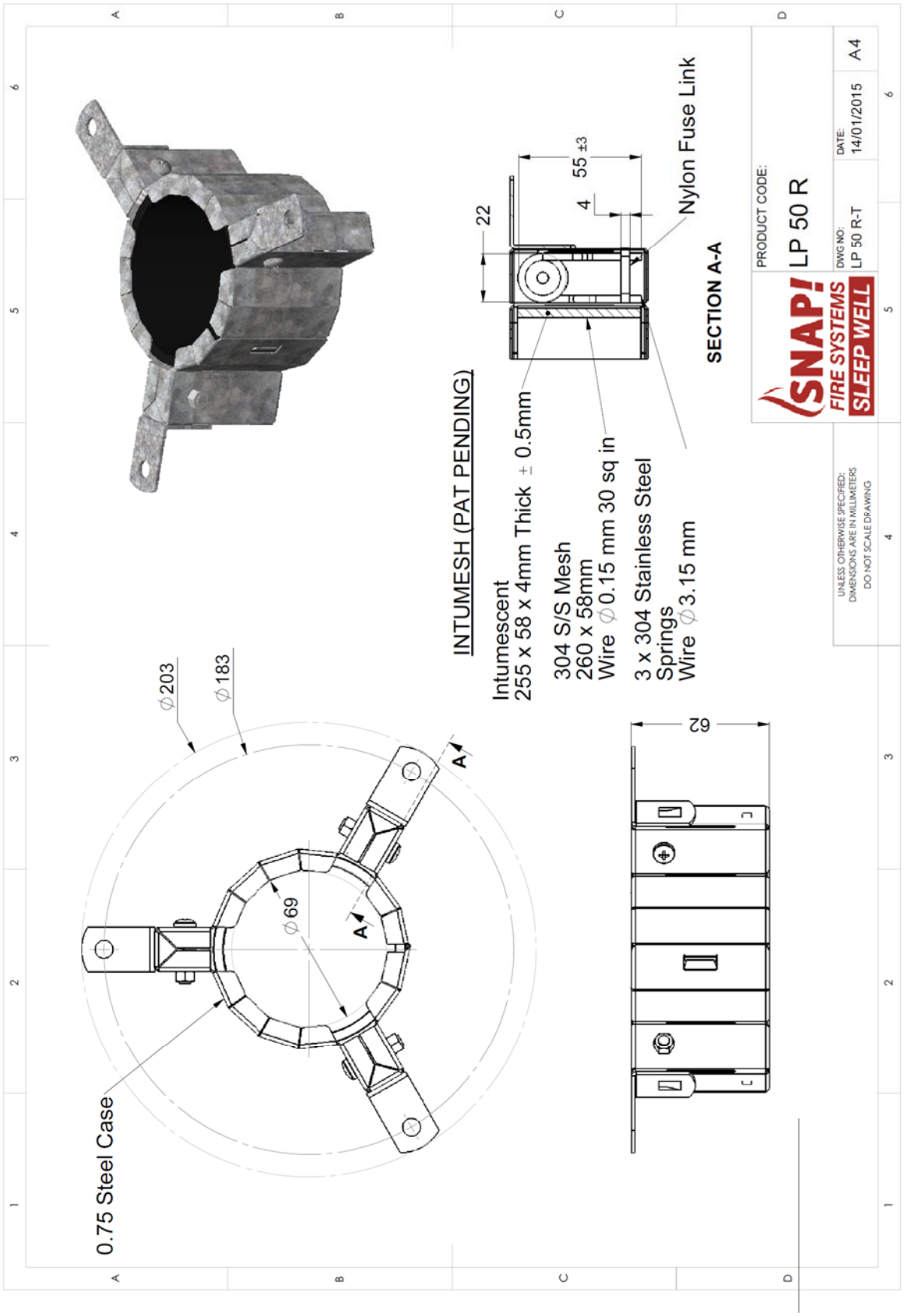


FIGURE 20 – SPECIMEN TEMPERATURE – HEAD DETAIL VARIATIONS

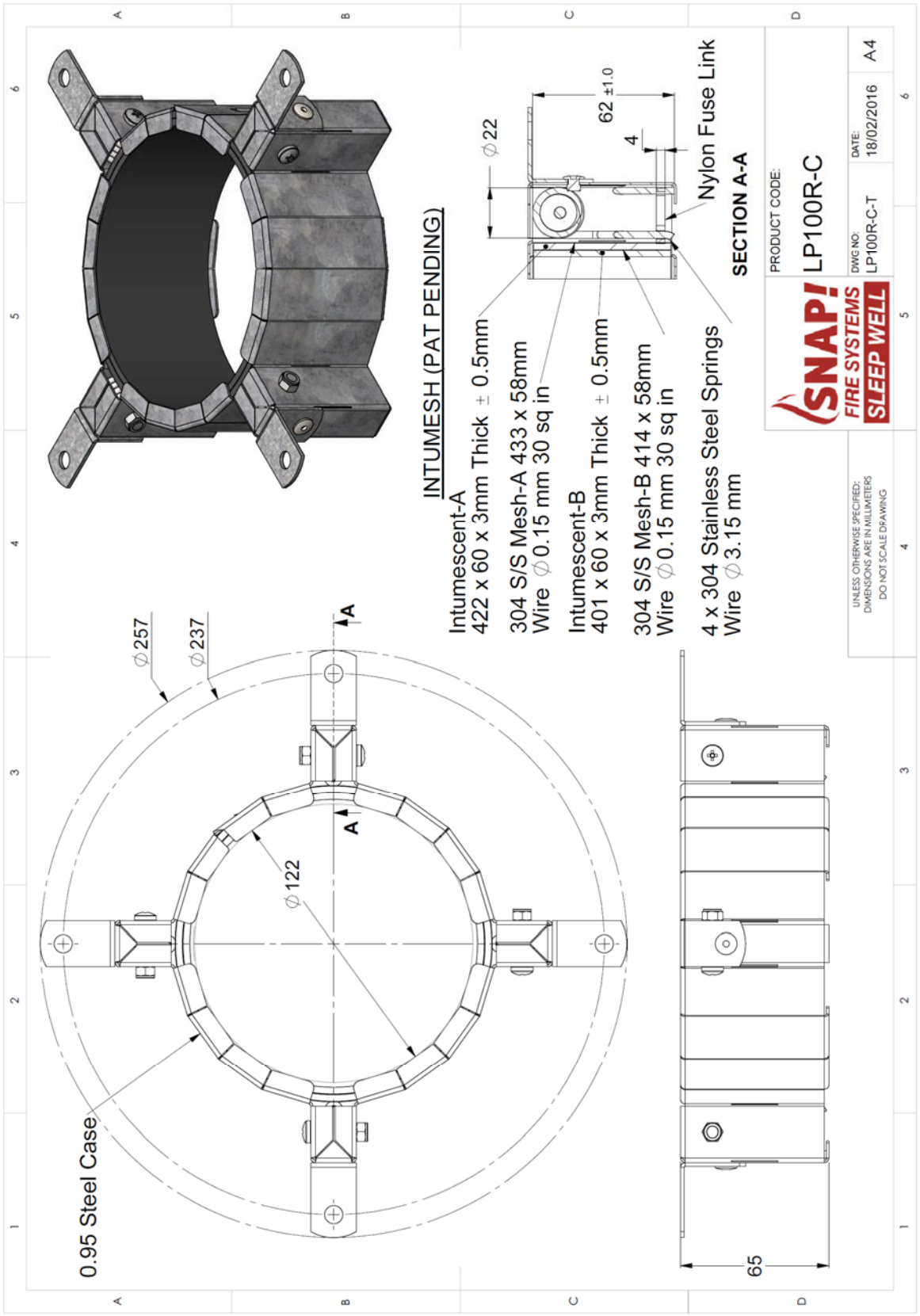
Appendix D – Specimen drawings



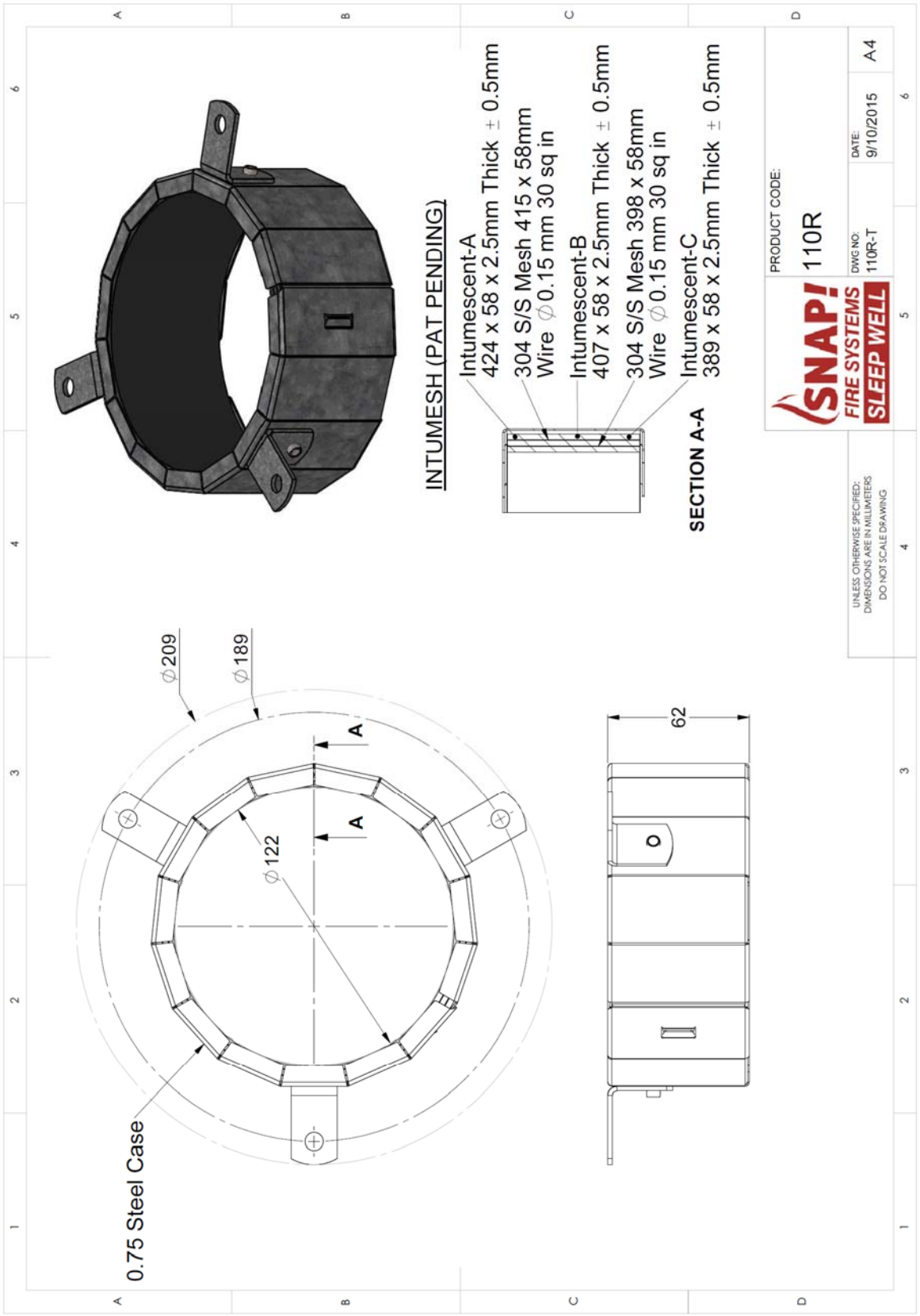
DRAWING NUMBERED SP_1001, DATED 12 APRIL 2016, BY SPEEDPANEL PTY LTD



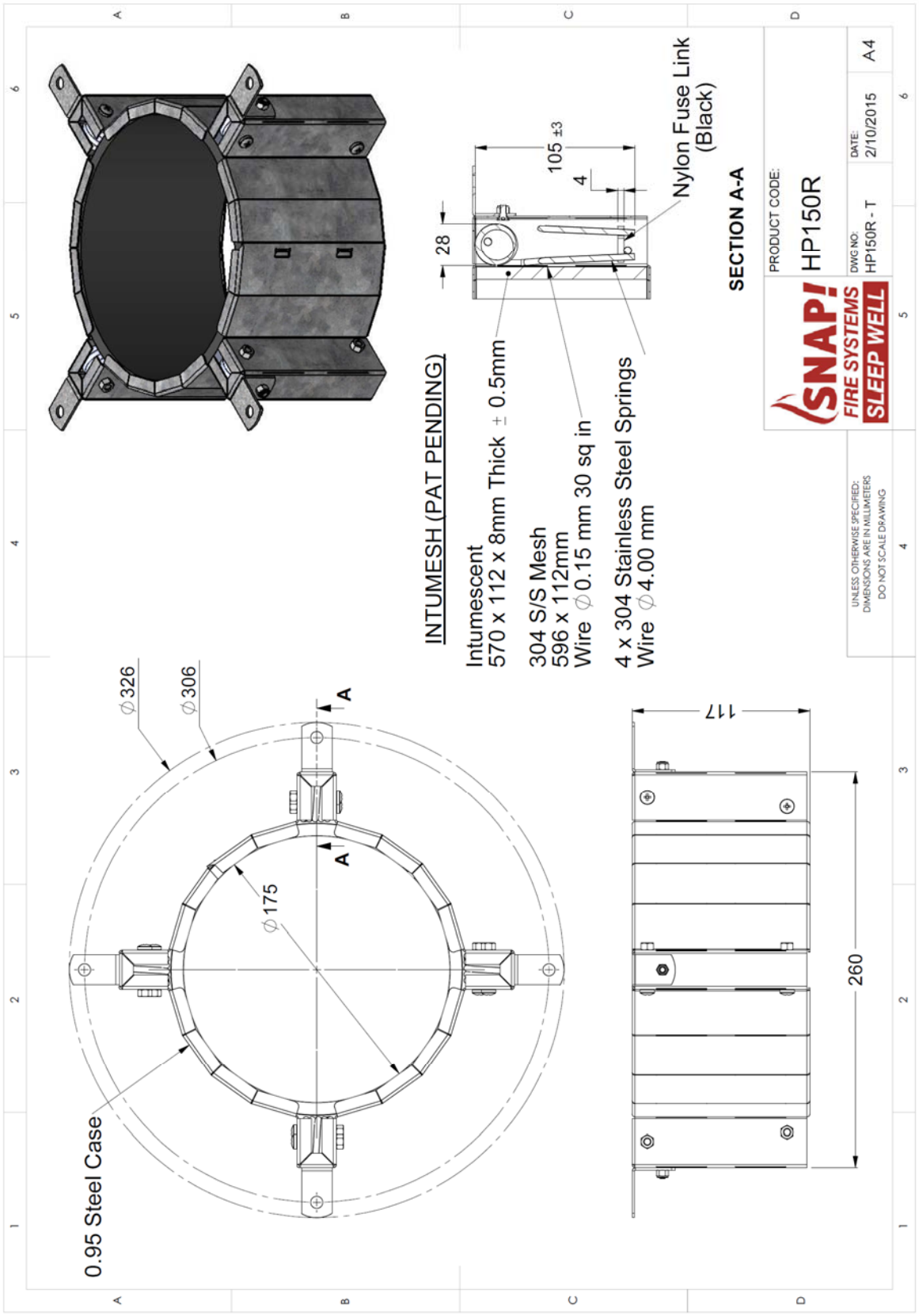
DRAWING NUMBERED LP50 R-T, DATED 14 JANUARY 2015, BY SNAP FIRE SYSTEMS



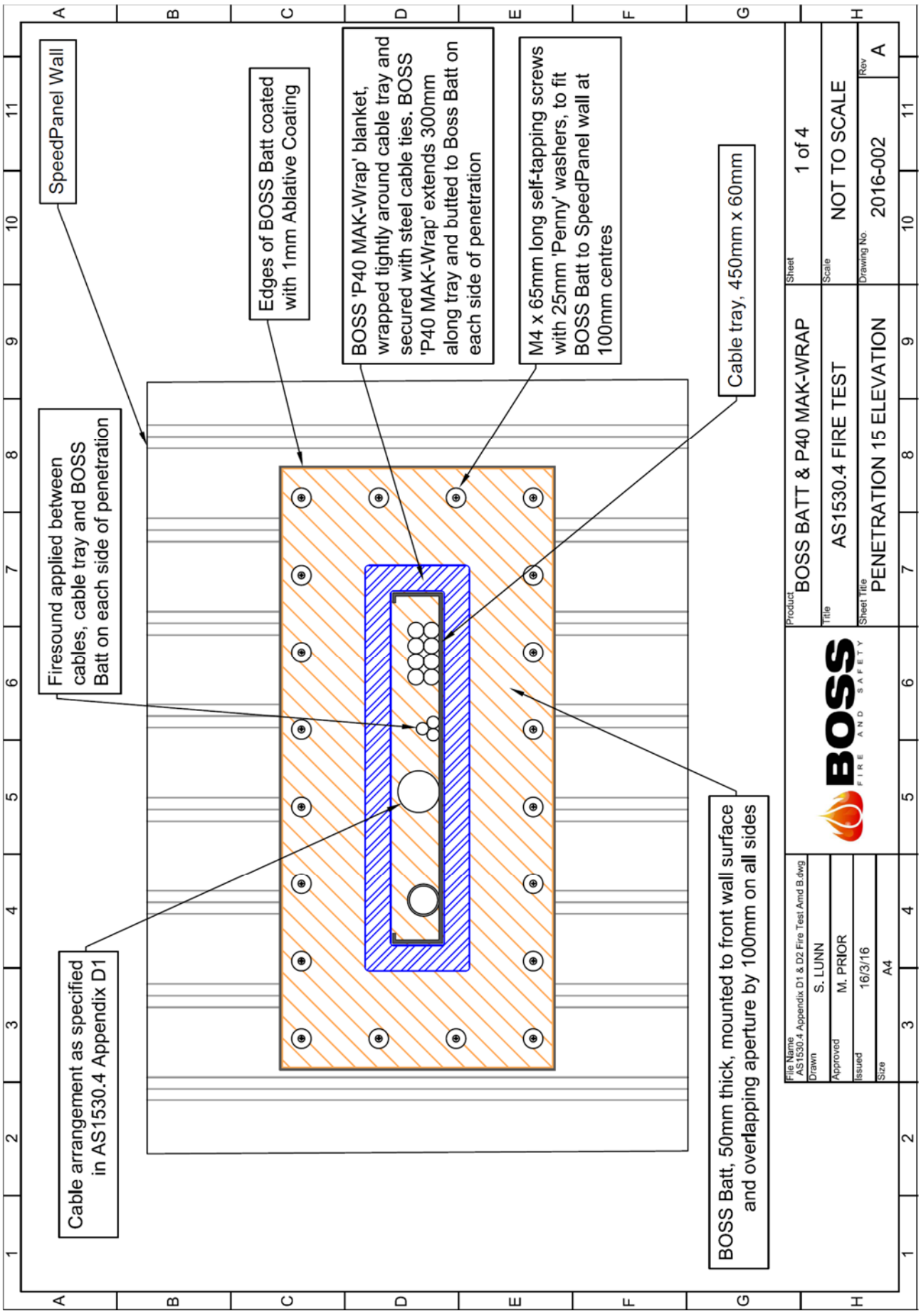
DRAWING NUMBERED LP100 R-C-T, DATED 18 FEBRUARY 2016, BY SNAP FIRE SYSTEMS



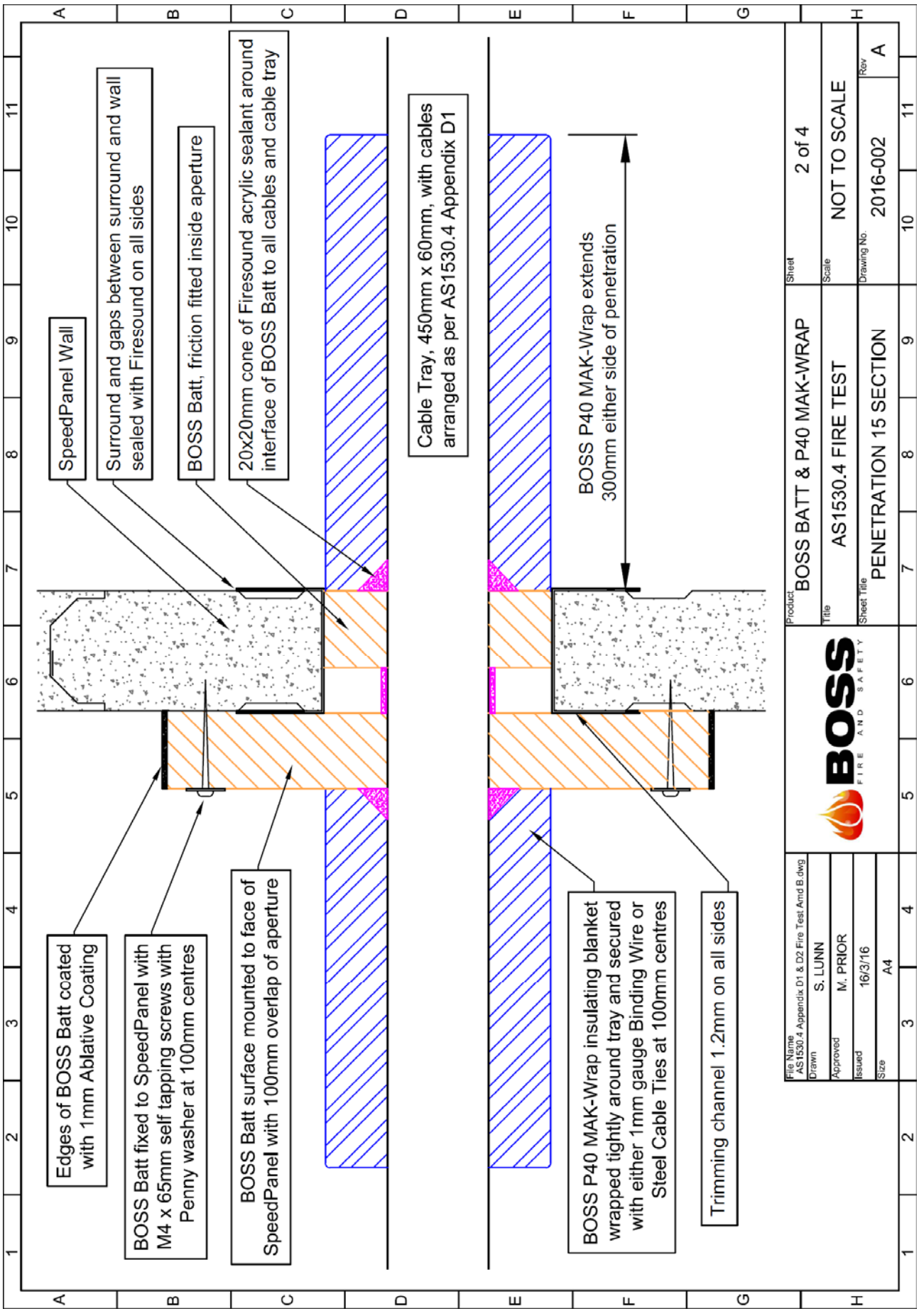
DRAWING NUMBERED LP110R-T, DATED 9 OCTOBER 2015, BY SNAP FIRE SYSTEMS



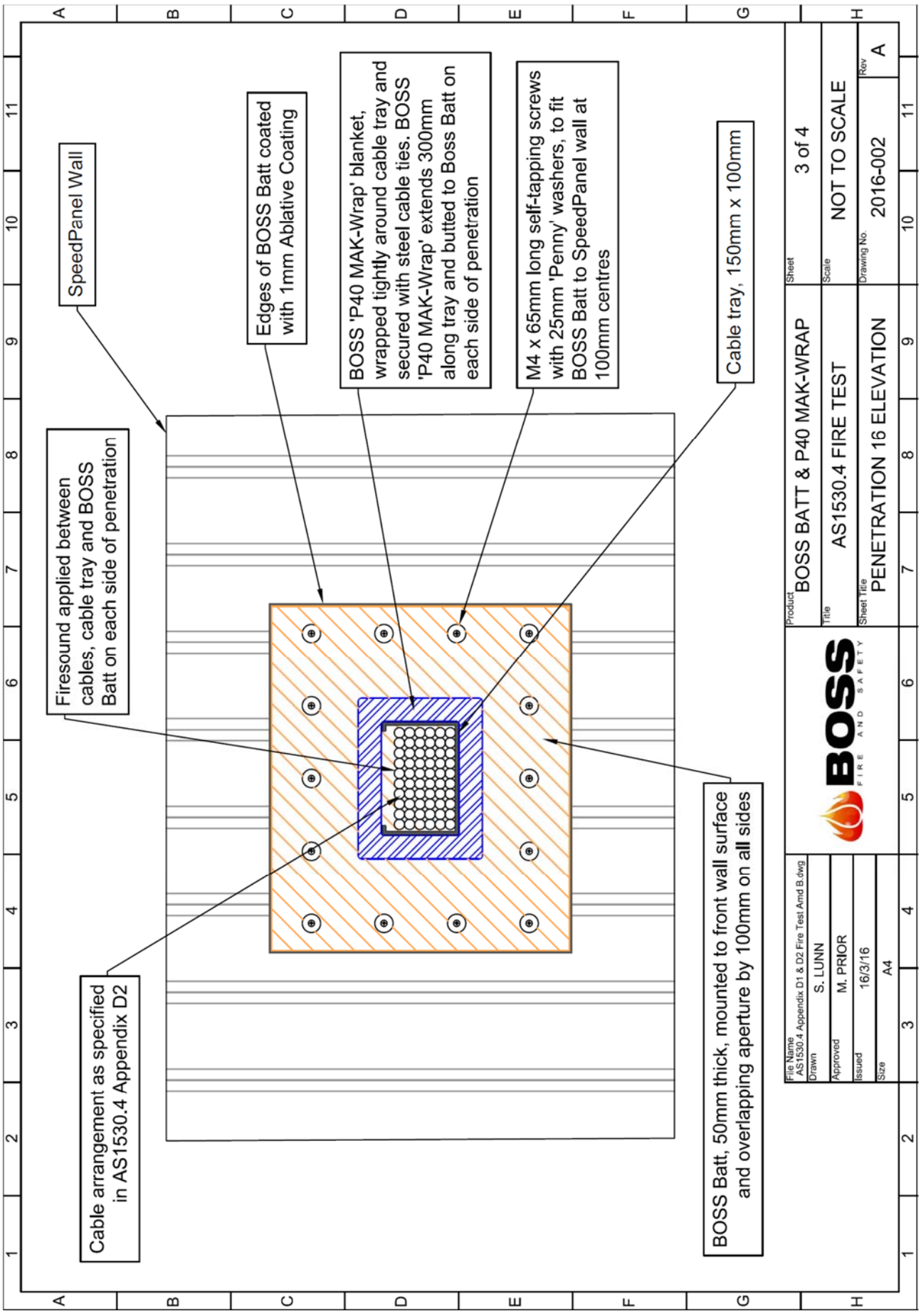
DRAWING NUMBERED LP150 R-T, DATED 2 OCTOBER 2015, BY SNAP FIRE SYSTEMS



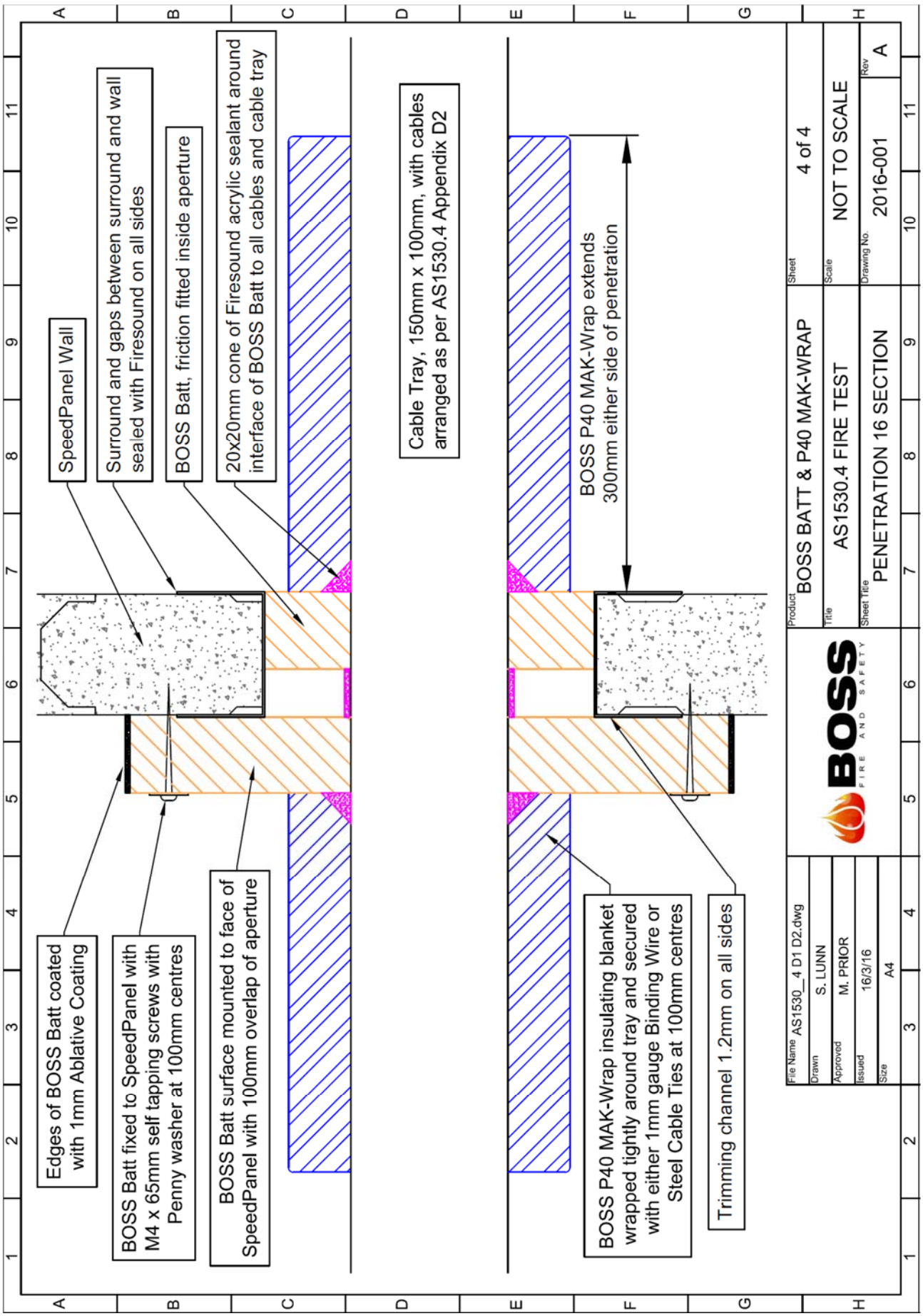
DRAWING NUMBERED 2016-002, SHEET 1 OF 4, DATED 16 MARCH 2016, BY BOSS FIRE AND SAFETY



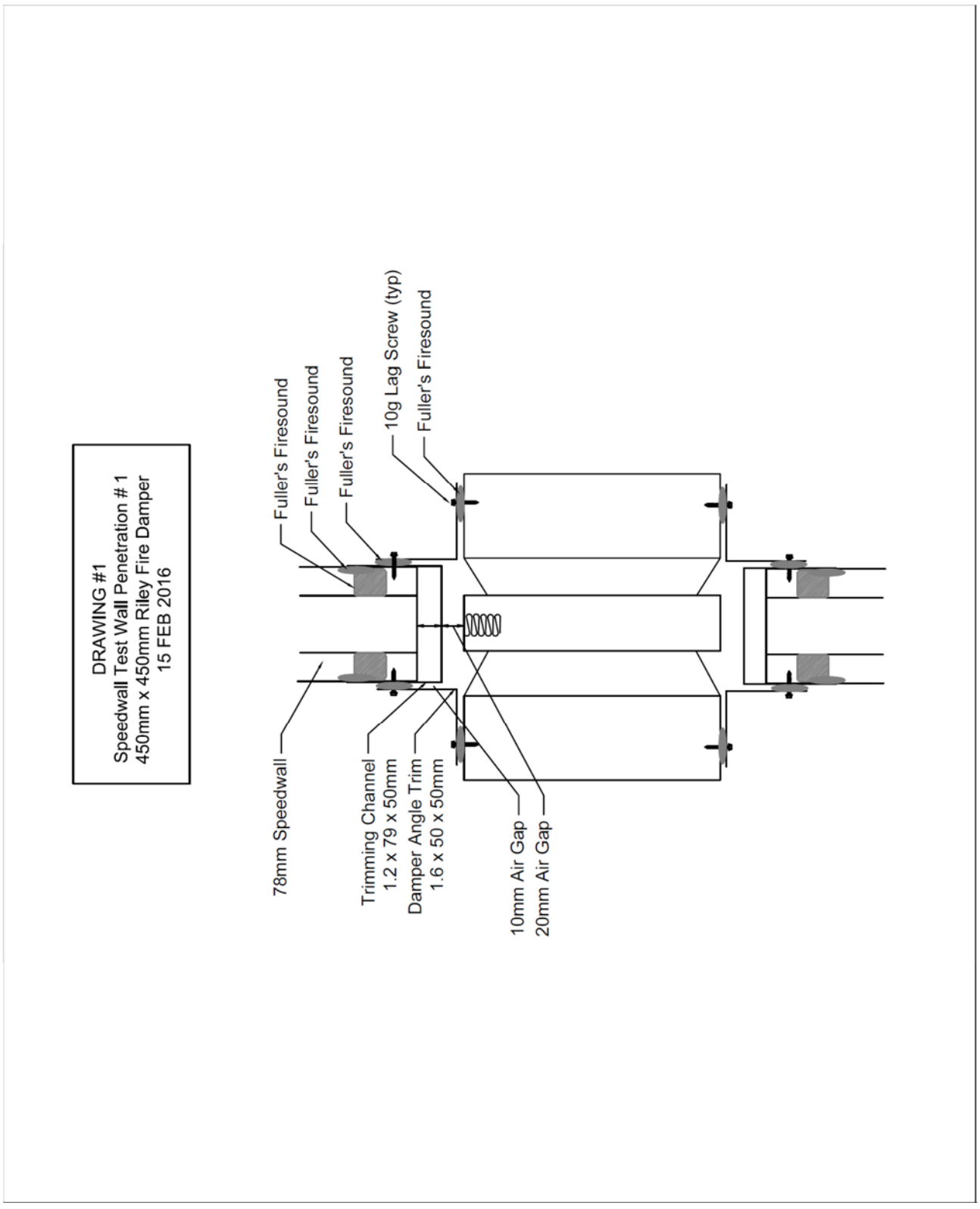
DRAWING NUMBERED 2016-002, SHEET 2 OF 4, DATED 16 MARCH 2016, BY BOSS FIRE AND SAFETY



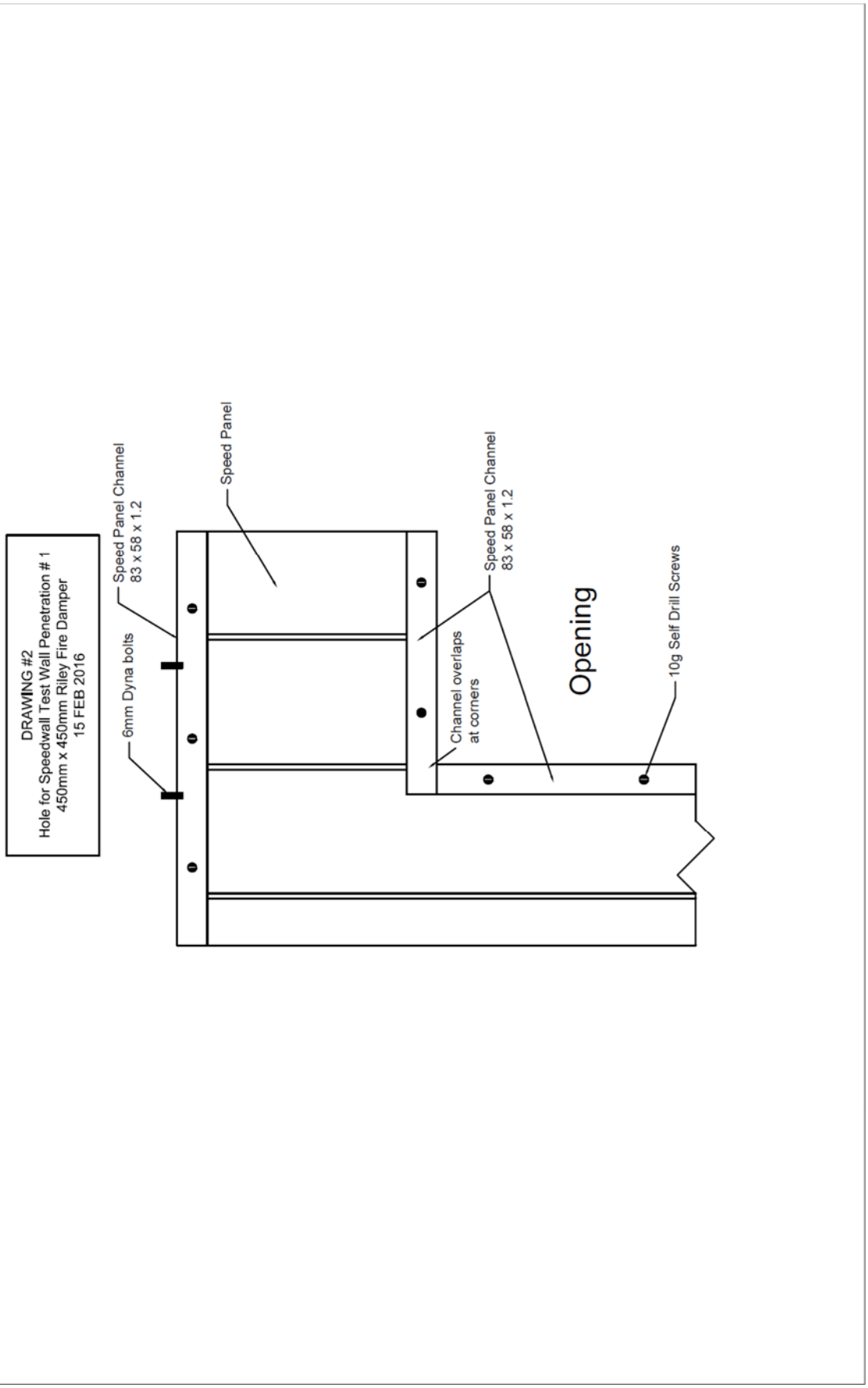
DRAWING NUMBERED 2016-002, SHEET 3 OF 4, DATED 16 MARCH 2016, BY BOSS FIRE AND SAFETY



DRAWING NUMBERED 2016-002, SHEET 4 OF 4, DATED 16 MARCH 2016, BY BOSS FIRE AND SAFETY

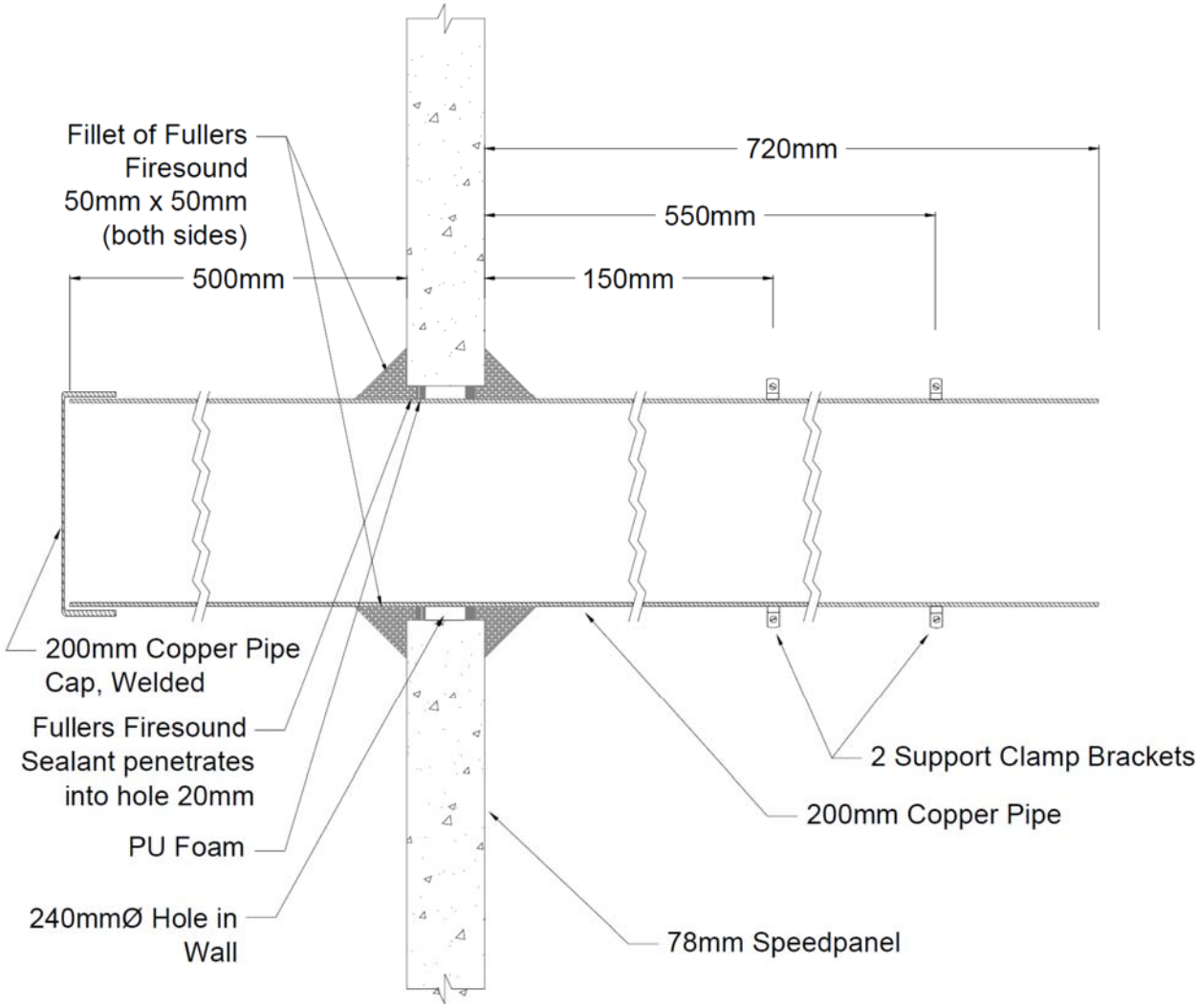


DRAWING NUMBERED 1, DATED 15 FEBRUARY 2016, BY SNAP FIRE SYSTEMS



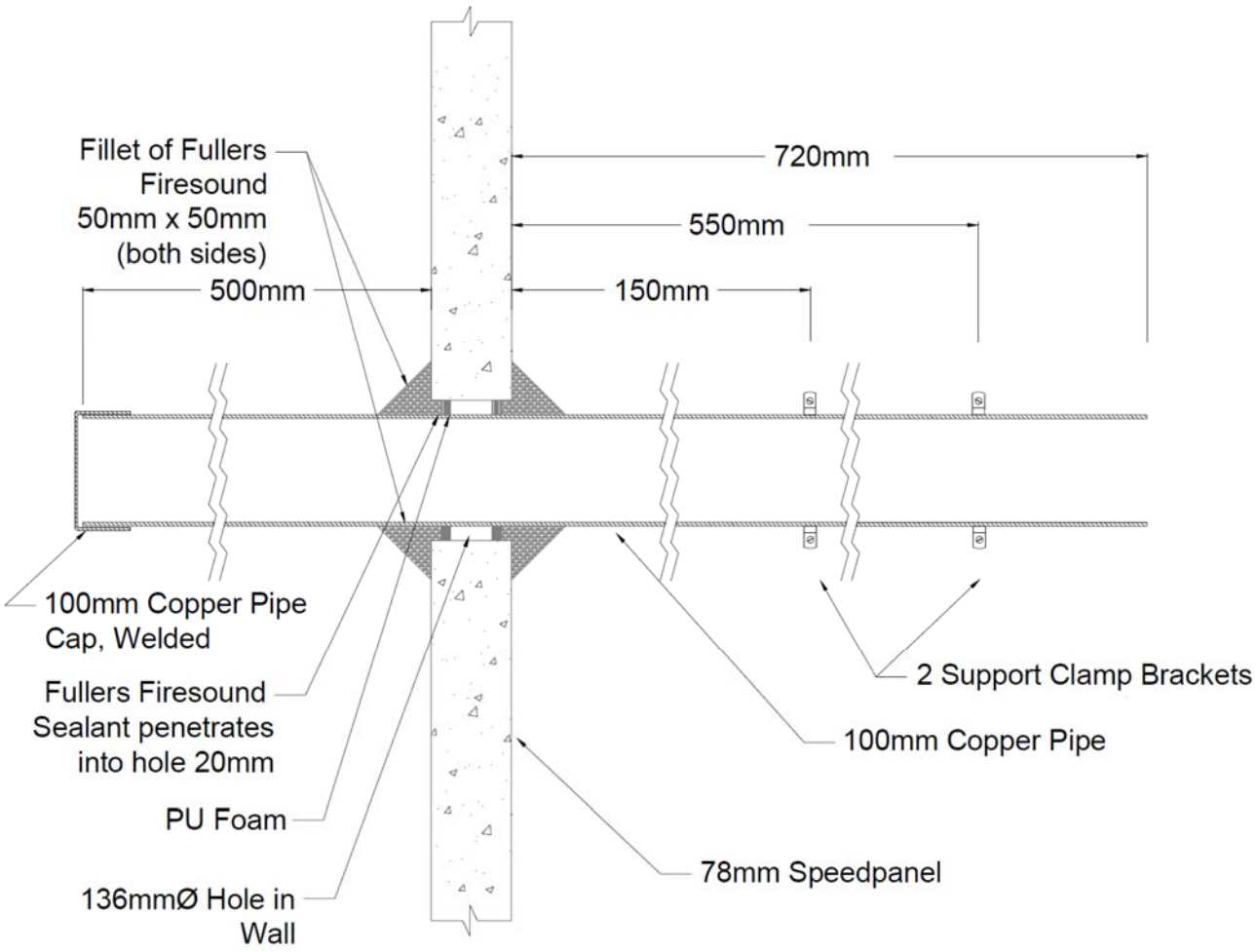
DRAWING NUMBERED 2, DATED 15 FEBRUARY 2016, BY SNAP FIRE SYSTEMS

Drawing #3
Speedpanel Test Wall: Penetration # 2
200mm Copper Pipe – Firesound Filleting
15 FEB 2016



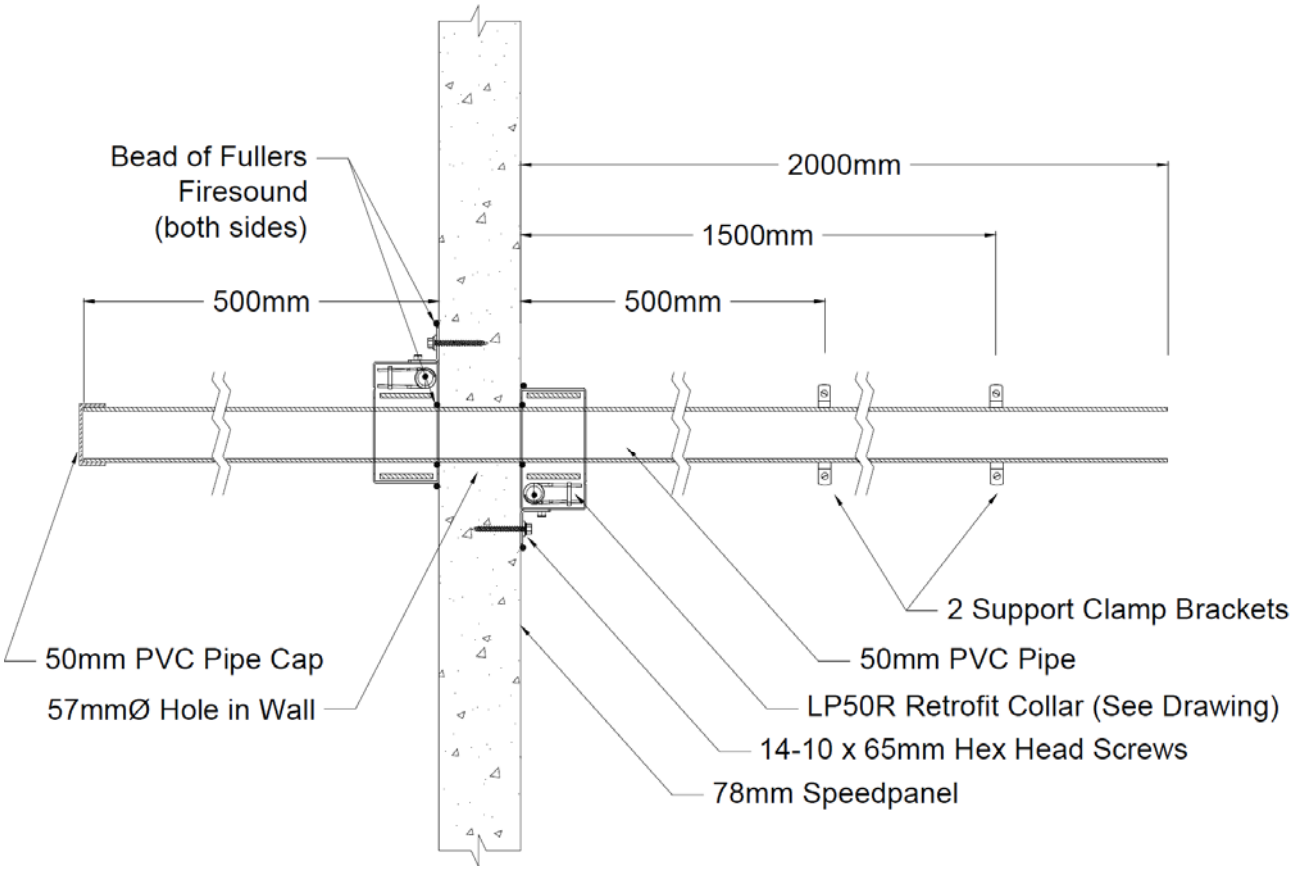
DRAWING NUMBERED 3, DATED 15 FEBRUARY 2016, BY SNAP FIRE SYSTEMS

Drawing #4
Speedpanel Test Wall Penetration # 3
100mm Copper Pipe – Firesound Filleting
15 FEB 2016



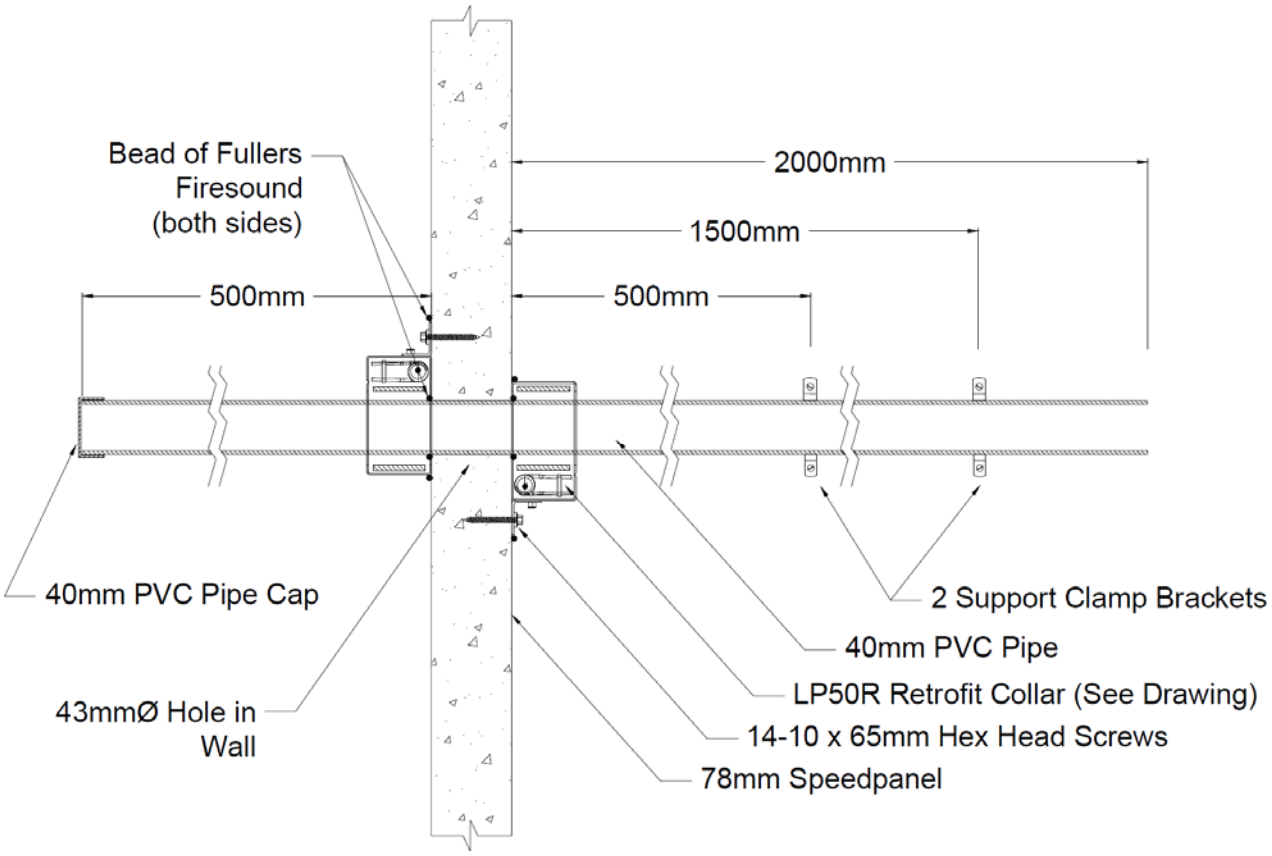
DRAWING NUMBERED 4, DATED 15 FEBRUARY 2016, BY SNAP FIRE SYSTEMS

Drawing #5
Speedpanel Test Wall Penetration # 4
50mm PVC Pipe – LP50R Retrofit Collar
15 FEB 2016



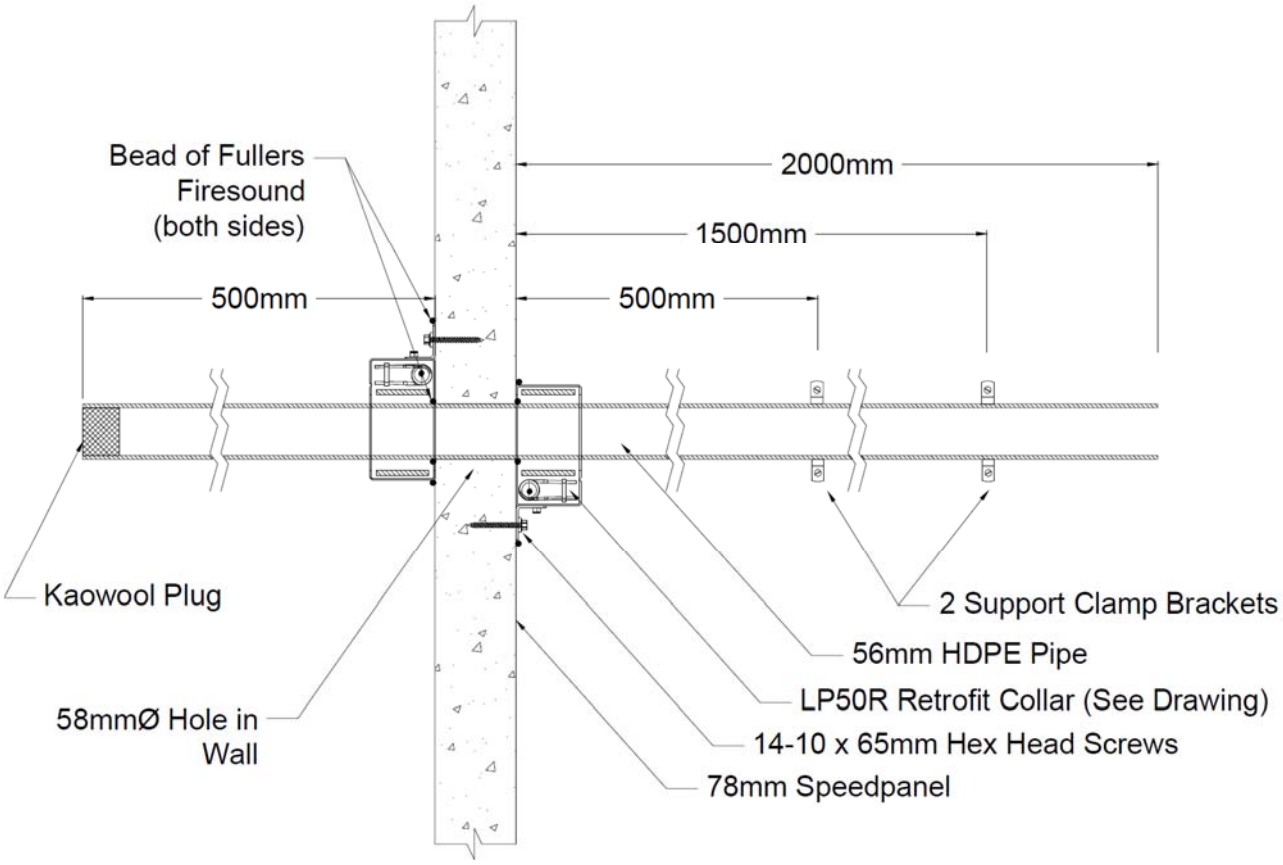
DRAWING NUMBERED 5, DATED 15 FEBRUARY 2016, BY SNAP FIRE SYSTEMS

Drawing #6
Speedpanel Test Wall Penetration # 5
40mm PVC Pipe – LP50R Retrofit Collar
15 FEB 2016



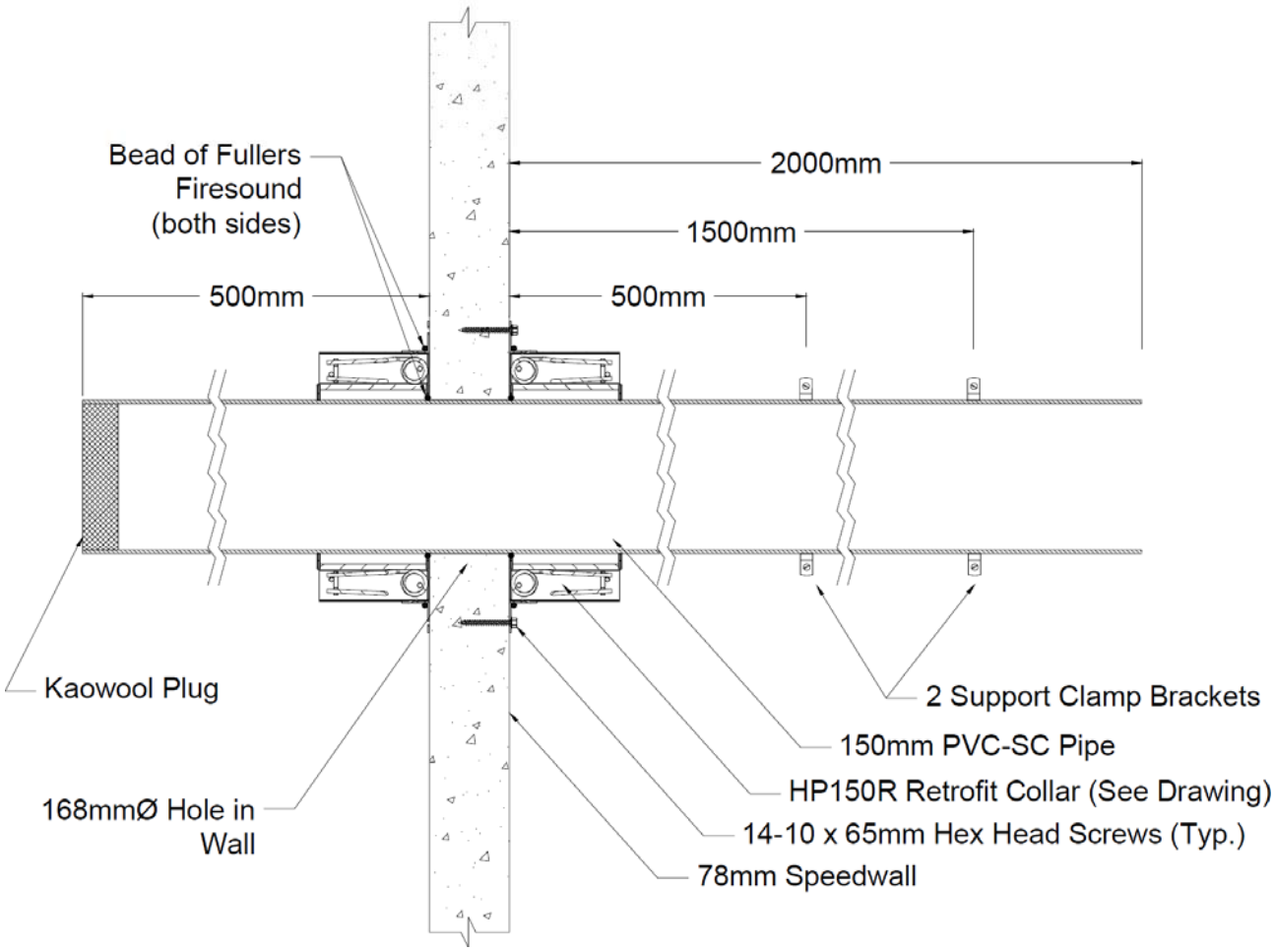
DRAWING NUMBERED 6, DATED 15 FEBRUARY 2016, BY SNAP FIRE SYSTEMS

Drawing #7
Speedpanel Test Wall Penetration # 6
56mm HDPE Pipe – LP50R Retrofit Collar
15 FEB 2016



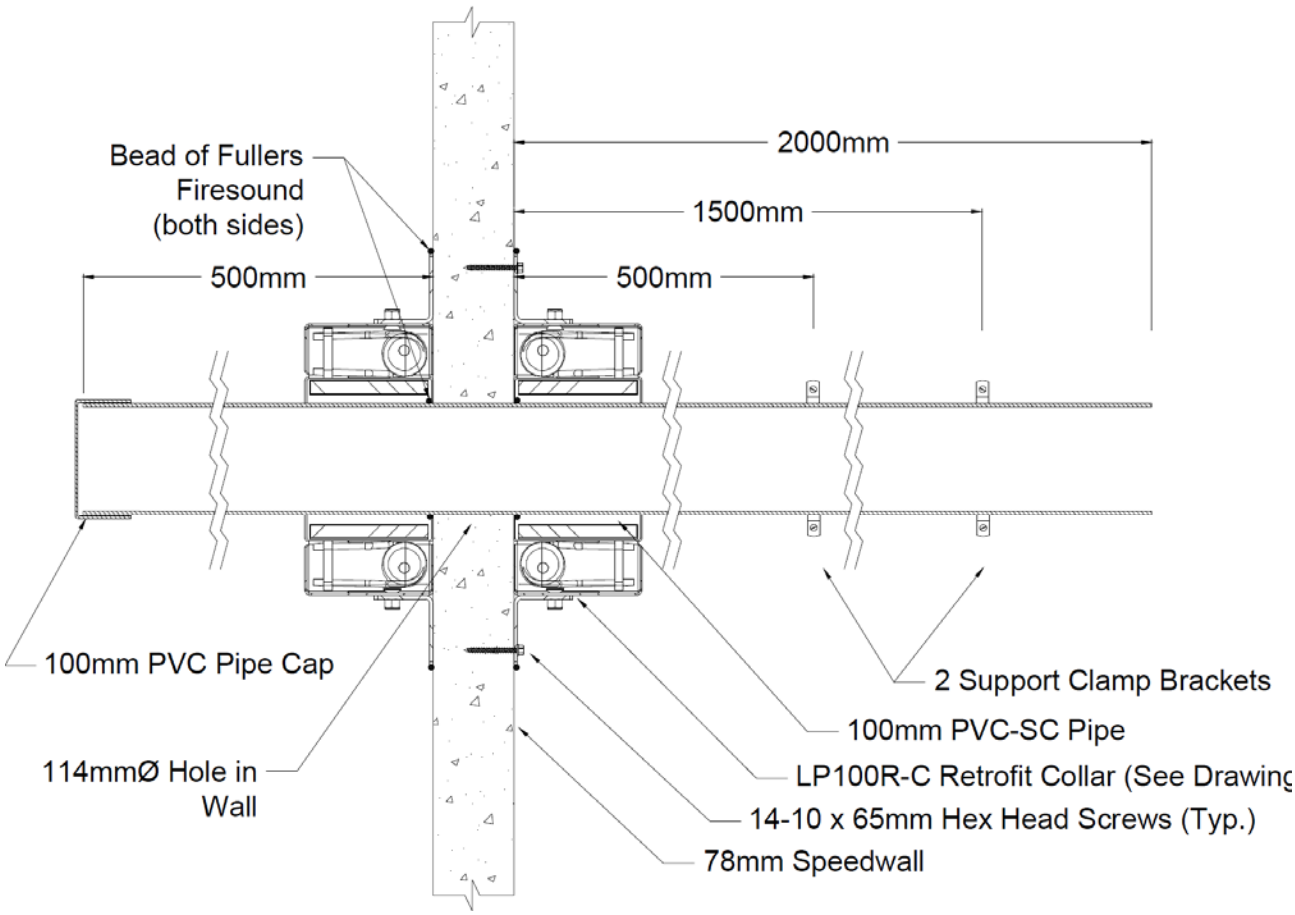
DRAWING NUMBERED 7, DATED 15 FEBRUARY 2016, BY SNAP FIRE SYSTEMS

Speedwall Test Wall Penetration # 7
150mm PVC-SC Pipe – HP150R Retrofit Collar
15 FEB 2016



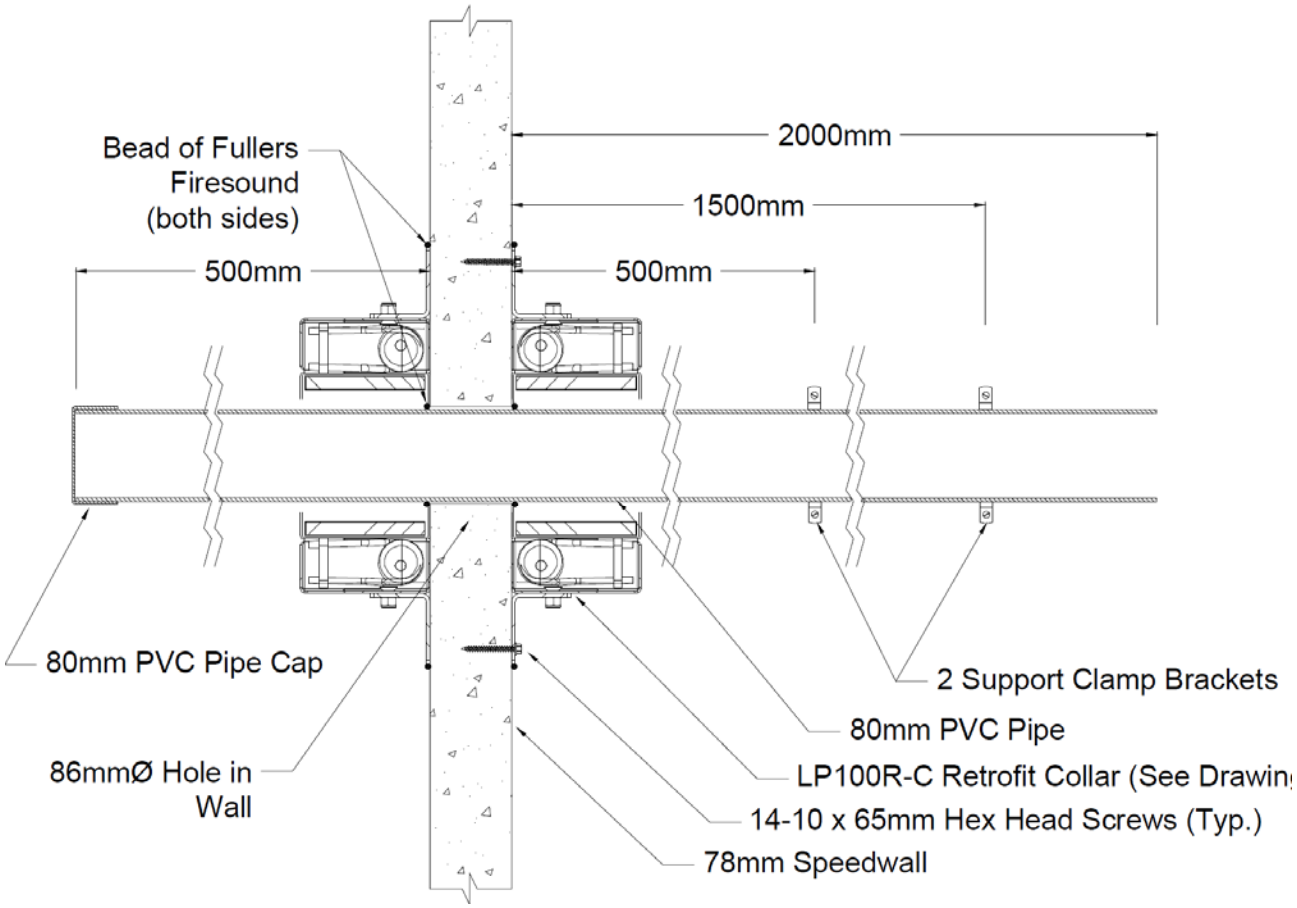
DRAWING NUMBERED 8, DATED 15 FEBRUARY 2016, BY SNAP FIRE SYSTEMS

Speedwall Test Wall Penetration # 8
100mm PVC-SC Pipe – LP100R-C Retrofit Collar
15 FEB 2016



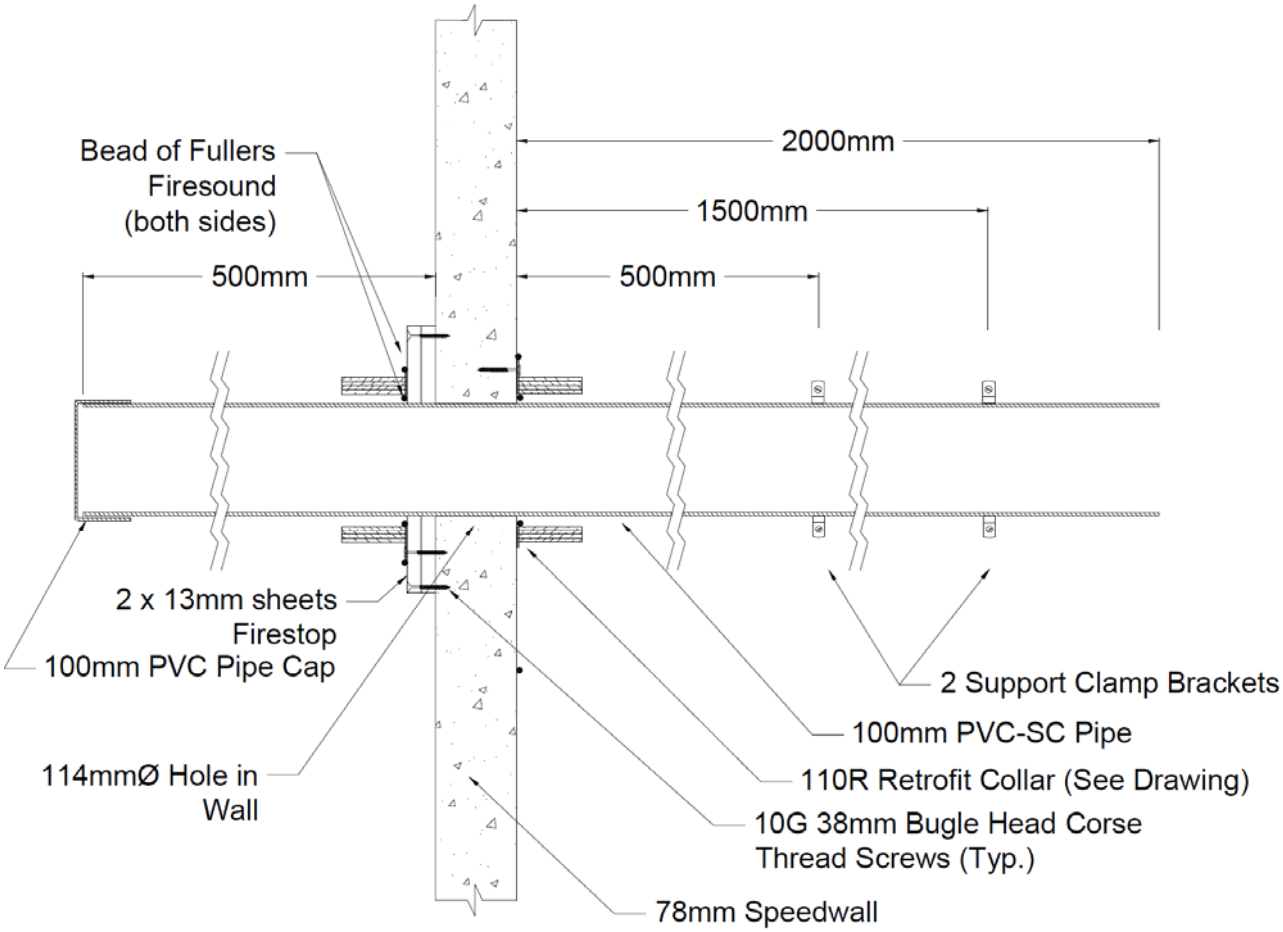
DRAWING NUMBERED 9, DATED 15 FEBRUARY 2016, BY SNAP FIRE SYSTEMS

Speedwall Test Wall Penetration # 9
80mm PVC Pipe – LP100R-C Retrofit Collar
15 FEB 2016



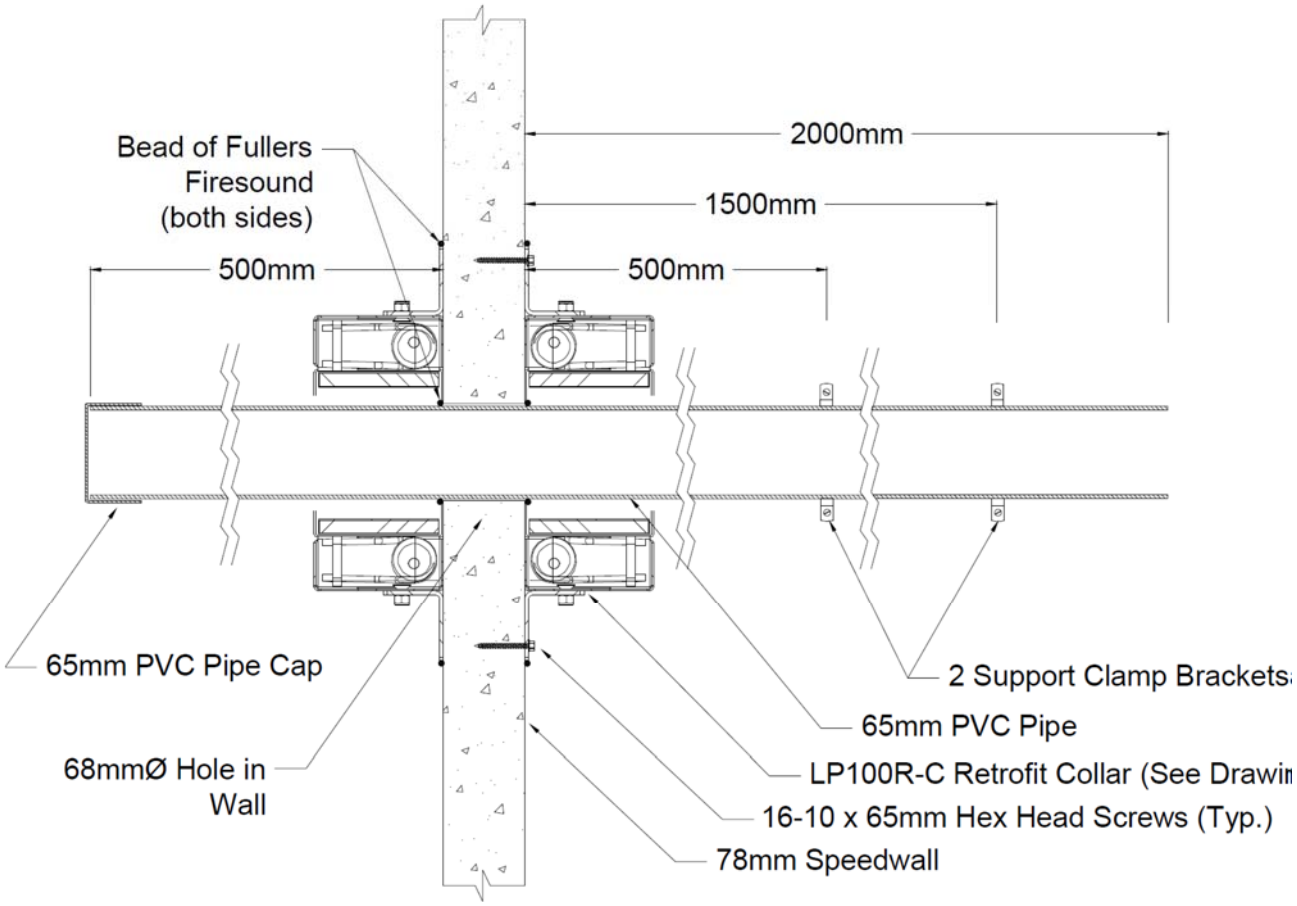
DRAWING NUMBERED 10, DATED 15 FEBRUARY 2016, BY SNAP FIRE SYSTEMS

Speedwall Test Wall Penetration # 10
100mm PVC-SC Pipe – 110R Retrofit Collar
15 FEB 2016



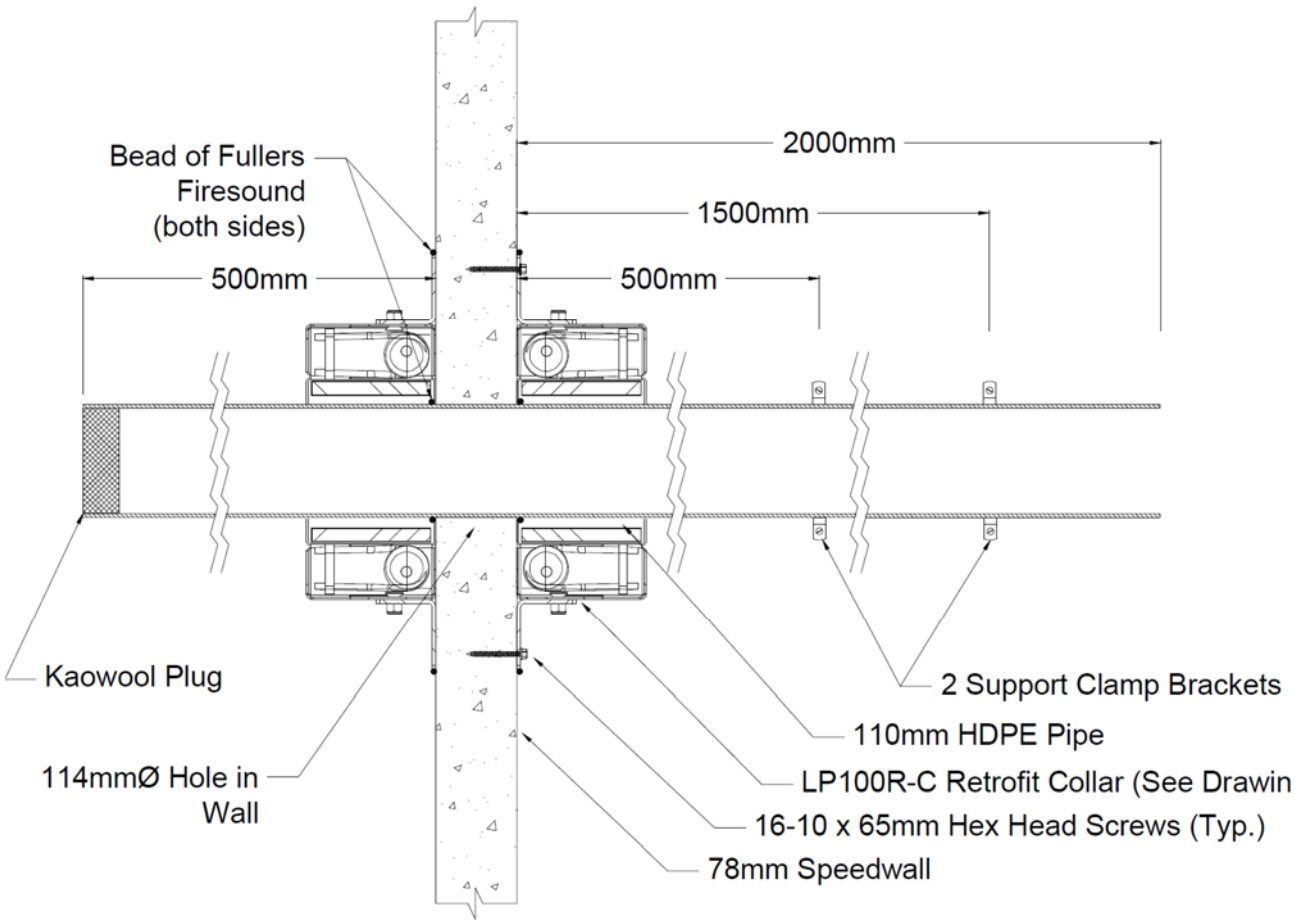
DRAWING NUMBERED 11, DATED 15 FEBRUARY 2016, BY SNAP FIRE SYSTEMS

Speedwall Test Wall Penetration # 11
65mm PVC Pipe – LP100R-C Retrofit Collar
15 FEB 2016



DRAWING NUMBERED 12, DATED 15 FEBRUARY 2016, BY SNAP FIRE SYSTEMS

Speedwall Test Wall Penetration # 12
110mm HDPE Pipe – LP100R-C Retrofit Collar
15 FEB 2016



DRAWING NUMBERED 13, DATED 15 FEBRUARY 2016, BY SNAP FIRE SYSTEMS

Appendix E – Certificate of Test

INFRASTRUCTURE TECHNOLOGIES
www.csiro.au

14 Julius Avenue, North Ryde NSW 2113
PO Box 310, North Ryde NSW 1670, Australia
T (02) 9490 5444 • ABN 41 687 119 230

Certificate of Test

No. 2809

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 4-2005 & 2014 on behalf of:

H.B. Fuller Company Australia Pty Ltd
16-22 Red Gum Drive
Dandenong South VIC 3175

A full description of the test specimen and complete test results are detailed in the Division's Sponsored Investigation report FSV 1731.

Product Name: Specimen 2 – H.B. Fuller Firesound sealant protecting a 240-mm ID opening in a 78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754, penetrated by 202-mm OD copper pipe

PENETRATING SERVICE	
Description	200-mm nominal copper pipe
Size	202-mm OD x 2-mm wall thickness extending 700-mm away from the wall and 500-mm into the furnace chamber
End conditions	Capped on the exposed end using a copper cap, and left open on the unexposed end
Supports	Approximately 100-mm and 500-mm away from the wall
FIRE STOPPING SYSTEM	
Application	20-mm annular gap around the pipe sealed on both sides of the wall with Firesound sealant to a nominal depth of 20-mm controlled by open cell polyurethane backing rod, and finished with a 50-mm fillet.
Drawing	Drawing numbered 3, dated 15 February 2016.

The element of construction described above satisfied the following criteria for fire-resistance for the period stated:

Structural Adequacy	not applicable
Integrity	no failure at 121 minutes
Insulation	17 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/120/0. The FRL is applicable for exposure to fire from either direction. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.

Testing Officer: Chris Wojcik Date of Test: 16 December 2015

Issued on the 9th day of June 2016 without alterations or additions.

Brett Roddy
Manager, Fire Testing and Assessments

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

COPY OF CERTIFICATE OF TEST – NO. 2809

INFRASTRUCTURE TECHNOLOGIES
www.csiro.au

14 Julius Avenue, North Ryde NSW 2113
PO Box 310, North Ryde NSW 1670, Australia
T (02) 9490 5444 • ABN 41 687 119 230

Certificate of Test

No. 2810

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 4-2005 & 2014 on behalf of:

H.B. Fuller Company Australia Pty Ltd
16-22 Red Gum Drive
Dandenong South VIC 3175

A full description of the test specimen and complete test results are detailed in the Division's Sponsored Investigation report FSV 1731.

Product Name: Specimen 3 – H.B. Fuller Firesound sealant protecting a 136-mm ID opening in a 78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754, penetrated by 102-mm OD copper pipe

PENETRATING SERVICE	
Description	100-mm nominal copper pipe
Size	102-mm OD x 3-mm wall thickness extending 720-mm away from the wall and 500-mm into the furnace chamber
End conditions	Capped on the exposed end using a copper cap, and left open on the unexposed end
Supports	Approximately 100-mm and 500-mm away from the wall
FIRE STOPPING SYSTEM	
Application	17-mm annular gap around the pipe sealed on both sides of the wall with Firesound sealant to a nominal depth of 20-mm controlled by open cell polyurethane backing rod, and finished with a 50-mm fillet.
Drawing	Drawing numbered 4, dated 15 February 2016.

The element of construction described above satisfied the following criteria for fire-resistance for the period stated:

Structural Adequacy	not applicable
Integrity	no failure at 121 minutes
Insulation	20 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/120/0. The FRL is applicable for exposure to fire from either direction. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.

Testing Officer: Chris Wojcik Date of Test: 16 December 2015

Issued on the 9th day of June 2016 without alterations or additions.

Brett Roddy
Manager, Fire Testing and Assessments

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

COPY OF CERTIFICATE OF TEST – NO. 2810

INFRASTRUCTURE TECHNOLOGIES
www.csiro.au

14 Julius Avenue, North Ryde NSW 2113
PO Box 310, North Ryde NSW 1670, Australia
T (02) 9490 5444 • ABN 41 687 119 230

Certificate of Test

No. 2811

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 4-2005 & 2014 on behalf of:

H.B. Fuller Company Australia Pty Ltd
16-22 Red Gum Drive
Dandenong South VIC 3175

A full description of the test specimen and complete test results are detailed in the Division's Sponsored Investigation report FSV 1731.

Product Name: Specimen 4 – Snap LP50R Retrofit fire collar and H.B. Fuller Firesound sealant protecting a 57-mm ID opening in a 78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754, penetrated by 57-mm OD uPVC pipe

PENETRATING SERVICE	
Description	50-mm nominal uPVC pipe
Size	57-mm OD x 2.5-mm wall thickness extending 2000-mm away from the wall and 500-mm into the furnace chamber
End conditions	Capped on the exposed end using a uPVC cap, and left open on the unexposed end
Supports	Approximately 500-mm and 1500-mm away from the wall
FIRE STOPPING SYSTEM	
Application	Fire collars were fitted around the pipe on both sides of the wall and fixed to the wall through the collar's three mounting tabs using 14-10 x 65-mm long hex head screws. Annular gaps around the pipe and the base of the collars were sealed on both sides of the wall with a bead of Firesound sealant.
Drawing	Drawing # LP 50 R-T, dated 14/09/14, by Snap Fire Systems. Drawing # 5, dated 15/02/16.

The element of construction described above satisfied the following criteria for fire-resistance for the period stated:

Structural Adequacy	not applicable
Integrity	no failure at 121 minutes
Insulation	no failure at 121 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/120/120. The FRL is applicable for exposure to fire from either direction. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.

Testing Officer: Chris Wojcik Date of Test: 16 December 2015

Issued on the 9th day of June 2016 without alterations or additions.

Brett Roddy
Manager, Fire Testing and Assessments

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

COPY OF CERTIFICATE OF TEST – NO. 2811

INFRASTRUCTURE TECHNOLOGIES
www.csiro.au

14 Julius Avenue, North Ryde NSW 2113
PO Box 310, North Ryde NSW 1670, Australia
T (02) 9490 5444 • ABN 41 687 119 230

Certificate of Test

No. 2812

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 4-2005 & 2014 on behalf of:

H.B. Fuller Company Australia Pty Ltd
16-22 Red Gum Drive
Dandenong South VIC 3175

A full description of the test specimen and complete test results are detailed in the Division's Sponsored Investigation report FSV 1731.

Product Name: Specimen 5 – Snap LP50R Retrofit fire collar and H.B. Fuller Firesound sealant protecting a 43-mm ID opening in a 78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754, penetrated by 43-mm OD uPVC pipe

PENETRATING SERVICE	
Description	40-mm nominal uPVC pipe
Size	43-mm OD x 2-mm wall thickness extending 2000-mm away from the wall and 500-mm into the furnace chamber
End conditions	Capped on the exposed end using a uPVC cap, and left open on the unexposed end
Supports	Approximately 500-mm and 1500-mm away from the wall
FIRE STOPPING SYSTEM	
Application	Fire collars were fitted around the pipe on both sides of the wall and fixed to the wall through the collar's three mounting tabs using 14-10 x 65-mm long hex head screws. Annular gaps around the pipe and the base of the collars were sealed on both sides of the wall with a bead of Firesound sealant.
Drawing	Drawing # LP 50 R-T, dated 14/09/14, by Snap Fire Systems. Drawing # 6, dated 15/02/16.

The element of construction described above satisfied the following criteria for fire-resistance for the period stated:

Structural Adequacy	not applicable
Integrity	no failure at 121 minutes
Insulation	No failure at 121 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/120/120. The FRL is applicable for exposure to fire from either direction. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.

Testing Officer: Chris Wojcik Date of Test: 16 December 2015

Issued on the 9th day of June 2016 without alterations or additions.

Brett Roddy
Manager, Fire Testing and Assessments

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

COPY OF CERTIFICATE OF TEST – NO. 2812

INFRASTRUCTURE TECHNOLOGIES
www.csiro.au

14 Julius Avenue, North Ryde NSW 2113
PO Box 310, North Ryde NSW 1670, Australia
T (02) 9490 5444 • ABN 41 687 119 230

Certificate of Test

No. 2813

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 4-2005 & 2014 on behalf of:

H.B. Fuller Company Australia Pty Ltd
16-22 Red Gum Drive
Dandenong South VIC 3175

A full description of the test specimen and complete test results are detailed in the Division's Sponsored Investigation report FSV 1731.

Product Name: Specimen 6 – Snap LP50R Retrofit fire collar and H.B. Fuller Firesound sealant protecting a 58-mm ID opening in a 78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754, penetrated by 57-mm OD HDPE pipe

PENETRATING SERVICE	
Description	50-mm nominal HDPE pipe
Size	57-mm OD x 3.5-mm wall thickness extending 2000-mm away from the wall and 500-mm into the furnace chamber
End conditions	Capped on the exposed end using a ceramic fibre plug, and left open on unexposed end
Supports	Approximately 500-mm and 1500-mm away from the wall
FIRE STOPPING SYSTEM	
Application	Fire collars were fitted around the pipe on both sides of the wall and fixed to the wall through the collar's three mounting tabs using 14-10 x 65-mm long hex head screws. Annular gaps around the pipe and the base of the collars were sealed on both sides of the wall with a bead of Firesound sealant.
Drawing	Drawing # LP 50 R, dated 14/09/14, by Snap Fire Systems. Drawing # 7, dated 15/02/16.

The element of construction described above satisfied the following criteria for fire-resistance for the period stated:

Structural Adequacy	not applicable
Integrity	105 minutes
Insulation	107 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/90/90. The FRL is applicable for exposure to fire from either direction. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.

Testing Officer: Chris Wojcik Date of Test: 16 December 2015

Issued on the 9th day of June 2016 without alterations or additions.

Brett Roddy
Manager, Fire Testing and Assessments

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

COPY OF CERTIFICATE OF TEST – NO. 2813

INFRASTRUCTURE TECHNOLOGIES
www.csiro.au

14 Julius Avenue, North Ryde NSW 2113
PO Box 310, North Ryde NSW 1670, Australia
T (02) 9490 5444 • ABN 41 687 119 230

Certificate of Test

No. 2814

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 4-2005 & 2014 on behalf of:

H.B. Fuller Company Australia Pty Ltd
16-22 Red Gum Drive
Dandenong South VIC 3175

A full description of the test specimen and complete test results are detailed in the Division's Sponsored Investigation report FSV 1731.

Product Name: Specimen 7 – Snap HP150R Retrofit fire collar and H.B. Fuller Firesound sealant protecting a 168-mm ID opening in a 78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754, penetrated by 157-mm OD uPVC pipe

PENETRATING SERVICE	
Description	168-mm ID opening
Size	157-mm OD x 4.5-mm wall thickness extending 2000-mm away from the wall and 500-mm into the furnace chamber
End conditions	Capped on the exposed end using a ceramic fibre plug, and left open on unexposed end
Supports	Approximately 500-mm and 1500-mm away from the wall
FIRE STOPPING SYSTEM	
Application	Fire collars were fitted around the pipe on both sides of the wall and fixed to the wall through the collar's three mounting tabs using 14-10 x 65-mm long hex head screws. Annular gaps around the pipe and the base of the collars were sealed on both sides of the wall with a bead of Firesound sealant.
Drawing	Drawing # HP 150 R-T, dated 2/10/15, by Snap Fire Systems. Drawing # 8, dated 15/02/16.

The element of construction described above satisfied the following criteria for fire-resistance for the period stated:

Structural Adequacy	not applicable
Integrity	No failure at 121 minutes
Insulation	115 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/120/90. The FRL is applicable for exposure to fire from either direction. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.

Testing Officer: Chris Wojcik Date of Test: 16 December 2015

Issued on the 9th day of June 2016 without alterations or additions.

Brett Roddy
Manager, Fire Testing and Assessments

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

COPY OF CERTIFICATE OF TEST – NO. 2814

INFRASTRUCTURE TECHNOLOGIES
www.csiro.au

14 Julius Avenue, North Ryde NSW 2113
PO Box 310, North Ryde NSW 1670, Australia
T (02) 9490 5444 • ABN 41 687 119 230

Certificate of Test

No. 2815

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 4-2005 & 2014 on behalf of:

H.B. Fuller Company Australia Pty Ltd
16-22 Red Gum Drive
Dandenong South VIC 3175

A full description of the test specimen and complete test results are detailed in the Division's Sponsored Investigation report FSV 1731.

Product Name: Specimen 8 – Snap LP100R-C Retrofit fire collar and H.B. Fuller Firesound sealant protecting a 114-mm ID opening in a 78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754, penetrated by 110-mm OD uPVC pipe

PENETRATING SERVICE	
Description	100-mm nominal uPVC pipe
Size	110-mm OD x 3.5-mm wall thickness extending 2000-mm away from the wall and 500-mm into the furnace chamber
End conditions	Capped on the exposed end using a uPVC cap, and left open on the unexposed end
Supports	Approximately 500-mm and 1500-mm away from the wall
FIRE STOPPING SYSTEM	
Application	Fire collars were fitted around the pipe on both sides of the wall and fixed to the wall through the collar's three mounting tabs using 14-10 x 65-mm long hex head screws. Annular gaps around the pipe and the base of the collars were sealed on both sides of the wall with a bead of Firesound sealant.
Drawing	Drawing # LP 100 R-C-T, dated 18/02/16, by Snap Fire Systems. Drawing # 9, dated 15/02/16.

The element of construction described above satisfied the following criteria for fire-resistance for the period stated:

Structural Adequacy	not applicable
Integrity	74 minutes
Insulation	76 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/60/60. The FRL is applicable for exposure to fire from either direction. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.

Testing Officer: Chris Wojcik Date of Test: 16 December 2015

Issued on the 9th day of June 2016 without alterations or additions.

Brett Roddy
Manager, Fire Testing and Assessments

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

COPY OF CERTIFICATE OF TEST – NO. 2815

INFRASTRUCTURE TECHNOLOGIES
www.csiro.au

14 Julius Avenue, North Ryde NSW 2113
PO Box 310, North Ryde NSW 1670, Australia
T (02) 9490 5444 • ABN 41 687 119 230

Certificate of Test

No. 2816

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 4-2005 & 2014 on behalf of:

H.B. Fuller Company Australia Pty Ltd
16-22 Red Gum Drive
Dandenong South VIC 3175

A full description of the test specimen and complete test results are detailed in the Division's Sponsored Investigation report FSV 1731.

Product Name: Specimen 9 – Snap LP110R-C Retrofit fire collar and H.B. Fuller Firesound sealant protecting a 86-mm ID opening in a 78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754, penetrated by 83-mm OD uPVC pipe

PENETRATING SERVICE	
Description	80-mm nominal uPVC pipe
Size	83-mm OD x 3-mm wall thickness extending 2000-mm away from the wall and 500-mm into the furnace chamber
End conditions	Capped on the exposed end using a uPVC cap, and left open on the unexposed end
Supports	Approximately 500-mm and 1500-mm away from the wall
FIRE STOPPING SYSTEM	
Application	Fire collars were fitted around the pipe on both sides of the wall and fixed to the wall through the collar's three mounting tabs using 14-10 x 65-mm long hex head screws. Annular gaps around the pipe and the base of the collars were sealed on both sides of the wall with a bead of Firesound sealant.
Drawing	Drawing # LP 100 R-C-T, dated 18/02/16, by Snap Fire Systems. Drawing # 10, dated 15/02/16.

The element of construction described above satisfied the following criteria for fire-resistance for the period stated:

Structural Adequacy	not applicable
Integrity	no failure at 121 minutes
Insulation	115 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/120/90. The FRL is applicable for exposure to fire from either direction. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.

Testing Officer: Chris Wojcik Date of Test: 16 December 2015

Issued on the 9th day of June 2016 without alterations or additions.

Brett Roddy
Manager, Fire Testing and Assessments

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

COPY OF CERTIFICATE OF TEST – NO. 2816

INFRASTRUCTURE TECHNOLOGIES
www.csiro.au

14 Julius Avenue, North Ryde NSW 2113
PO Box 310, North Ryde NSW 1670, Australia
T (02) 9490 5444 • ABN 41 687 119 230

Certificate of Test

No. 2817

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 4-2005 & 2014 on behalf of:

H.B. Fuller Company Australia Pty Ltd
16-22 Red Gum Drive
Dandenong South VIC 3175

A full description of the test specimen and complete test results are detailed in the Division's Sponsored Investigation report FSV 1731.

Product Name: Specimen 10 – Snap 110R Retrofit fire collar and H.B. Fuller Firesound sealant protecting a 114-mm ID opening in a 78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754, penetrated by 110-mm OD uPVC pipe

PENETRATING SERVICE	
Description	100-mm nominal uPVC pipe
Size	110-mm OD x 3.5-mm wall thickness extending 2000-mm away from the wall and 500-mm into the furnace chamber
End conditions	Capped on the exposed end using a uPVC cap, and left open on the unexposed end
Supports	Approximately 500-mm and 1500-mm away from the wall
FIRE STOPPING SYSTEM	
Application	Fire collars were fitted around the pipe on both sides of the wall and fixed to the wall through the collar's three mounting tabs using 10g x 38-mm long hex head screws. On the exposed side of the wall, the face was lined with two layers of 13-mm thick plasterboard and the fire collar was fixed directly to the plasterboard. Annular gaps around the pipe and the base of the collars were sealed on both sides of the wall with a bead of Firesound sealant.
Drawing	Drawing # 110 R-T, dated 9/10/15, by Snap Fire Systems. Drawing # 11, dated 15/02/16.

The element of construction described above satisfied the following criteria for fire-resistance for the period stated:

Structural Adequacy	not applicable
Integrity	no failure at 121 minutes
Insulation	115 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/120/90. The FRL is applicable for exposure to fire from either direction. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.

Testing Officer: Chris Wojcik Date of Test: 16 December 2015

Issued on the 9th day of June 2016 without alterations or additions.

Brett Roddy
Manager, Fire Testing and Assessments

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

COPY OF CERTIFICATE OF TEST – NO. 2817

INFRASTRUCTURE TECHNOLOGIES
www.csiro.au

14 Julius Avenue, North Ryde NSW 2113
PO Box 310, North Ryde NSW 1670, Australia
T (02) 9490 5444 • ABN 41 687 119 230

Certificate of Test

No. 2818

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 4-2005 & 2014 on behalf of:

H.B. Fuller Company Australia Pty Ltd
16-22 Red Gum Drive
Dandenong South VIC 3175

A full description of the test specimen and complete test results are detailed in the Division's Sponsored Investigation report FSV 1731.

Product Name: Specimen 11 – Snap LP110R-C Retrofit fire collar and H.B. Fuller Firesound sealant protecting a 70-mm ID opening in a 78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754, penetrated by 70-mm OD uPVC pipe

PENETRATING SERVICE	
Description	65-mm nominal uPVC pipe
Size	70-mm OD x 3.5-mm wall thickness extending 2000-mm away from the wall and 500-mm into the furnace chamber
End conditions	Capped on the exposed end using a uPVC cap, and left open on the unexposed end
Supports	Approximately 500-mm and 1500-mm away from the wall
FIRE STOPPING SYSTEM	
Application	Fire collars were fitted around the pipe on both sides of the wall and fixed to the wall through the collar's three mounting tabs using 14-10 x 65-mm long hex head screws. Annular gaps around the pipe and the base of the collars were sealed on both sides of the wall with a bead of Firesound sealant.
Drawing	Drawing # LP 100 R-C-T, dated 18/02/16, by Snap Fire Systems. Drawing # 12, dated 15/02/16.

The element of construction described above satisfied the following criteria for fire-resistance for the period stated:

Structural Adequacy	not applicable
Integrity	no failure at 110 minutes
Insulation	104 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/90/90. The FRL is applicable for exposure to fire from either direction. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.

Testing Officer: Chris Wojcik Date of Test: 16 December 2015

Issued on the 9th day of June 2016 without alterations or additions.

Brett Roddy
Manager, Fire Testing and Assessments

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

COPY OF CERTIFICATE OF TEST – NO. 2818

INFRASTRUCTURE TECHNOLOGIES
www.csiro.au

14 Julius Avenue, North Ryde NSW 2113
PO Box 310, North Ryde NSW 1670, Australia
T (02) 9490 5444 • ABN 41 687 119 230

Certificate of Test

No. 2819

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 4-2005 & 2014 on behalf of:

H.B. Fuller Company Australia Pty Ltd
16-22 Red Gum Drive
Dandenong South VIC 3175

A full description of the test specimen and complete test results are detailed in the Division's Sponsored Investigation report FSV 1731.

Product Name: Specimen 12 – Snap LP100R-C Retrofit fire collar and H.B. Fuller Firesound sealant protecting a 114-mm ID opening in a 78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754, penetrated by 110-mm OD HDPE pipe

PENETRATING SERVICE	
Description	100-mm nominal HDPE pipe
Size	110-mm OD x 5.5-mm wall thickness extending 2000-mm away from the wall and 500-mm into the furnace chamber
End conditions	Capped on the exposed end using a ceramic fibre plug, and left open on the unexposed end
Supports	Approximately 500-mm and 1500-mm away from the wall
FIRE STOPPING SYSTEM	
Application	Fire collars were fitted around the pipe on both sides of the wall and fixed to the wall through the collar's three mounting tabs using 14-10 x 65-mm long hex head screws. Annular gaps around the pipe and the base of the collars were sealed on both sides of the wall with a bead of Firesound sealant.
Drawing	Drawing numbered LP 100 R-C-T, dated 18/02/16, by Snap Fire Systems. Drawing # 13, dated 15/02/16.

The element of construction described above satisfied the following criteria for fire-resistance for the period stated:

Structural Adequacy	not applicable
Integrity	77 minutes
Insulation	82 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/60/60. The FRL is applicable for exposure to fire from either direction. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.

Testing Officer: Chris Wojcik Date of Test: 16 December 2015

Issued on the 9th day of June 2016 without alterations or additions.

Brett Roddy
Manager, Fire Testing and Assessments

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

COPY OF CERTIFICATE OF TEST – NO. 2819

INFRASTRUCTURE TECHNOLOGIES
www.csiro.au

14 Julius Avenue, North Ryde NSW 2113
PO Box 310, North Ryde NSW 1670, Australia
T (02) 9490 5444 • ABN 41 687 119 230

Certificate of Test

No. 2820

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 4-2005 & 2014 on behalf of:

H.B. Fuller Company Australia Pty Ltd
16-22 Red Gum Drive
Dandenong South VIC 3175

A full description of the test specimen and complete test results are detailed in the Division's Sponsored Investigation report FSV 1731.

Product Name: Specimen 13 – H.B. Fuller Firesound sealant protecting a 58-mm ID opening in a 78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754, penetrated by 43-mm OD steel pipe

PENETRATING SERVICE	
Description	32-mm nominal steel pipe
Size	43-mm OD x 3-mm wall thickness extending 700-mm away from the wall and 500-mm into the furnace chamber
End conditions	Capped on the exposed end using a copper cap, and left open on the unexposed end
Supports	Approximately 100-mm and 500-mm away from the wall
FIRE STOPPING SYSTEM	
Application	Annular gap around the pipe sealed on both sides of the wall with Firesound sealant to a nominal depth of 20-mm controlled by open cell polyurethane backing rod, and finished with a 50-mm fillet.
Drawing	Drawing numbered 14, dated 15 February 2016.

The element of construction described above satisfied the following criteria for fire-resistance for the period stated:

Structural Adequacy	not applicable
Integrity	No failure at 121 minutes
Insulation	104 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/120/90. The FRL is applicable for exposure to fire from either direction. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.

Testing Officer: Chris Wojcik Date of Test: 16 December 2015

Issued on the 9th day of June 2016 without alterations or additions.

Brett Roddy
Manager, Fire Testing and Assessments

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

COPY OF CERTIFICATE OF TEST – NO. 2820

INFRASTRUCTURE TECHNOLOGIES
www.csiro.au

14 Julius Avenue, North Ryde NSW 2113
PO Box 310, North Ryde NSW 1670, Australia
T (02) 9490 5444 • ABN 41 687 119 230

Certificate of Test

No. 2821

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 4-2005 & 2014 on behalf of:

H.B. Fuller Company Australia Pty Ltd
16-22 Red Gum Drive
Dandenong South VIC 3175

A full description of the test specimen and complete test results are detailed in the Division's Sponsored Investigation report FSV 1731.

Product Name: Specimen 14 – H.B. Fuller Firesound sealant protecting a 40-mm ID opening in a 78-mm thick Speedpanel wall system, with an established FRL of -/120/120, as stated in BRANZ report numbered FR3754, penetrated by a bunch of 5 x 11-mm OD four-core electrical cables

PENETRATING SERVICE	
Description	bunch of five electrical cables
Size	bunch of 5 x 11-mm OD four-core electrical cables extending 700-mm away from the wall and 500-mm into the furnace chamber
Supports	Approximately 100-mm and 500-mm away from the wall
FIRE STOPPING SYSTEM	
Application	Annular gap around the cable bunch sealed on both sides of the wall with Firesound sealant to a nominal depth of 20-mm controlled by open cell polyurethane backing rod, and finished with a 50-mm fillet.
Drawing	Drawing numbered 15, dated 15 February 2016.

The element of construction described above satisfied the following criteria for fire-resistance for the period stated:

Structural Adequacy	not applicable
Integrity	No failure at 121 minutes
Insulation	120 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/120/120. The FRL is applicable for exposure to fire from either direction. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.

Testing Officer: Chris Wojcik Date of Test: 16 December 2015

Issued on the 9th day of June 2016 without alterations or additions.

Brett Roddy
Manager, Fire Testing and Assessments

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

COPY OF CERTIFICATE OF TEST – NO. 2821

INFRASTRUCTURE TECHNOLOGIES
www.csiro.au

14 Julius Avenue, North Ryde NSW 2113
PO Box 310, North Ryde NSW 1670, Australia
T (02) 9490 5444 • ABN 41 687 119 230

Certificate of Test

No. 2822

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 4-2005 & 2014 on behalf of:

H.B. Fuller Company Australia Pty Ltd
16-22 Red Gum Drive
Dandenong South VIC 3175

A full description of the test specimen and complete test results are detailed in the Division's Sponsored Investigation report FSV 1731.

Product Name: Specimen 15 – Boss Batt and Boss "P40 MAK-Wrap" blanket protecting a 600-mm x 200-mm opening in a 78-mm thick Speedpanel wall system, with established FRL of -/120/120, as stated in BRANZ report # FR3754, penetrated by a cable tray with cable arrangement Group A specified in AS 1530.4 Appendix D2

PENETRATING SERVICE	
Description	cable arrangement Group A specified in AS1530.4 Appendix D2 on a metal cable tray
Size	one single core 630 mm^2 cable, one three core 185 mm^2 cable, bunch of three 6 mm^2 cables and a bunch of eight 16 mm^2 cables all mounted onto a 470-mm wide cable tray extending 700-mm away from the wall and 500-mm into the furnace chamber
Supports	Approximately 100-mm and 500-mm away from the wall
FIRE STOPPING SYSTEM	
Application	The C-track lined opening was sealed with one layer of Boss batt, friction fitted flush with exposed side of wall. A contoured cut-out was cut in batt to accommodate the installation of cable tray. A second batt 780-mm long x 350-mm wide was fitted around cable tray and fixed to unexposed face of wall using M4 x 65-mm long self-tapping screws at 100-mm centres. Firesound sealant applied to all gaps between trimming channel in the opening and wall itself, as well as around cables and the Boss batts. The cables together with cable tray were then wrapped with Boss "P40 MAK-Wrap" blanket, which extended 300-mm from the each side of the wall. The Boss batts were then coated with 1-mm thick Boss Ablative Coating.
Drawing	Drawings # 2016-002, Sheets 1 and 2, dated 16/03/16, by Boss Fire and Safety.

The element of construction described above satisfied the following criteria for fire-resistance for the period stated:

Structural Adequacy	not applicable
Integrity	no failure at 121 minutes
Insulation	no failure at 121 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/120/120. The FRL is applicable for exposure to fire from either direction. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.

Testing Officer: Chris Wojcik Date of Test: 16 December 2015

Issued on the 9th day of June 2016 without alterations or additions.

Brett Roddy
Manager, Fire Testing and Assessments

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

COPY OF CERTIFICATE OF TEST – NO. 2822

INFRASTRUCTURE TECHNOLOGIES
www.csiro.au

14 Julius Avenue, North Ryde NSW 2113
PO Box 310, North Ryde NSW 1670, Australia
T (02) 9490 5444 • ABN 41 687 119 230

Certificate of Test

No. 2823

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 4-2005 & 2014 on behalf of:

H.B. Fuller Company Australia Pty Ltd
16-22 Red Gum Drive
Dandenong South VIC 3175

A full description of the test specimen and complete test results are detailed in the Division's Sponsored Investigation report FSV 1731.

Product Name: Specimen 16 – Boss Batt and Boss "P40 MAK-Wrap" blanket protecting a 300-mm x 250-mm opening in a 78-mm thick Speedpanel wall system, with established FRL of -/120/120, as stated in BRANZ report # FR3754, penetrated by a cable tray with cable arrangement Group B specified in AS1530.4 Appendix D2

PENETRATING SERVICE	
Description	cable arrangement Group B specified in AS1530.4 Appendix D2 on a metal cable tray
Size	bunch of 60 x 15-mm OD telecommunication cables mounted onto a 180-mm wide cable tray extending 700-mm away from the wall and 500-mm into the furnace chamber
Supports	Approximately 100-mm and 500-mm away from the wall
FIRE STOPPING SYSTEM	
Application	The C-track lined opening was sealed with one layer of the Boss batt, friction fitted flush with the exposed side of the wall. A contoured cut-out was then cut in the batt to accommodate the installation of the cable tray. A second batt 500-mm long x 400-mm wide was fitted around the cable tray and fixed to the unexposed face of wall using M4 x 65-mm long self-tapping screws at 100-mm centres. Firesound sealant applied to all the gaps between the trimming channel in the opening and the wall itself, as well as around the cables and the Boss batts. The cables together with the cable tray were then wrapped with Boss "P40 MAK-Wrap" blanket, which extended 300-mm from the each side of the wall. The Boss batts were then coated with 1-mm thick Boss Ablative Coating.
Drawing	Drawings numbered 2016-002, sheets 3 and 4, dated 16th March 2016, by Boss Fire and Safety.

The element of construction described above satisfied the following criteria for fire-resistance for the period stated:

Structural Adequacy	not applicable
Integrity	no failure at 121 minutes
Insulation	no failure at 121 minutes

and therefore for the purpose of Building Regulations in Australia, achieved a fire-resistance level (FRL) of -/120/120. The FRL is applicable for exposure to fire from either direction. This certificate is provided for general information only and does not comply with regulatory requirements for evidence of compliance.

Testing Officer: Chris Wojcik Date of Test: 16 December 2015

Issued on the 9th day of June 2016 without alterations or additions.

Brett Roddy
Manager, Fire Testing and Assessments

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

COPY OF CERTIFICATE OF TEST – NO. 2823

References

The following informative documents are referred to in this Report:

AS 1530.4-2005 Methods for fire tests on building materials, components and structures - Part 4: Fire-resistance tests of elements of building construction.

CONTACT US

t 1300 363 400
+61 3 9545 2176
e enquiries@csiro.au
w www.csiro.au

YOUR CSIRO

Australia is founding its future on science and innovation. Its national science agency, CSIRO, is a powerhouse of ideas, technologies and skills for building prosperity, growth, health and sustainability. It serves governments, industries, business and communities across the nation.

FOR FURTHER INFORMATION

Infrastructure Technologies
Chris Wojcik
Manager Fire Resistance Testing
t +61 2 9490 5508
e chris.wojcik@csiro.au
w www.csiro.au/Organisation-Structure/Divisions/CMSE/Infrastructure-Technologies/Fire-safety.aspx

Infrastructure Technologies
Brett Roddy
Team Leader, Fire Testing and Assessments
t +61 2 9490 5449
e brett.roddy@csiro.au
w www.csiro.au/Organisation-Structure/Divisions/CMSE/Infrastructure-Technologies/Fire-safety.aspx