Fire-resistance test of Trafalgar Fire stopping systems protecting control joints and service penetrations in a Ritek wall

Test Report

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Date: 5 December 2024
Client: Trafalgar Group Pty Ltd

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5 December 2024	5 December 2024	5 December 2024

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Contents

Fire-resistance test of Trafalgar Fire stopping systems protecting control joints and service penetrations in a Ritek wall

Sponsored Investigation No. FSP 2461

1 Introduction

1.1 Identification of specimen

The sponsor identified the test assembly (CP39) as a Ritek 150X-Plus wall incorporating two (2) control joints and eight (8) penetrating services protected with various fire Trafalgar Fire protection systems.

1.2 Sponsor

Trafalgar Group Pty Ltd
26A Ferndell Street
South Granville, NSW 2142

1.3 Manufacturer

Trafalgar Group Pty Ltd
26A Ferndell Street
South Granville NSW 2142

1.4 Test standard

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

Section 10: Service penetrations and control joints.

1.5 Reference standard

Australian Standard 4072, Components for the protection of openings in fire-resistant separating elements, Part 1 - 2005, Service penetrations and control joints.

1.6 Test number

CSIRO Reference test number FS 5366/4872

1.7 Test date

The fire-resistance test was conducted on 7 August 2024.

2 Description of specimen

2.1 General

The test assembly comprised an 1800-mm wide x 1800-mm high x 150-mm thick Ritek 150X-PLUS wall system penetrated by two control joints eight (and 8) service penetrations protected with various fire stopping systems.

Supporting Construction

The 150-mm thick Ritek 150X-Plus wall comprised pre-fabricated permanent formwork panels which were screw fixed together and core filled with concrete with an established fire resistance level (FRL) of 240/240/240, as per CSIRO test report FSV 2075 (Revision B).

Documents containing a complete description of each specimen were supplied by the sponsor and are retained on file. For the purpose of the test, the service penetrations were referenced as detailed in the table below.

ID	Specimen details
1	A 12-mm wide vertical control joint in a 150-mm thick Ritek 150X-PLUS wall protected with FyreFLEX Fire Resistant sealant.
2	A 50-mm wide vertical control joint in a Ritek 150X-PLUS wall protected with RyanSPAN75 block and FyreFLEX Fire Resistant sealant.
3	A nominal 100-mm diameter UPVC pipe penetrating a Ritek 150X-PLUS wall through a 114-mm diameter core hole protected with Unicorn Continuous Collars and FyrePEX HP Sealant.
4	A nominal 40-mm diameter UPVC pipe penetrating a Ritek 150X-PLUS wall through a 43-mm diameter core hole protected with two 40-mm Retrofit FyreCOLLAR and FyreFLEX Fire Resistant Sealant.
5	A bundle of three 2C+E TPS power cables, two Category 6 cables, and two Fire alarm cables penetrating a 150-mm thick Ritek 150X-PLUS wall through a 25-mm diameter core hole protected with FyreFLEX Fire Resistant Sealant.
6	A bundle of seven power cables penetrating a Ritek 150X-PLUS wall through a 70-mm diameter core hole protected with FyreFLEX Fire Resistant Sealant and Trafalgar TWrap.
7	A bundle of Appendix D1 cables penetrating a Ritek 150X-PLUS wall through a 400-mm x 420-mm wall opening protected with a FyreBATT system, FyreFLEX Fire Resistant Sealant and TWrap.
8	A bundle of Aluminium core power cables penetrating a Ritek 150X-PLUS wall through a 400-mm x 420-mm core hole protected with a FyreBATT system, FyrePEX HP sealant and TWrap.

9	A nominal 100-mm diameter UPVC pipe penetrating a 150-mm thick Ritek 150X-PLUS wall through a 114-mm diameter core hole protected with Trafalgar BladeRUNNER fire collars and FyreFLEX Fire Resistant Sealant incorporating an elbow joint fitted on the exposed face.
10	A nominal 100-mm diameter HDPE pipe penetrating a Ritek 150X-PLUS wall system through a 114-mm diameter core hole protected with Trafalgar BladeRUNNER fire collars and FyreFLEX Fire Resistant Sealant.

Specimen 1 –A 12-mm wide vertical control joint in a 150-mm thick Ritek 150X-PLUS wall protected with FyreFLEX Fire Resistant sealant.

An 1800-mm high x 12-mm wide control joint opening was formed in a 150-mm thick Ritek 150X-PLUS wall system that incorporated an extruded aluminium track on the vertical the edges of a single layer of 6-mm fibre cement lining the internal facing as shown in Figure A- Detail L.

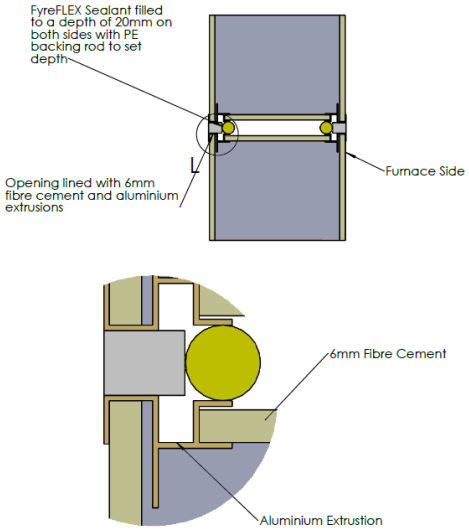
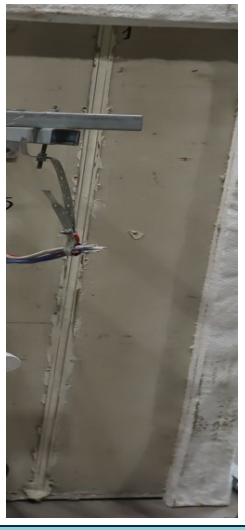
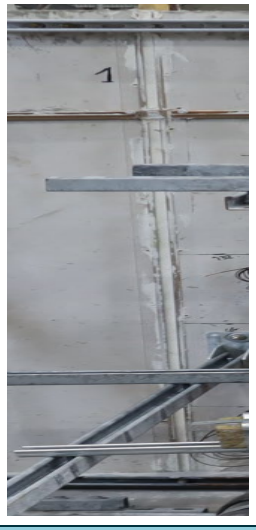


Figure A – Detail L

On both sides of the wall FyreFLEX Fire Resistant Sealant was used to fill the 12-mm wide joint opening to a depth of 20-mm controlled with a Tremco 22-mm diameter open-cell foam backing rod. The FyreFLEX sealant finished flush with the wall as shown in drawing titled 'Spec.1 Vert. Joint FyreFLEX', dated 4 October 2024, by Trafalgar Group Pty Ltd.

	
Exposed side	**Unexposed side**

Specimen 2 – A 50-mm wide vertical control joint in a Ritek 150X-PLUS wall protected with RyanSPAN75 block and FyreFLEX Fire Resistant sealant.

The RyanSPAN75 block consists of intumescent strips within a foam with nominal dimensions of 85-mm high x 75-mm wide and 1000-mm long, with a nominal density of 287 kg/m^3.

An 1800-mm high x 50-mm wide control joint opening was formed in a Ritek 150X-PLUS wall system that incorporated Ritek extruded aluminium track on the vertical edges with a single layer of 6-mm fibre cement lining the internal facing as shown in Figure B- Detail N.

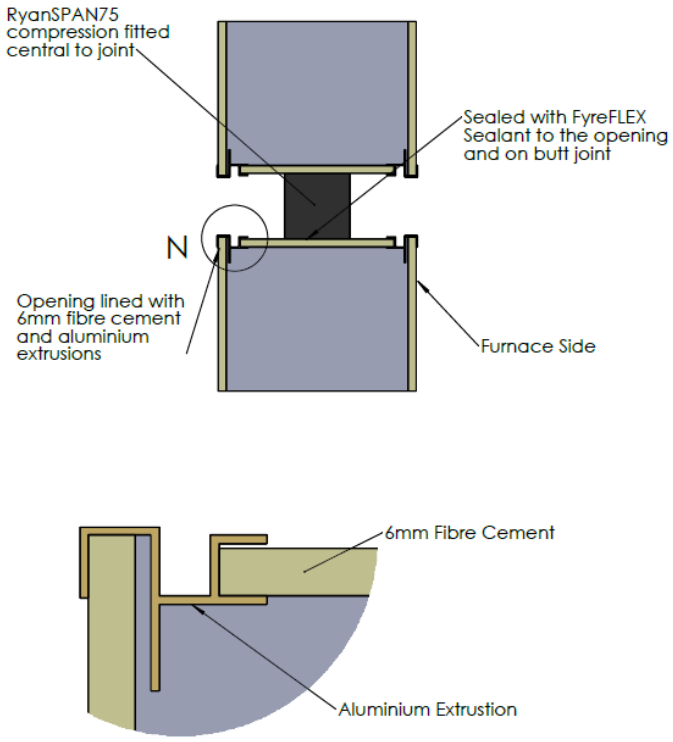
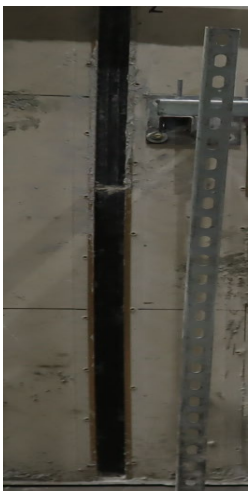
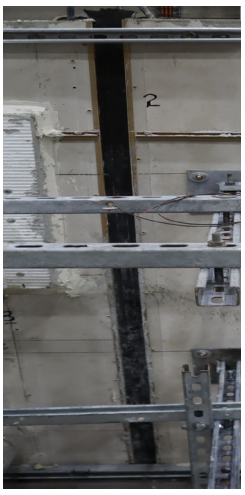


Figure A – Detail N

Two pieces of RyanSPAN75 block measuring 85-mm deep x 75-mm wide x 1000 long, were required to fit the 1800-mm long control joint. The blocks were friction fitted centrally into the 1800-mm long x 50-mm wide vertical control joint opening, FyreFLEX sealant was applied to both faces of the RyanSPAN75 butt joint and along the vertical faces between the RyanSPAN75 and the 6-mm fibre cement. 150X-PLUSas showing in drawing titles 'Spec.2 Vert. Joint RyanSPAN', dated 4 October 2024, by Trafalgar Group Pty Ltd.

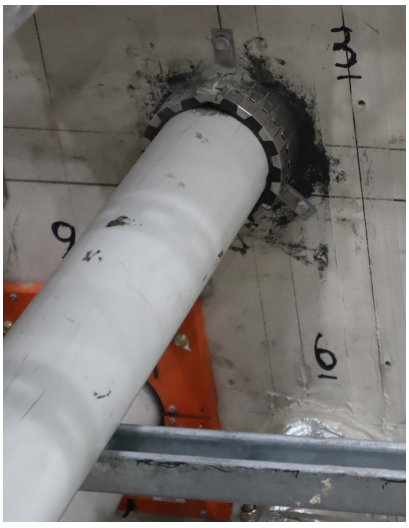
	
Exposed side	**Unexposed side**

Specimen 3 – A nominal 100-mm diameter UPVC pipe penetrating a Ritek 150X-PLUS wall through a 114-mm diameter core hole protected with Unicorn Continuous Collars and FyrePEX HP Sealant.

The Trafalgar Unicorn Continuous Collar consisted of a 50-mm wide x 10-mm ± 1-mm thick intumescent strip with a stated density of 970 kg/m^3. The intumescent was retained within a 0.6-mm steel backing, supplied in a 2.3 metre-long 'strap', designed to be cut to length to suit the OD of the penetration service. The steel intumescent backing was 50-mm tall and consisted of 15-mm wide segments between bend reliefs. Every segment had an opening for the mounting brackets, and every second segment had a fold at one end to retain the intumescent. The mounting brackets had a Z-profile (7.5-mm x 50-mm x 40-mm respective lengths of the folds) matching the 50-mm height of the collar, such that it folded over the end of the collar, down the side, and out onto the separating element. The middle segment of the bracket had two legs that slotted into the collar body segments. Each bracket was 20-mm wide, with a 7-mm wide x 13-mm long slot located in the bracket's base for screw fixings.

The penetrating service comprised a nominal 100-mm UPVC pipe with a measured 110-mm OD and wall thickness of 3.0-mm, which penetrated the Ritek 150X-PLUS wall through a 114-mm diameter core hole, as shown in drawings titled 'Spec. 3 DN100 PVC', dated 4 October 2024 by Trafalgar Group Pty Ltd. The pipe projected horizontally 2000-mm away from the unexposed face of the Ritek 150X-PLUS wall system and 500-mm into the furnace chamber. The pipe was supported at 395-mm and 1080-mm from the unexposed face of the wall, The pipe was left open on the unexposed end and closed with a PVC cap on the exposed end.

The annular gap between the service and the Ritek 150X-PLUS wall was filled from both sides of the wall with FyrePEX HP sealant to a depth of 10-mm. A Trafalgar Unicorn Continuous fire collar was installed at each side of the wall. The two ends of the intumescent notched at a 45-degree angle, before being installed around the service and the two ends of the collar were secured with a steel mounting bracket, with additional two mounting brackets attached to the collar and evenly distributed around the service. The three brackets were secured to the wall surface with M6 x 50-mm long concrete screw anchors.

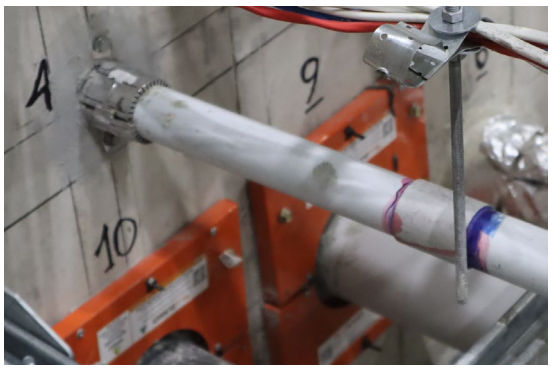
	
Exposed side	**Unexposed side**

Specimen 4 – A nominal 40-mm diameter UPVC pipe penetrating a Ritek 150X-PLUS wall through a 43-mm diameter core hole protected with 40-mm Retrofit FyreCOLLAR and FyreFLEX Fire Resistant Sealant.

The 40-mm Retrofit FyreCOLLAR is constructed with a 0.5mm thick Stainless steel and consists of two halves fitted with a layer of intumescent material with a thickness of approximately 2-mm and a height of around 50-mm and, with one fixing hole in each half. The collar has an outer diameter between 53-mm to 56-mm and an inner diameter of approximately 46-mm ±1-mm.

The penetrating service comprised a nominal 40-mm UPVC pipe, which penetrated the Ritek 150X-PLUS wall through a 43-mm diameter core hole, as shown in drawings titled Spec. 4 DN40 PVC, dated 4 October 2024 by Trafalgar Group Pty Ltd. The pipe projected horizontally 2000-mm from the unexposed face of the Ritek 150X-PLUS wall system and 500-mm into the furnace chamber. The pipe was supported at approximately 395-mm and 1080-mm from the unexposed face of the wall, The pipe was left open on the unexposed end and closed with a PVC cap on the exposed end.

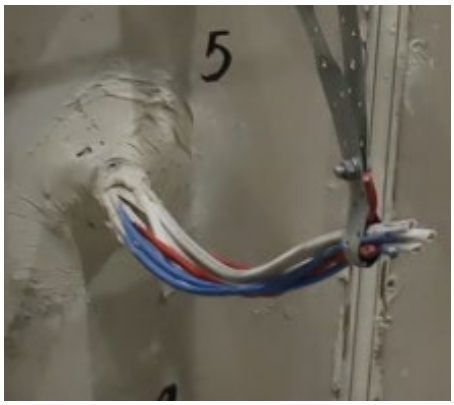
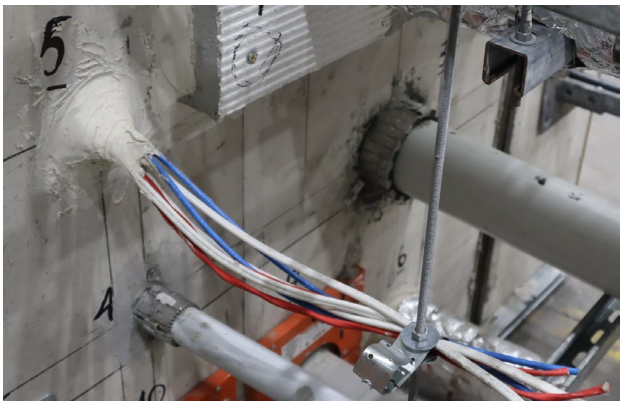
The annular gap between the service and the Ritek 150X-PLUS wall was filled from both sides of the wall with FyrePEX HP sealant to a depth of 10-mm. A Retrofit FyreCOLLAR was installed on each side of the wall and secured with two mounting brackets attached to the collar and evenly distributed around the service. The two brackets were secured to the wall surface with M6 x 50mm long concrete screw anchors.

	
Exposed side	**Unexposed side**

Specimen 5 – A bundle of three 2C+E TPS power cables, two Category 6 cables, and two Fire alarm cables penetrating a 150-mm thick Ritek 150X-PLUS wall through a 25-mm diameter core hole protected with FyreFLEX Fire Resistant Sealant.

The penetrating service comprised a bundle of three 2.5-mm^2 (2C+E) TPS 2C cables, two Category 6 cables and two Fire alarm cables penetrating a 150-mm thick Ritek 150X-PLUS wall system through a 25-mm opening, as shown in the drawing titled Spec. 5 Various Cables, dated 4 October 2024 by Trafalgar Group Pty Ltd. The bundle of cables projected 500-mm from the unexposed face and 500-mm from the exposed face into the furnace. The service was supported on both sides with builders strap at approximately 400-mm from the unexposed face of the wall and 450-mm into the furnace chamber.

FyreFLEX sealant was applied on both sides of the wall, filling the annular gap between the service and the wall to a depth of 20-mm. On both sides of the wall surface, a 30-mm x 70-mm fillet of FyreFLEX sealant was made surrounding the bundle of cables.

	
Exposed side	**Unexposed side**

Specimen 6 – A bundle of seven power cables penetrating a Ritek 150X-PLUS wall through a 70-mm diameter core hole protected with FyreFLEX Fire Resistant Sealant and Trafalgar TWrap

The penetrating service comprised a bundle of seven 16-mm OD 6-mm^2 (three core + earth) power cables, penetrating a 70-mm diameter core hole in a 150-mm thick Ritek 150X-PLUS wall system, as shown in the drawing titled *Spec. 6 7xCables (TWrap)*, dated 4 October 2024 by Trafalgar Group Pty Ltd. On both sides of the wall, the bundle of cables was insulated with a single layer of 300-mm wide Trafalgar TWrap insulation, butted up to the wall and with an overlap of 50-mm. The wrap was secured with stainless steel cable ties 50-mm from each end and once at the mid-point. The bundle of cables projected 500-mm from the unexposed face and 500-mm from the exposed face into the furnace. The service was supported on both sides with builder's strap at approximately 350-mm from the wall.

FyreFLEX sealant was applied from both sides of the wall, filling the annular gap between the service and the wall to a depth of 30-mm. On both sides of the wall surface, a 50-mm x 50-mm fillet of FyreFLEX sealant was made surrounding the bundle of cables.

	
Exposed side	**Unexposed side**

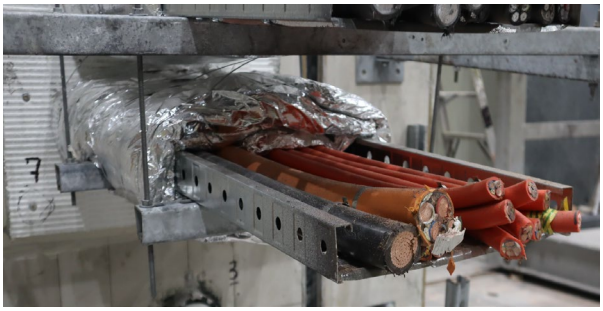
Specimen 7 – A bundle of Appendix D1 cables penetrating a Ritek 150X-PLUS wall through a 400-mm x 420-mm wall opening protected with a FyreBATT system, FyreFLEX Fire Resistant Sealant and TWrap.

A FyreBATT system composed of two layers of FyreBATT, measuring 400-mm high x 420-mm wide and 600-mm high x 620-mm wide, was applied on a 400-mm high x 420-mm wide opening of a 150-mm thick Ritek 150X-PLUS wall system. The FyreBATT system was used for specimens 7 and 8, as shown in the drawing titled Overview, dated 4 October 2024 by Trafalgar Group Pty Ltd. The smaller layer was friction fitted to the opening, sealed with FyreFLEX sealant around the perimeter of the butt joint and finished flush with the unexposed surface of the wall. The second layer was split into two halves and applied at the opening, adjacent to the first layer. A section of 100-mm of the FyreBATT was supported on the wall, around the wall opening, then fixed with M6 x 100-mm masonry anchors at 200-mm apart and 50-mm from the edges of the FyreBATT. A 25-mm x 25-mm fillet of FyreFLEX sealant was applied around the perimeter of the FyreBATT fixed to the wall.

FyreBATT is a 60-mm thick coated mineral fibre batt consisting of high-density fibrous lamella core, sealed on both sides with a flexible ablative coating with a density of 153 kg/m^3.

The penetration service comprised a Group A cable configuration, in accordance with Appendix D1 of the AS 1530.4, mounted on a 300-mm wide cable tray, penetrating a 330-mm wide x 60-mm high opening made to the two layers of the 60-mm thick FyreBATT system, as shown in the drawing titled *Spec. 7 D1 cables*, dated 4 October 2024 by Trafalgar Group Pty Ltd. The cable tray projected 860-mm from the unexposed face and 500-mm from the exposed face into the furnace. The service was supported on both sides with Unistrut at approximately 320-mm and 730-mm from the unexposed wall and, 420-mm from the exposed side of the wall.

FyreFLEX sealant was applied from the exposed and unexposed sides of the FyreBATT, filling the annular gap between the service and the FyreBATT. On both sides of the FyreBATT surface, a 30-mm x 30-mm fillet of FyreFLEX sealant was made surrounding the cable tray. The cable tray was wrapped on both sides with two layers of TWrap, butted up to the batt, and with an overlap of 100-mm. On the unexposed side of the tray, a 600-mm wide x 25-mm thick TWrap was applied and secured with stainless steel cable ties at 50-mm from each end and every 150-mm between the cables. A 300-mm wide TWrap was applied on the furnace side.

	
Exposed side	**Unexposed side**

Specimen 8 – A bundle of Aluminium core power cables penetrating a Ritek 150X-PLUS wall through a 400-mm x 420-mm wall opening protected with a FyreBATT system, FyrePEX HP sealant and TWrap.

A FyreBATT system composed of two layers of FyreBATT, measuring 400-mm high x 420-mm wide and 600-mm high x 620-mm wide, was applied on a 400-mm high x 420-mm wide opening of a 150-mm thick Ritek 150X-PLUS wall system. The FyreBATT system was used for specimens 7 and 8, as shown in the drawing titled Overview, dated 4 October 2024 by Trafalgar Group Pty Ltd. The smaller layer was friction fitted to the opening, sealed with FyreFLEX sealant around the perimeter of the butt joint and finished flush with the unexposed surface of the wall. The second layer was split into two halves and applied at the opening, adjacent to the first layer. A section of 100-mm of the FyreBATT was supported on the wall, around the wall opening, then fixed with M6 x 100-mm masonry anchors at 200-mm apart and 50-mm from the edges of the FyreBATT. A 25-mm x 25-mm fillet of FyreFLEX sealant was applied around the perimeter of the FyreBATT fixed to the wall.

FyreBATT is a 60-mm thick coated mineral fibre batt consisting of a high-density fibrous lamella core, sealed on both sides with a flexible ablative coating with a 153 kg/m^3 density. The penetration service comprised a Group of Aluminium cable configuration;

- One Aluminium core XLPE insulated cable, 630mm^2 single core OD 50-mm.
- Four Aluminium core XLPE insulated cables, 240mm^2 single core OD 30-mm.
- Three Aluminium core XLPE insulated cables, 16mm^2 single core OD 10-mm.
- Four Aluminium core XLPE insulated cables, 16mm^2 4C+E core, measured OD 26-mm.
- Four Aluminium core XLPE insulated cables, 16mm^2 4C+E core, measured OD 26-mm.

The cables were mounted on a 300-mm wide cable tray, penetrating a 330-mm wide x 60-mm high opening made to the two layers of the 60-mm thick FyreBATT system, as shown in the drawing titled *Spec. 8 AL cables*, dated 4 October 2024 by Trafalgar Group Pty Ltd. The cable tray projected 860-mm from the unexposed face of the wall and 500-mm from the exposed face into the furnace. The service was supported on both sides with Unistrut at approximately 320-mm and 730-mm from the unexposed wall and, 420-mm from the exposed side of the wall.

FyrePEX HP sealant was applied to fill the annular gap between the service and the FyreBATT and finished flush with the FyreBATT surfaces. Offcuts of FyreBATT was also filled in the opening with the FyrePEX HP sealant.

The cable tray was wrapped on both sides with a single layer of TWrap, butted up to the batt, and with an overlap of 100-mm. On the unexposed side of the tray, a 600-mm wide x 25-mm thick TWrap was applied and secured with stainless steel cable ties at 50-mm from each end and every 150-mm between the cables. A 300-mm wide x 25-mm thick TWrap was applied on the furnace side.

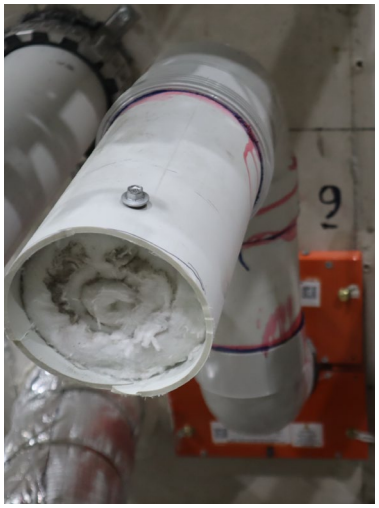
	
Exposed side	**Unexposed side**

Specimen 9 – A nominal 100-mm diameter UPVC pipe penetrating a 150-mm thick Ritek 150X-PLUS wall through a 114-mm diameter core hole protected with Trafalgar BladeRUNNER fire collars and FyreFLEX Fire Resistant Sealant incorporating an elbow joint fitted on the exposed face.

The Trafalgar BladeRUNNER fire collar was constructed from 1.1-mm mild steel plate and comprised of two symmetrical halves. Each half contained a baseplate measuring 240-mm wide x 140-mm long x 20-mm high. The top side of the baseplate contained a blade measuring 154-mm wide x 69-mm long x 15-mm high flange. Each blade was lined with a 55-mm wide x 150-mm long x 10-mm thick Trafalgar Intumescent strip (stated density of 730 kg/m^3) with double-sided tape. The blade was held in place with a 12-mm wide x 10-mm high x 137-mm long angles which were secured to the baseplate at the front with four 4-mm steel rivets. Each blade contained two tensioned springs secured to the baseplate with the blade being pulled back to the rear and the blades were held in place with 4.8-mm wide x 1.3-mm thick plastic cable ties (manufactured with Nilon 66-UL). Construction of the fire collar is detailed in drawing named 'BladeRUNNER', dated 22 February 2024, by Trafalgar Fire.

The penetrating service comprised a DN100 UPVC pipe with a measured 110-mm OD and a 3.0-mm thickness penetrating a 114-mm diameter core hole in a 150-mm thick Ritek 150X-PLUS wall system. A BladeRUNNER fire collar was installed at each side of the wall. The two halves of the BladeRUNNER were fitted around the pipe and secured to the wall using four M6 x 50-mm masonry anchors around the pipe. A PVC elbow was connected to the penetrating pipe on the exposed side, in line with the BladeRUNNER. FyreFLEX sealant was applied in the annular gap from both sides of the wall to a depth of 10-mm.

The service was supported with Unistrut at 395-mm and 1080-mm on the unexposed side The pipe at the end of the elbow was capped with Kaowool.

	
Exposed side	**Unexposed side**

Specimen 10 – A nominal 100-mm diameter HDPE pipe penetrating a Ritek 150X-PLUS wall system through a 114-mm diameter core hole protected with Trafalgar BladeRUNNER fire collars and FyreFLEX Fire Resistant Sealant.

The Trafalgar BladeRUNNER was constructed from 1.1-mm mild steel plate and comprised of two symmetrical halves. Each half contained a baseplate measuring 240-mm wide x 140-mm long x 20-mm high. The top side of the baseplate contained a blade measuring 154-mm wide x 69-mm long x 15-mm high flange. Each blade was lined with a 55-mm wide x 150-mm long x 10-mm thick Trafalgar Intumescent strip (stated density of 730 kg/m^3) with double-sided tape. The blade was held in place with a 12-mm wide x 10-mm high x 137-mm long angles which were secured to the baseplate at the front with four 4-mm steel rivets. Each blade contained two tensioned springs secured to the baseplate with the blade being pulled back to the rear and the blades were held in place with 4.8-mm wide x 1.3-mm thick plastic cable ties (manufactured with Nilon 66-UL). Construction of the fire collar is detailed in drawing named 'BladeRUNNER', dated 22 February 2024, by Trafalgar Fire.

The penetrating service comprised a nominal diameter 100-mm HDPE pipe with a measured 110-mm OD and a 3.6-mm thickness penetrating a 114-mm diameter core hole in a 150-mm thick Ritek 150X-PLUS wall system. A BladeRUNNER fire collar was installed at each side of the wall. The two halves of the BladeRUNNER were fitted around the pipe and secured to the wall using four M6 x 50-mm masonry anchors around the pipe. FyreFLEX sealant was applied in the annular gap from both sides of the wall to a depth of 10-mm.

The service was supported with Unistrut at 395mm and 1080mm on the unexposed side The pipe at the end of the elbow was capped with Kaowool.

	
Exposed side	**Unexposed side**

2.2 Orientation

The Ritek 150X-PLUS wall system was placed vertically and sealed against the furnace chamber and the specimen was exposed to fire from one side only.

2.3 Dimensions

The overall dimensions of the separating wall element were 1800-mm x 1800-mm to suit the furnace opening of 1650-mm x 1650-mm.

2.4 Conditioning

The specimen construction was completed on 1st August 2024 and stored under indoor laboratory atmospheric temperature and humidity conditions until the test date.

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

The construction was organised by the test sponsor. CSIRO was not involved in the selection of the materials.

3 Documentation

The following documents were supplied or referenced by the sponsor as a complete description of the specimen and should be read in conjunction with this report:

- Drawings titled CP39 Drawings Ritek, 12 sheets, dated 21 October 2024, Trafalgar Group Pty Ltd.
- CP39 Specimen description DRAFT, dated 1 August 2024, Trafalgar Group Pty Ltd.
- CP39 Product descriptions, dated 1 August 2024, Trafalgar Group Pty Ltd.
- The profile of the aluminium track is detailed in drawing titled track extrusion, dated the 16 June 2006, by Ritek System Pty Ltd.

Confidential information about the test specimens have been submitted and is retained at CSIRO Infrastructure Technologies

4 Equipment

4.1 Furnace

The furnace had a nominal opening of 1650-mm x 1650-mm as appropriate for vertical specimens.

The furnace was lined with refractory bricks and materials with the thermal properties as specified in AS 1530.4:2014 and was heated by combustion of a mixture of natural gas and air.

4.2 Temperature

The temperature in the furnace chamber was measured by four type K, 3-mm diameter, and 310 stainless steel Mineral Insulated Metal Sheathed (MIMS) thermocouples.

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.

The pressure probe was located approximately 800-mm above the sill of the furnace, where the pressure was controlled at 19 Pa.

4.4 Measurement system

The primary measurement system for furnace temperature and pressure control comprised multiple-channel data loggers, scanning at one-minute intervals during the test.

5 Ambient temperature

The ambient laboratory conditions measured as specified by AS 1530.4-2014 clause 2.11.5 was 4°C at the commencement of the test.

6 Departures from standard

The furnace pressure tolerances were in excess of the requirements of AS 1530.4-2014 for the periods of time as shown in Figure 3. The test laboratory confirms that this departure in furnace pressure was potentially more onerous and would not have significantly affected the results of this test.

The furnace temperature tolerances and severity were in excess of the requirements of AS 1530.4-2014 for the periods of time as shown in Figures 1 and 2. The test laboratory confirms that this departure in temperature tolerances was potentially more onerous would not have significantly affected the results of this test.

The ambient air temperature at the commencement of the test, mentioned in Section 5 of this report, was 1^{o}C below the tolerance of the requirements of AS 1530.4-2014 clause 2.11.5. The test laboratory confirms that this minor departure in ambient temperature would not have significantly affected the results of this test.

7 Termination of the test

The test was terminated at 241 minutes by the agreement with the sponsor.

8 Test results

8.1 Critical observations

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

Time	Observation
14 sec -	Smoke emitted through the control joint foam of Specimen 2.
40 sec -	Smoke emitted between the wrap and the cables of Specimens 7 and 8.
2 minutes -	Smoke emitted through the end of pipes of Specimens 3 and 4.
3 minutes -	Smoke is being emitted through the end of pipes of Specimens 9 and 10.
4 minutes -	Smoke emitted through the end of the pipe of Specimens 3 and 4 has ceased.
8 minutes -	Light smoke is being emitted between the sealants and cables of Specimen 5.
9 minutes -	Smoke emitted through the end of pipe of Specimen 10 has ceased.
12 minutes -	Smoke emitted through the end of pipe of Specimen 9 has ceased.
14 minutes -	Smoke is being emitted between the batt and the wrap of Specimen 8.
21 minutes -	Light smoke is being re-emitted through the end of pipes of Specimens 9 and 10.
24 minutes -	Smoke has ceased between the wrap and cables of Specimens 7 and 8.
27 minutes -	Smoke is being emitted between the collar and the pipe of Specimen 9.
66 minutes -	Smoke is being emitted between the vertical joint of the batt above Specimen 8. The batt is slightly lifted and opened at that location.
76 minutes -	Light smoke is being emitted between the collar and pipe of Specimen 3.
77 minutes -	The intumescent foam, from Specimen 2, is detaching from its layers along the block.
78 minutes -	Intumescent material is being expelled between the batt and the wrap of specimen 8. LHS (photograph 5).
100 minutes -	The opening of the FyreBATT joint above Specimen 8 is increasing.
116 minutes -	Decolouration is noted between the wrap and the batt of specimen 9.
119 minutes -	Light smoke is being emitted from the joint between the aluminium angle (track) and the fibre cement approximately 30 cm below the head of specimen 1.
124 minutes -	The separation of the layers of the foam of Specimen 2 is increasing.
126 minutes -	Smoke is being re-emitted through the end of pipe of Specimen 4.
130 minutes -	Smoke emitted between wrap and cables of Specimens 7 and 8 has intensified.
135 minutes -	Sealant along the control joint of Specimen 1 has started to swell.
140 minutes -	The base of pipe of specimen 4 has melted and detached from the collar.
142 minutes -	A red glow is visible through the collar of specimen 4 into the furnace. Cotton pad was applied with no ignition noted at this time.
144 minutes -	Insulation failure of Specimen 7 – maximum temperature rise of 180K is exceeded on the FyreBatt, 25-mm from the wrap.

Time	Observation
158 minutes -	The foam from the control joint of Specimen 2 is being pushed out, reaching the top-edge of the aluminium track.
163 minutes -	Smoke is being emitted between the wrap and sealant of Specimen 6.
175 minutes -	Insulation failure of Specimen 4 – maximum temperature rise of 180K is exceeded on top of the collar, 25-mm from the RITEX wall.
196 minutes -	Insulation failure of Specimen 6 – maximum temperature rise of 180K is exceeded at the bottom of the cable, 25-mm from the wrap.
210 minutes -	Insulation failure of Specimen 2 – maximum temperature rise of 180K is exceeded on the RITEK track, 1/3 span from the top.
216 minutes -	A cavity is formed at the base of the pipe of Specimen 9. Cotton pad was applied with no ignition noted.
217 minutes -	Insulation failure of Specimen 9 – maximum temperature rise of 180K is exceeded on the PVC pipe, 25-mm from the collar.
223 minutes -	Integrity failure of Specimen 9 - Cotton pad applied on the cavity exposed at the base of the pipe of specimen 9. Ignition of the cotton pad was observed (photograph 11).
224 minutes -	Integrity failure of Specimen 9 - Cavity exposed at the base of specimen 9 with ignition of the Specimen for more than 10 sec of continuous flame was noted (photograph 12).
232 minutes -	Smoke emitted from the end of the pipe of Specimen 10 has intensified.
233 minutes -	Insulation failure of Specimen 1 – maximum temperature rise of 180K is exceeded on the edge track, 1/3 span from the top, LHS.
235 minutes -	Insulation failure of Specimen 10 – maximum temperature rise of 180K is exceeded on top of the HDPE pipe, 25-mm from the collar.
235 minutes -	Integrity failure of Specimen 10 – Cotton pad applied on the exposed cavity, at the base of the pipe of Specimen 10. Ignition of the cotton pad was observed (photograph 13).
241 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.

8.5 Specimen temperature

Figure 4 shows the curve of temperature versus time associated with Specimen 1.

Figure 5 shows the curve of temperature versus time associated with Specimen 2.

Figure 6 shows the curve of temperature versus time associated with Specimen 3.

Figure 7 shows the curve of temperature versus time associated with Specimen 4.

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

Figure 9 shows the curve of temperature versus time associated with Specimen 5.

Figure 10 shows the curve of temperature versus time associated with Specimen 7.

Figure 11 shows the curve of temperature versus time associated with Specimen 8.

Figure 12 shows the curve of temperature versus time associated with Specimen 9.

Figure 13 shows the curve of temperature versus time associated with Specimen 10.

8.6 Performance

Performance observed in respect of the following AS 1530.4-2014 criteria for Section 10:

Specimen 1 –A 12-mm wide vertical control joint in a 150-mm thick Ritek 150X-PLUS wall protected with FyreFLEX Fire Resistant sealant

Structural adequacy	-	not applicable
Integrity	-	no failure at 240 minutes
Insulation	-	233 minutes

Specimen 2 – A 50-mm wide vertical control joint in a Ritek 150X-PLUS wall protected with RyanSPAN75 block and FyreFLEX Fire Resistant sealant.

Structural adequacy	-	not applicable
Integrity	-	no failure at 240 minutes
Insulation	-	210 minutes

Specimen 3 – A nominal 100-mm diameter UPVC pipe penetrating a Ritek 150X-PLUS wall through a 114-mm diameter core hole protected with Unicorn Continuous Collars and FyrePEX HP Sealant

Structural adequacy	-	not applicable
Integrity	-	no failure at 240 minutes
Insulation	-	no failure at 240 minutes

Specimen 4 –A nominal 40-mm diameter UPVC pipe penetrating a Ritek 150X-PLUS wall through a 43-mm diameter core hole protected with two 40-mm Retrofit FyreCOLLAR and FyreFLEX Fire Resistant Sealant.

Structural adequacy	-	not applicable
Integrity	-	no failure at 240 minutes
Insulation	-	175 minutes

Specimen 5 – A bundle of three 2C+E TPS power cables, two Category 6 cables, and two Fire alarm cables penetrating a 150-mm thick Ritek 150X-PLUS wall through a 25-mm diameter core hole protected with FyreFLEX Fire Resistant Sealant.

Structural adequacy	-	not applicable
Integrity	-	no failure at 240 minutes
Insulation	-	no failure at 240 minutes

Specimen 6 – A bundle of seven power cables penetrating a Ritek 150X-PLUS wall through a 70-mm diameter core hole protected with FyreFLEX Fire Resistant Sealant and Trafalgar Twrap.

Structural adequacy	-	not applicable
Integrity	-	no failure at 240 minutes
Insulation	-	196 minutes

Specimen 7 – A bundle of Appendix D1 cables penetrating a Ritek 150X-PLUS wall through a 400-mm x 420-mm wall opening protected with a FyreBATT system, FyreFLEX Fire Resistant Sealant and Twrap.

Structural adequacy	-	not applicable
Integrity	-	no failure at 240 minutes
Insulation	-	144 minutes

Specimen 8 – A bundle of Aluminium core power cables penetrating a Ritek 150X-PLUS wall through a 400-mm x 420-mm wall opening protected with a FyreBATT system, FyrePEX HP sealant and TWrap.

Structural adequacy	-	not applicable
Integrity	-	no failure at 240 minutes
Insulation	-	no failure at 240 minutes

Specimen 9 – A nominal 100-mm diameter UPVC pipe penetrating a 150-mm thick Ritek 150X-PLUS wall through a 114-mm diameter core hole protected with Trafalgar BladeRUNNER fire collars and FyreFLEX Fire Resistant Sealant; incorporating an elbow joint fitted on the exposed face.

Structural adequacy	-	not applicable
Integrity	-	223 minutes
Insulation	-	217 minutes

Specimen 10 – A nominal 100-mm diameter HDPE pipe penetrating a Ritek 150X-PLUS wall system through a 114-mm diameter core hole protected with Trafalgar BladeRUNNER fire collars and FyreFLEX Fire Resistant Sealant.

Structural adequacy	-	not applicable
Integrity	-	235 minutes
Insulation	-	235 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 FRL's of the following test specimens were as follows:

Specimen 1:	-/240/180	Specimen 6:	-/240/180
Specimen 2:	-/240/180	Specimens 7 & 8*:	-/240/120
Specimen 3:	-/240/240	Specimen 9:	-/180/180
Specimen 4:	-/240/120	Specimen 10:	-/180/180
Specimen 5:	-/240/240		

* The clearance between Specimens 7 and 8 within the furnace chamber was less than the minimum required clearance of 200-mm as specified in clause 2.9.6. In this case the fire-resistance level for the combined services has been applied based on the worst performing service penetration included in this service cluster.

For the purposes of AS 1530.4-2014, the results of these fire tests may be used to directly assess fire hazard, but it should be noted that a single test method will not provide a full assessment of fire hazard under all fire conditions.

10 Field of direct application of test results

The fire protection systems for specimens 1, 2, 3, 4, 5, 6 and 10 were essentially symmetrical fire protection systems and the results are applicable when exposed to fire from either direction.

The fire protection systems for specimens 7, 8 and 9 were essentially asymmetrical and the results are applicable when exposed to fire from the direction as tested.

11 Tested by

Peter Gordon
Testing Officer

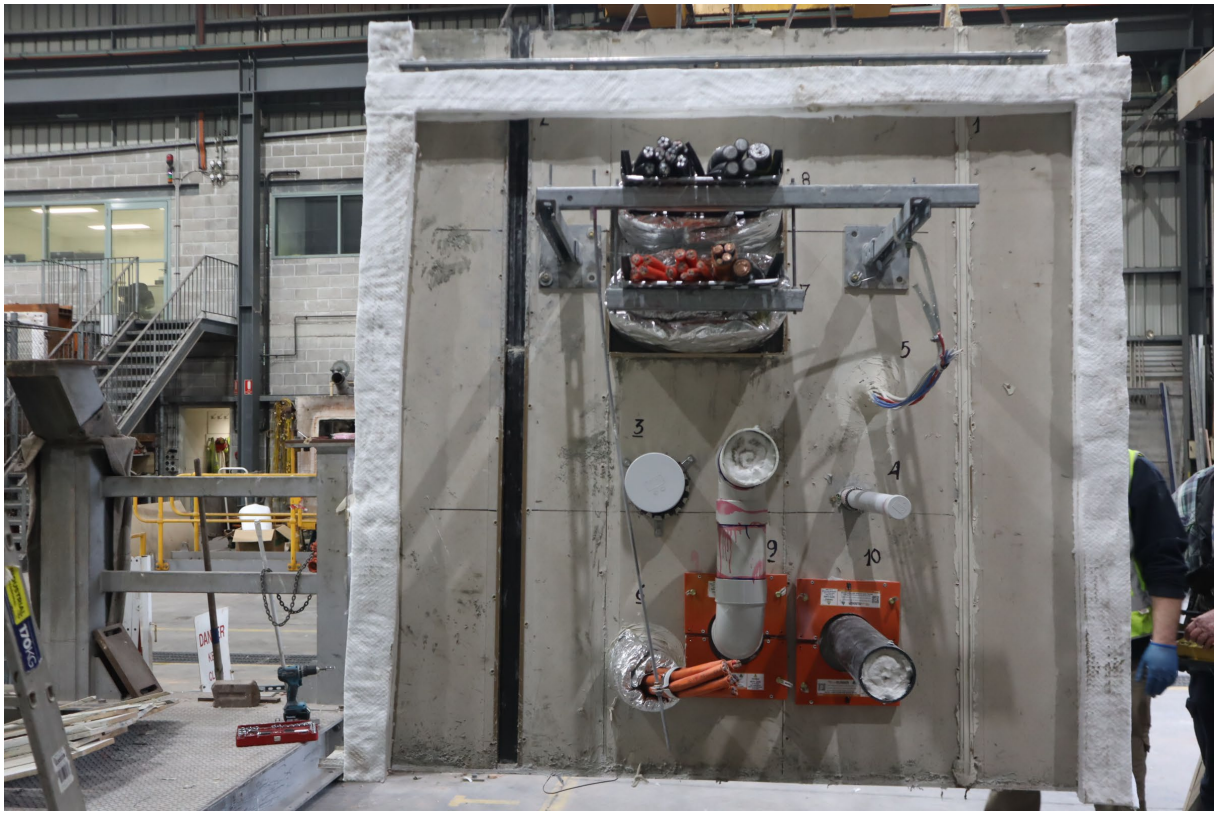
Appendices

Appendix A – Measurement location

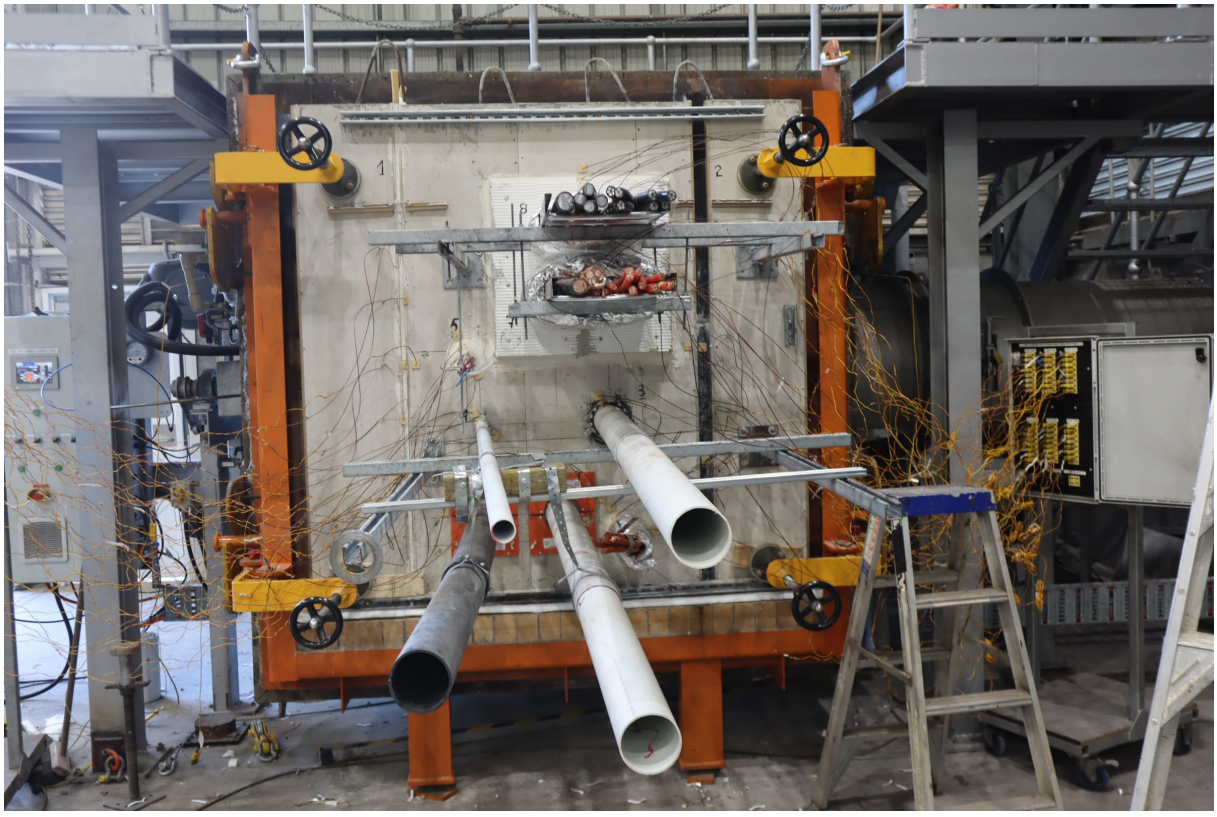
Measurement Location		T/C designation
Group location	**T/C Position**	
Specimen 1	On the RITEK wall, 25-mm from the Edge Track. On ¼ span from the top (RHS)	S1
	On the RITEK wall, 25-mm from the Edge Track. Centre (LHS)	S2
	On the RITEK ek wall, 25-mm from the Edge Track – On ¼ span from Bottom (RHS)	S3
	On the Edge Track, 1/3 spam from the top (LHS).	S4
	On the Edge Track, 1/3 spam from the bottom (RHS).	S5
	On the sealant - ¼ span from the top the top	S6
	On the sealant –mid height	S7
	On the sealant – On ¼ span from Bottom (RHS)	S8
Specimen 4	On the RITEK wall, 25-mm from the collar (top)	S9
	On the RITEK wall, 25-mm from the collar (Bottom)	S10
	On the collar, 25-mm above the RITEK wall (top)	S11
	On the collar, 25-mm above the RITEK wall (Bottom)	S12
	On the PVC pipe, 25-mm above the collar (top)	S13
	On the PVC pipe, 25-mm above the collar (Bottom)	S14
Specimen 5	On the RITEK wall, 25-mm from the sealant (top)	S15
	On the RITEK wall, 25-mm from the sealant (Bottom)	S16
	On the sealant, 25-mm from the RITEK wall (Top)	S17
	On the sealant, 25-mm from the RITEK wall (Bottom)	S18
	On the TPS cable, 25-mm from the sealant	S19
	On the CTA6 blue cable, 25-mm from the sealant.	S20
	On the FireSense (Red) cable, 25-mm from the sealant.	S21
Specimen 9	On the RITEK wall, 25-mm from the blade runner (top)	S22
	On the RITEK wall, 25-mm from the blade runner (RHS)	S23
	On the blade runner, 25-mm from the PVC pipe (top)	S24
	On the blade runner, 25-mm from the PVC pipe (RHS)	S25
	On the PVC pipe, 25-mm from the blade runner (top)	S26
	On the PVC pipe, 25-mm from the blade runner (RHS)	S27
Specimen 10	On the RITEK wall, 25-mm from the blade runner (top)	S28
	On the RITEK wall, 25-mm from the blade runner (LHS)	S29
	On the blade runner, 25-mm from the PVC pipe (top)	S30
	On the blade runner, 25-mm from the PVC pipe (LHS)	S31
	On the PVC pipe, 25-mm from the blade runner (top)	S32
	On the PVC pipe, 25-mm from the blade runner (LHS)	S33
Ambient		S34
Rover		S35
Specimen 2	On the RITEK wall, 25-mm from the Edge Track. On ¼ span from the top (RHS)	S36
	On the RITEK wall, 25-mm from the Edge Track. Centre (LHS)	S37
	On the RITEK wall, 25-mm from the Edge Track – On ¼ span from Bottom (RHS)	S38
	On the RITEK Track, 1/3 spam from the top (LHS).	S39
	On the RITEK Track, 1/3 spam from the bottom (RHS).	S40
	On the RyanSPAN75 foam - ¼ span from the top the top	S41
	On the RyanSPAN75foam – At the centre	S42
	On the RyanSPAN75foam – On ¼ span from Bottom (RHS)	S43
Specimen 3	On the RITEK wall, 25-mm from the collar (top)	S44
	On the RITEK wall, 25-mm from the collar (Bottom)	S45
	On the collar, 25-mm above the RITEK wall (top)	S46
	On the collar, 25-mm above the RITEK wall (Bottom)	S47
	On the PVC pipe, 25-mm above the collar (top)	S48
	On the PVC pipe, 25-mm above the collar (Bottom)	S49
Specimen 6	On the RITEK wall, 25-mm from the sealant (top)	S50
	On the RITEK wall, 25-mm from the sealant (RHS)	S51
	On the sealant, 25-mm from the RITEK wall (Top)	S52
	On the sealant, 25-mm from the RITEK (RHS)	S53

Measurement Location		T/C designation
Group location	**T/C Position**	
	On the wrap, 25-mm from the sealant (top)	S54
	On the wrap, 25-mm from the sealant (RHS)	S55
	On the cables, 25-mm from the wrap (top)	S56
	On the cables, 25-mm from the wrap (Bottom)	S57
Specimen 7	On the RITEK wall, 25-mm from the sealant (top)	S58
	On the RITEK wall, 25-mm from the sealant (RHS)	S59
	On the sealant, 25-mm from the RITEK wall (Top)	S60
	On the sealant, 25-mm from the RITEK wall (RHS)	S61
	On the FyreBATT, 25-mm from the wrap (top)	S62
	On the FyreBATT, 25-mm from the wrap (RHS)	S63
	On the wrap, 25-mm from the FyreBATT (top)	S64
	On the wrap, 25-mm from the FyreBATT (RHS)	S65
	On the TRAY, 25-mm from the wrap (RHS)	S66
	On the TRAY, 25-mm from the wrap (Bottom)	S67
	On top of the 41.4-mm OD XLPE insulate cable, 25-mm from the wrap	S68
	On top of the 53.8-mm OD 3-core+E PVC insulate cable, 25-mm from the wrap	S69
	On top of the 16-mm OD 3-core+E PVC insulate cable, 25-mm from the wrap	S70
	On top of the 20.4-mm OD 3-core+E PVC insulate cable, 25-mm from the wrap	S71
Specimen 8	On the FyreBATT, 25-mm from the wrap (top)	S72
	On the FyreBATT, 25-mm from the wrap (RHS)	S73
	On the wrap, 25-mm from the FyreBATT (top)	S74
	On the wrap, 25-mm from the FyreBATT (RHS)	S75
	On the TRAY, 25-mm from the wrap (RHS)	S76
	On the TRAY, 25-mm from the wrap (Bottom)	S77
	On top of the 45-mm OD XLPE insulate Aluminium cable, 25-mm from the wrap	S78
	On top of the 30-mm OD XLPE insulate Aluminium cable, 25-mm from the wrap	S79
	On top of the 10-mm OD 3-core+E XLPE insulate Aluminium cable, 25-mm from the wrap	S80
	On top of the 25-mm OD 4-core+E XLPE insulate Aluminium cable, 25-mm from the wrap	S81
	On top of the 25-mm OD 4-core+E XLPE insulate Aluminium cable, 25-mm from the wrap	S82

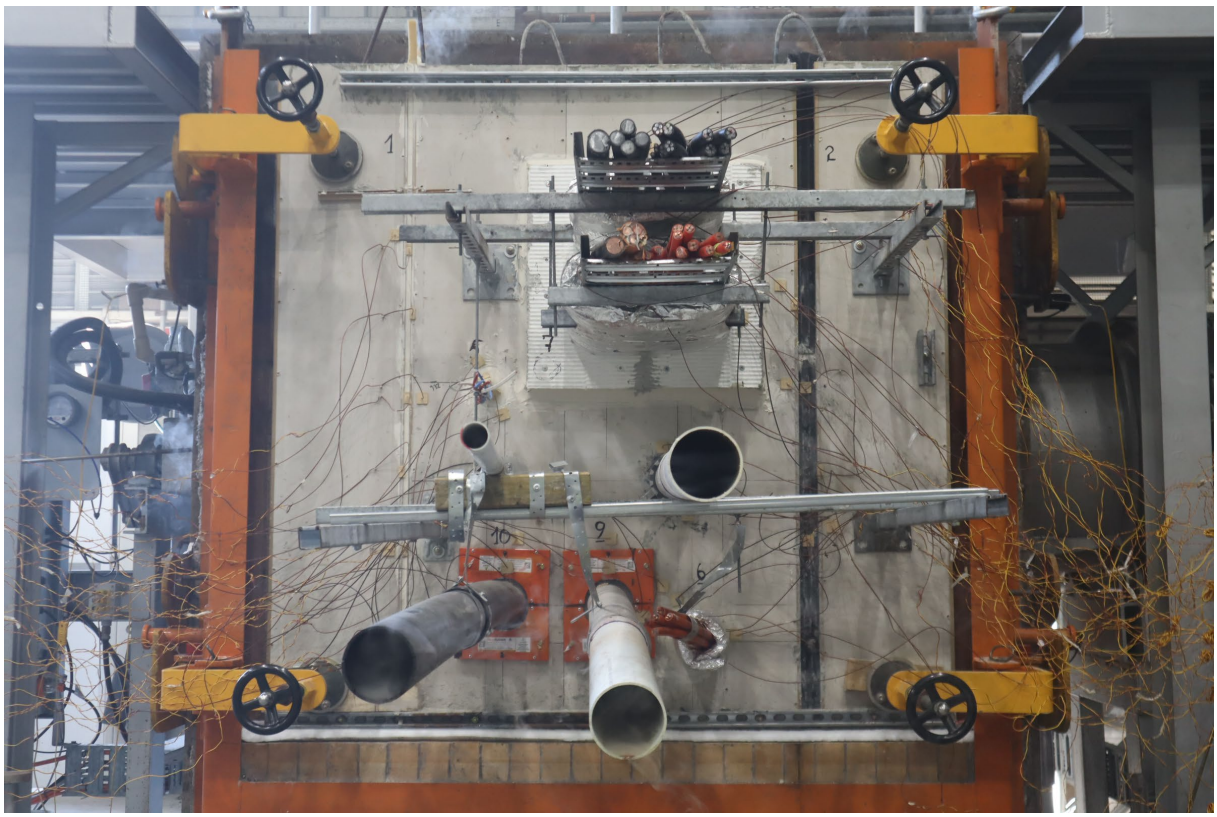
Appendix B – Test photographs



PHOTOGRAPH 1 – EXPOSED FACE OF SPECIMENS PRIOR TO TESTING



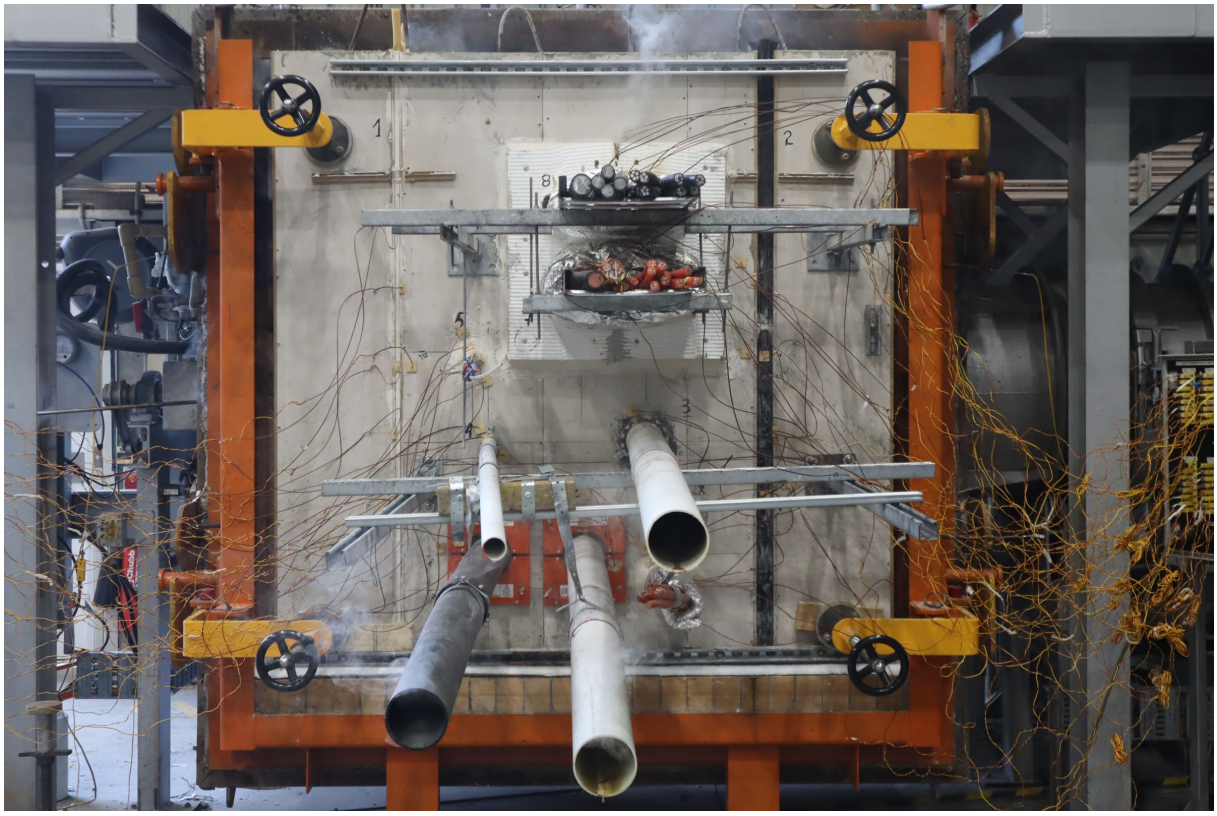
PHOTOGRAPH 2 – UNEXPOSED FACE OF SPECIMENS PRIOR TO TESTING



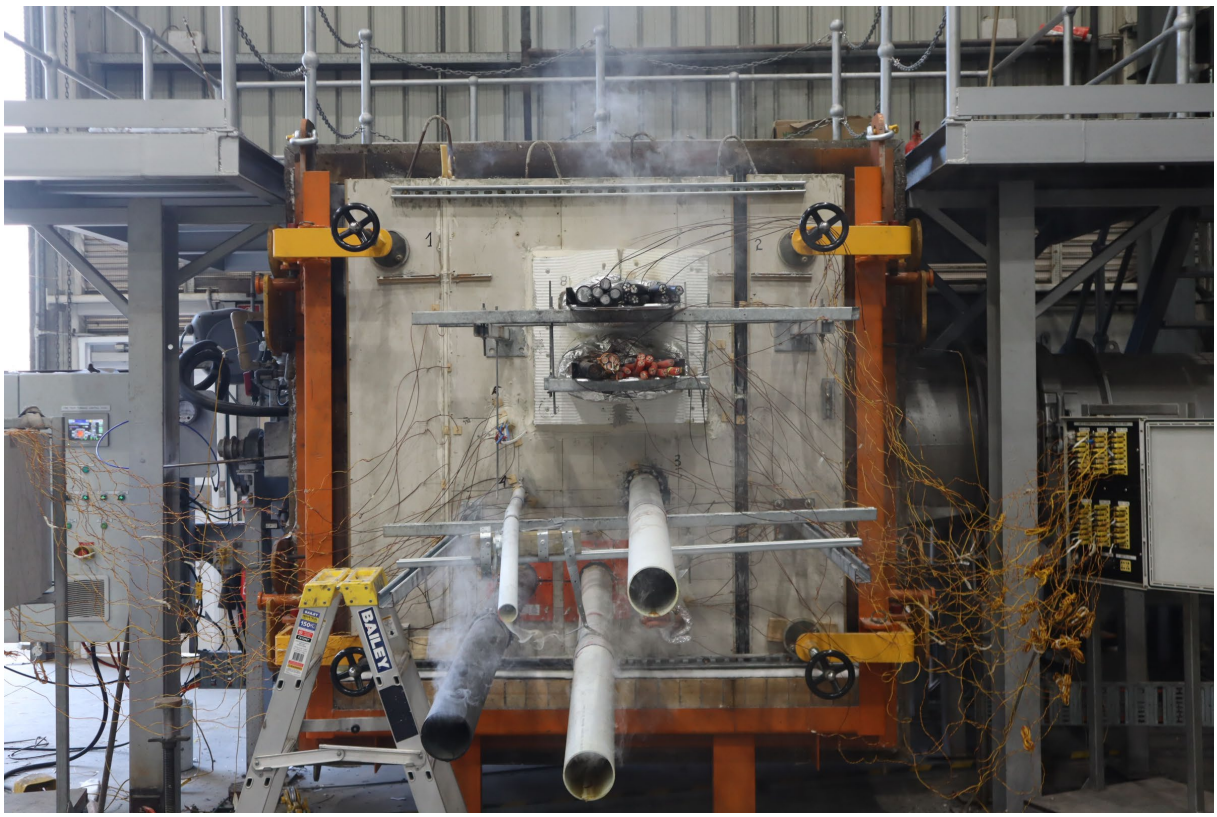
PHOTOGRAPH 3 – UNEXPOSED FACE OF SPECIMENS 30 MINUTES INTO THE TEST

PHOTOGRAPH 4 – UNEXPOSED FACE OF SPECIMENS 60 MINUTES INTO THE TEST

PHOTOGRAPH 5 – UNEXPOSED FACE OF SPECIMEN 8 AT 78 MINUTES INTO THE TEST



PHOTOGRAPH 6 – UNEXPOSED FACE OF SPECIMENS AT 90 MINUTES INTO THE TEST



PHOTOGRAPH 7 – UNEXPOSED FACE OF SPECIMENS AT 120 MINUTES INTO THE TEST

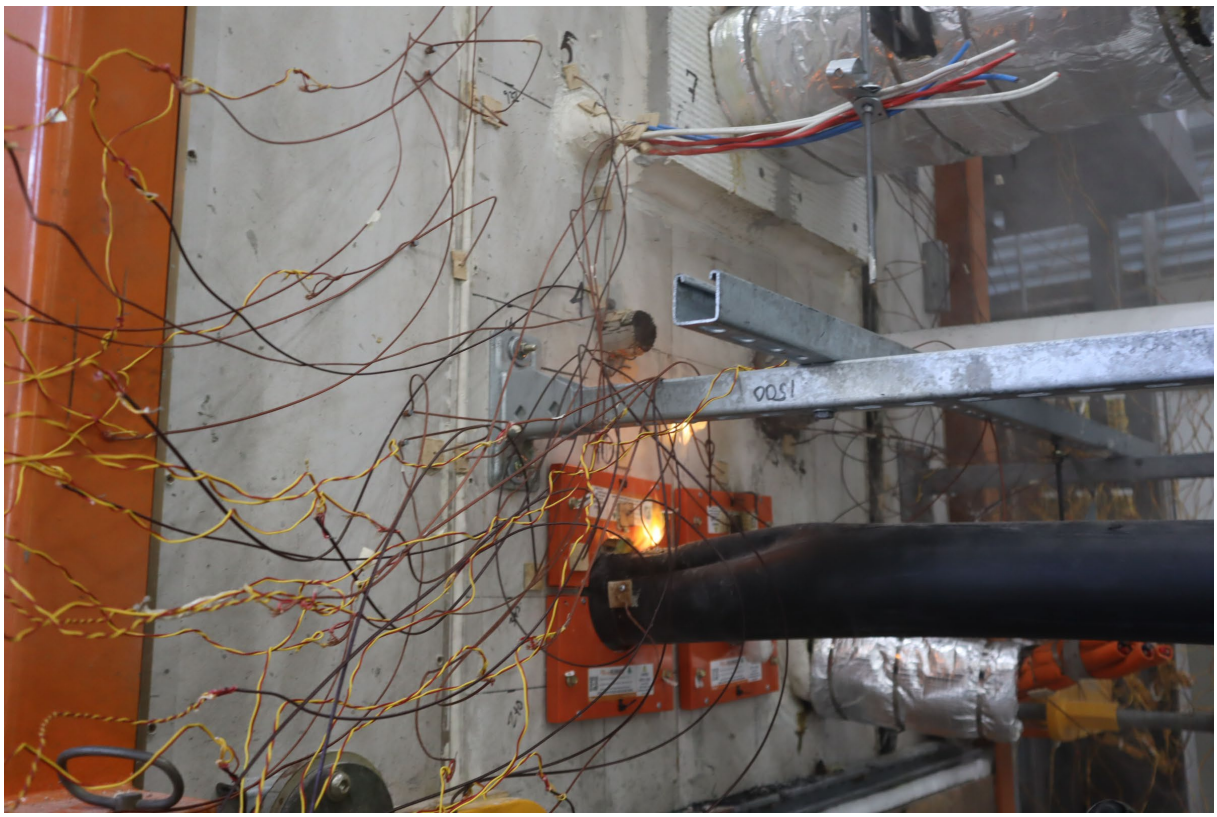
PHOTOGRAPH 8 – UNEXPOSED FACE OF SPECIMENS AT 150 MINUTES INTO THE TEST

PHOTOGRAPH 9 – UNEXPOSED FACE OF SPECIMENS AT 180 MINUTES INTO THE TEST

PHOTOGRAPH 10 – UNEXPOSED FACE OF SPECIMENS AT 210 MINUTES INTO THE TEST

PHOTOGRAPH 11 – UNEXPOSED FACE OF SPECIMEN 9 AT 223 MINUTES INTO THE TEST

PHOTOGRAPH 12 – UNEXPOSED FACE OF SPECIMEN 9 AT 224 MINUTES INTO THE TEST



PHOTOGRAPH 13 – UNEXPOSED FACE OF SPECIMEN 10 AT 235 MINUTES INTO THE TEST

PHOTOGRAPH 14 – UNEXPOSED FACE OF SPECIMENS AT THE COMPLETION OF TESTING

PHOTOGRAPH 15 – EXPOSED FACE OF SPECIMENS AFTER THE COMPLETION OF TESTING

Appendix C – Test data charts

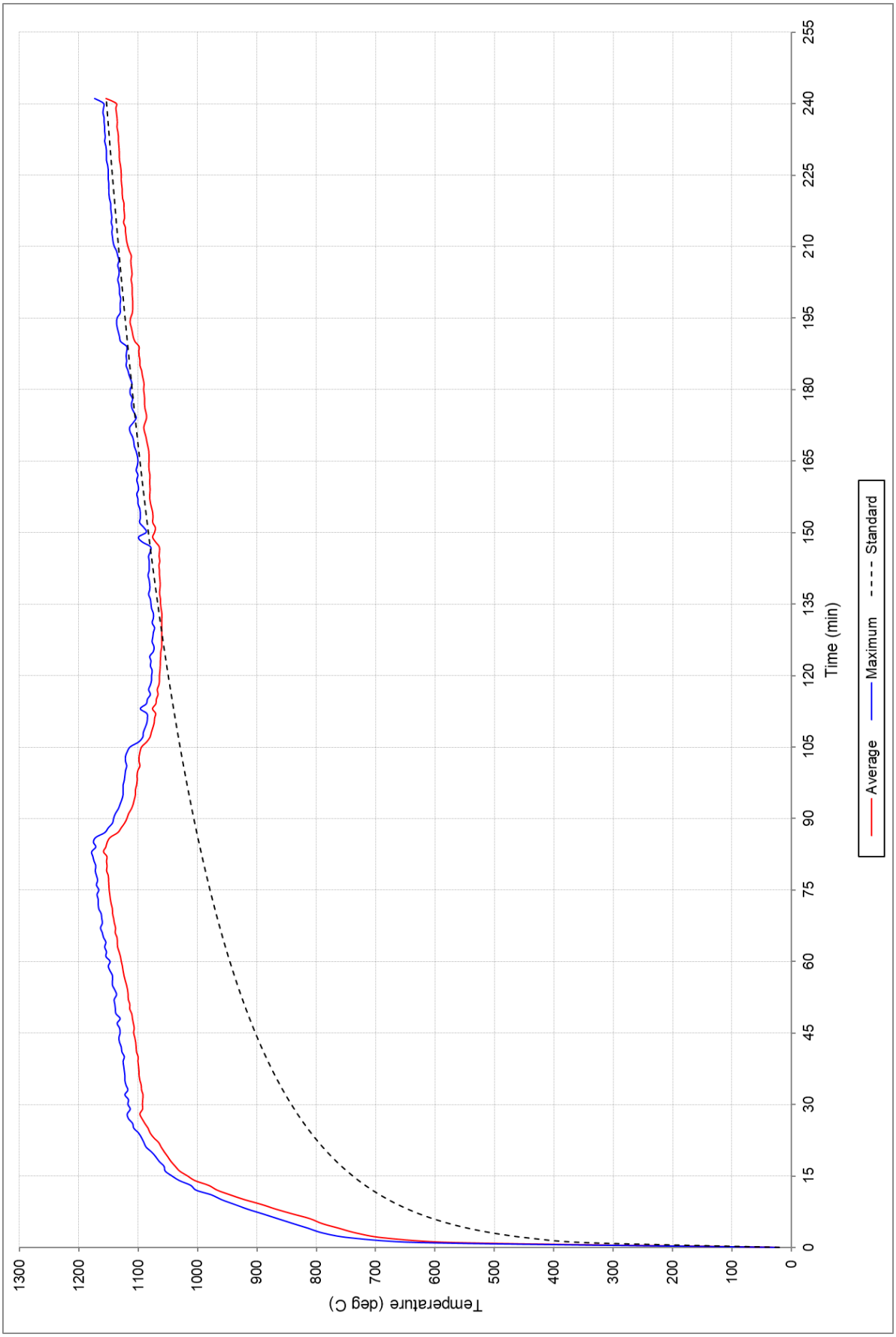


FIGURE 1 – FURNACE TEMPERATURE

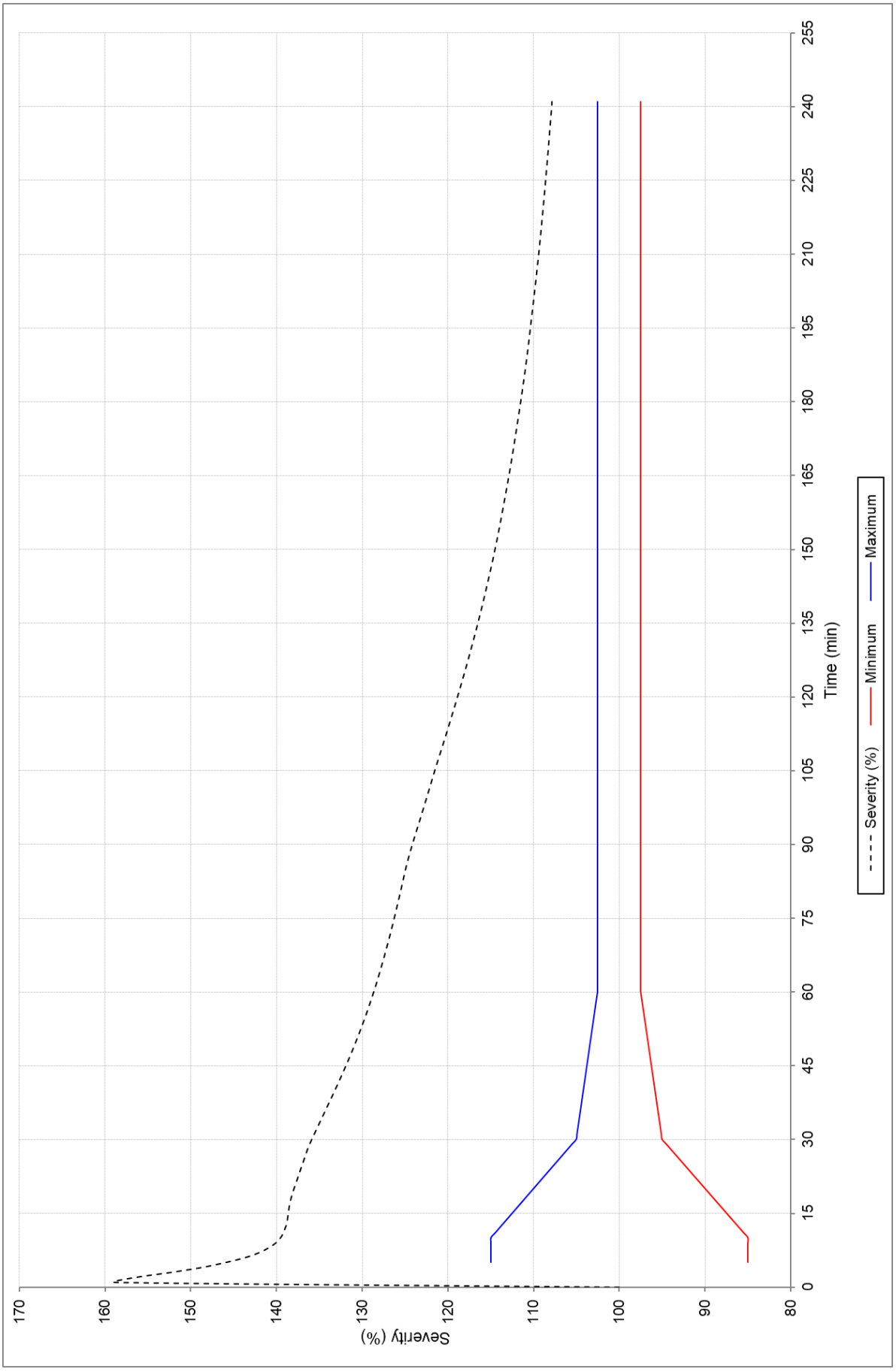


FIGURE 2 – FURNACE SEVERITY

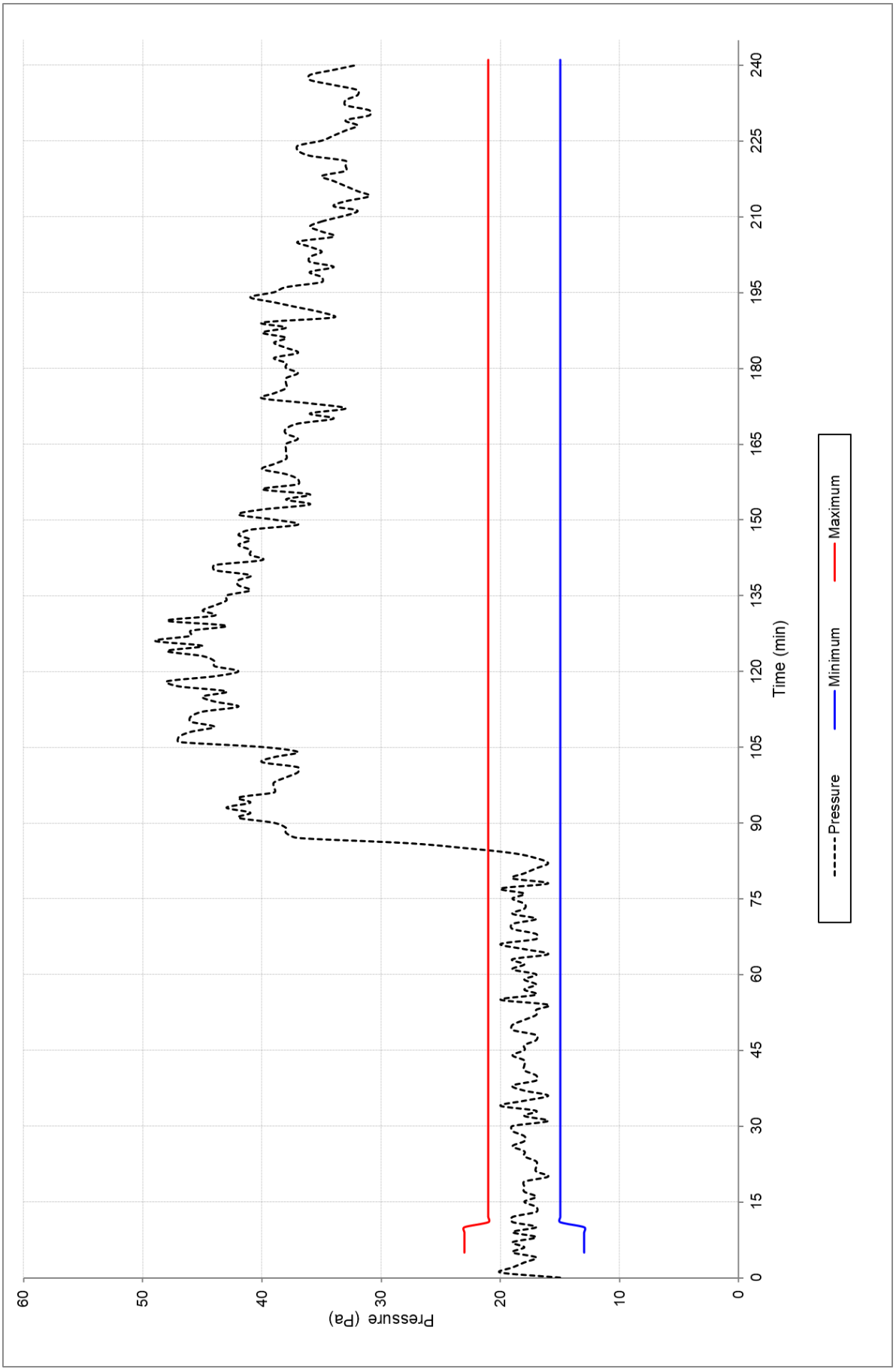


FIGURE 3 – FURNACE PRESSURE

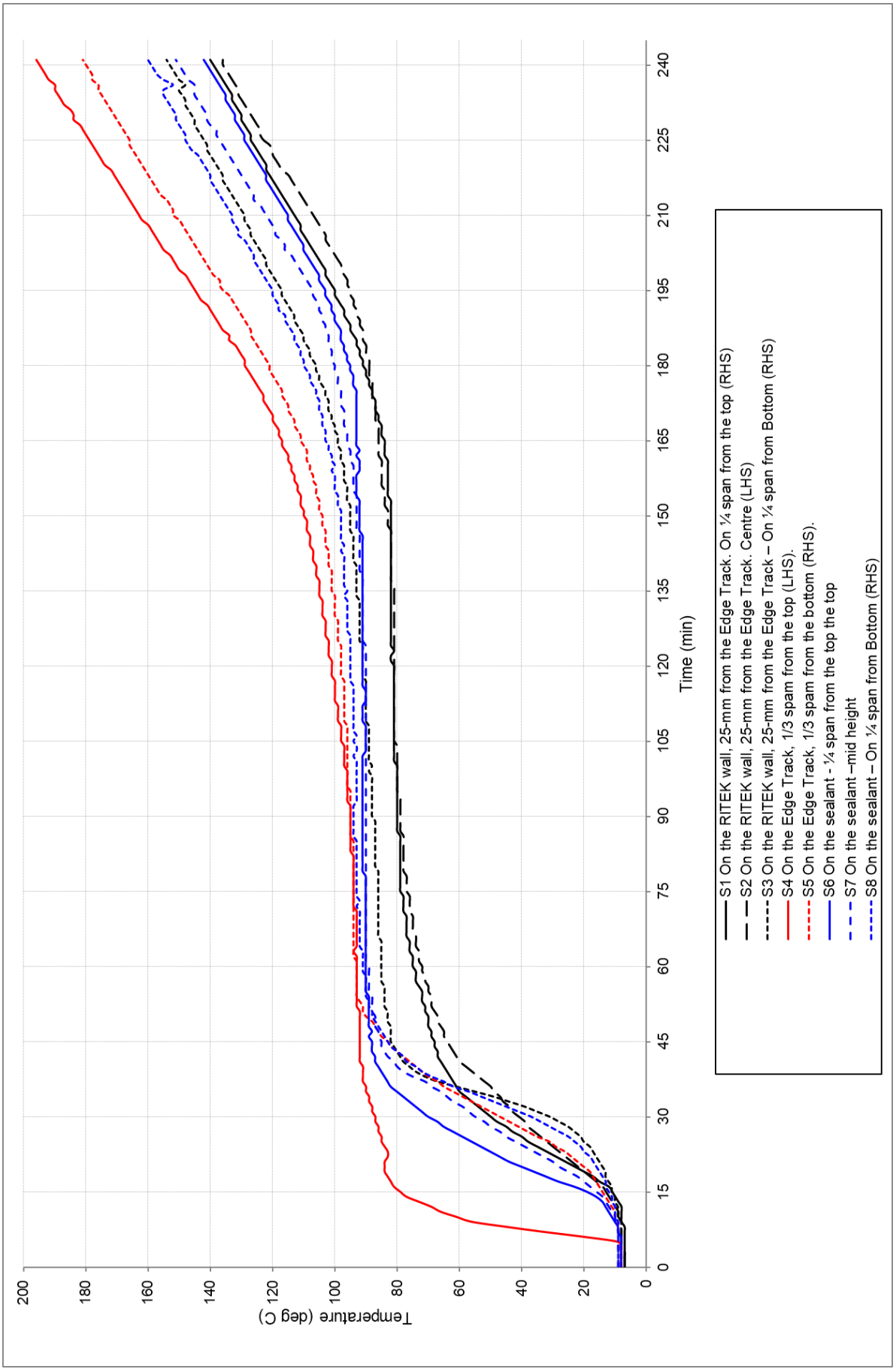


FIGURE 4 – TEMPERATURE VERSUS TIME ASSOCIATED WITH SPECIMEN 1

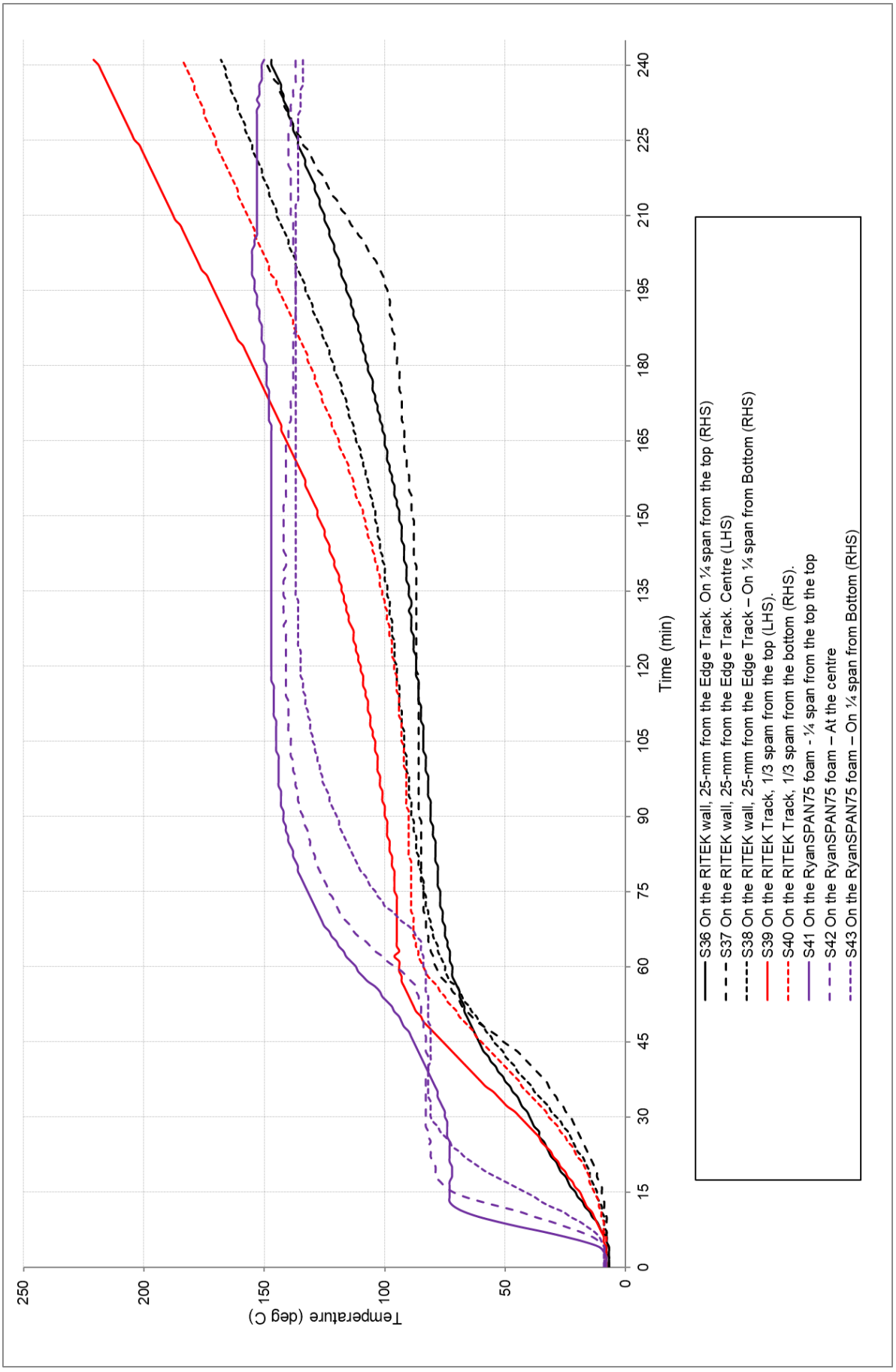


FIGURE 5 – TEMPERATURE VERSUS TIME ASSOCIATED WITH SPECIMEN 2

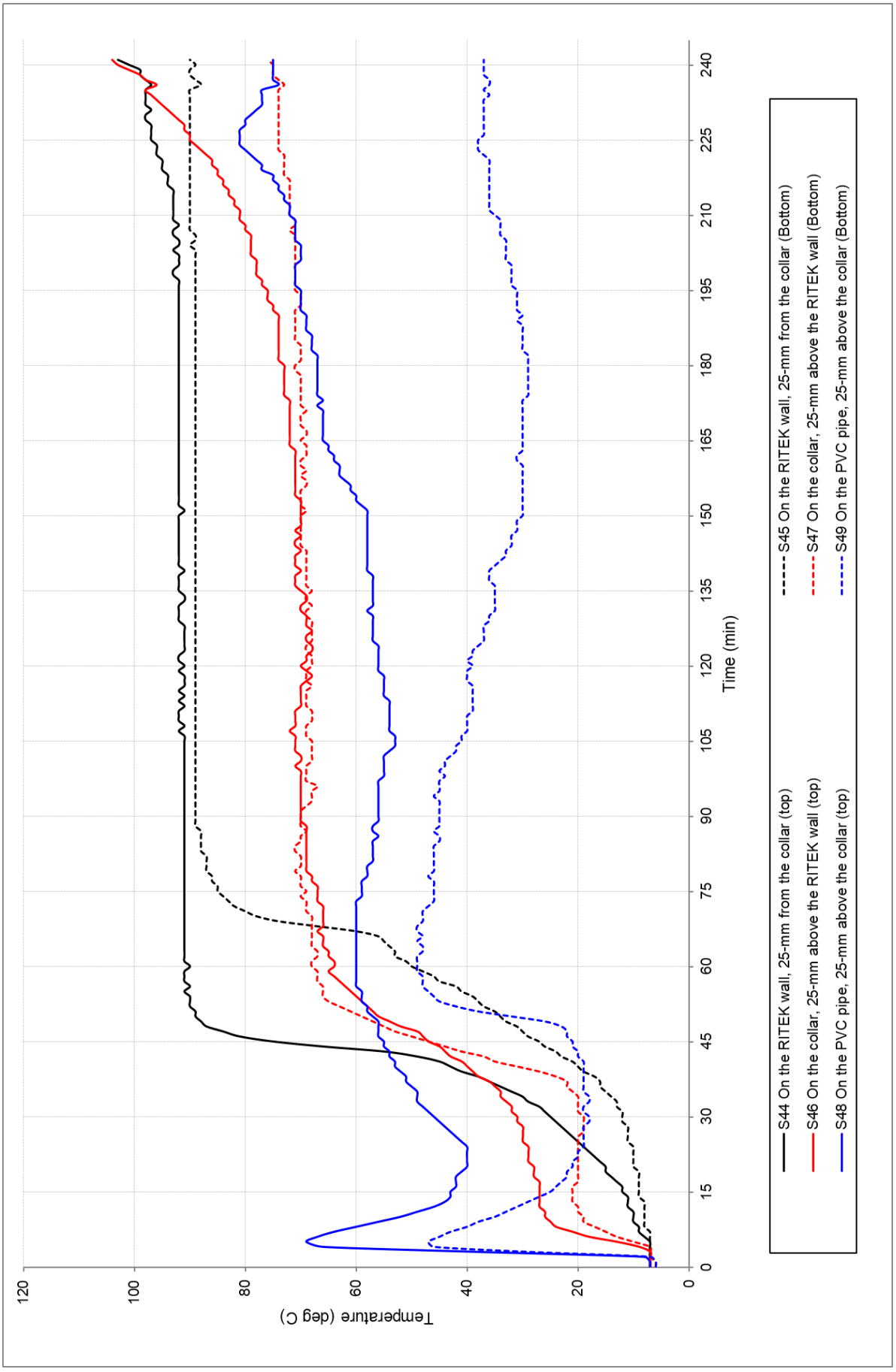


FIGURE 6 – TEMPERATURE VERSUS TIME ASSOCIATED WITH SPECIMEN 3

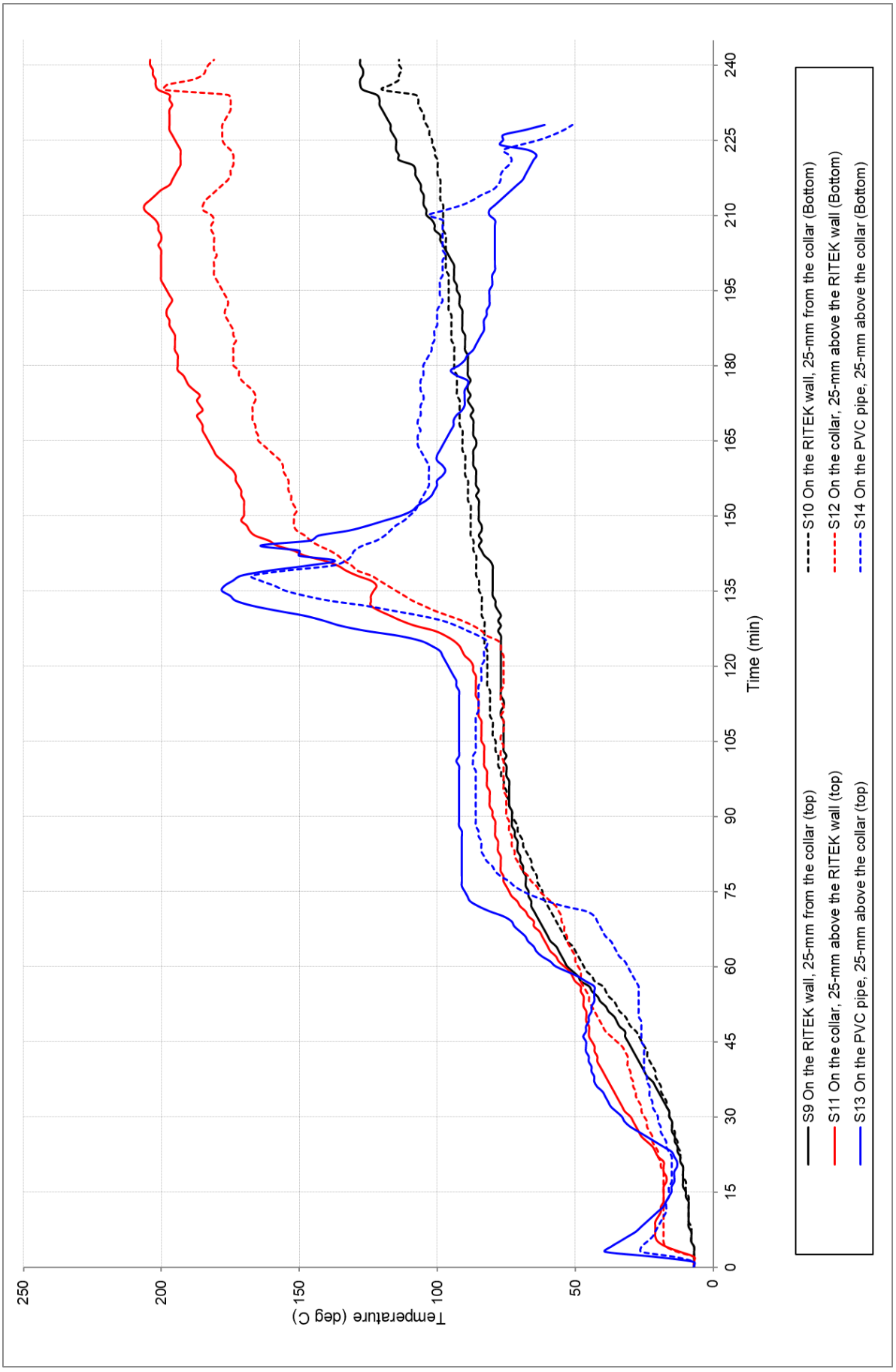


FIGURE 7 – TEMPERATURE VERSUS TIME ASSOCIATED WITH SPECIMEN 4

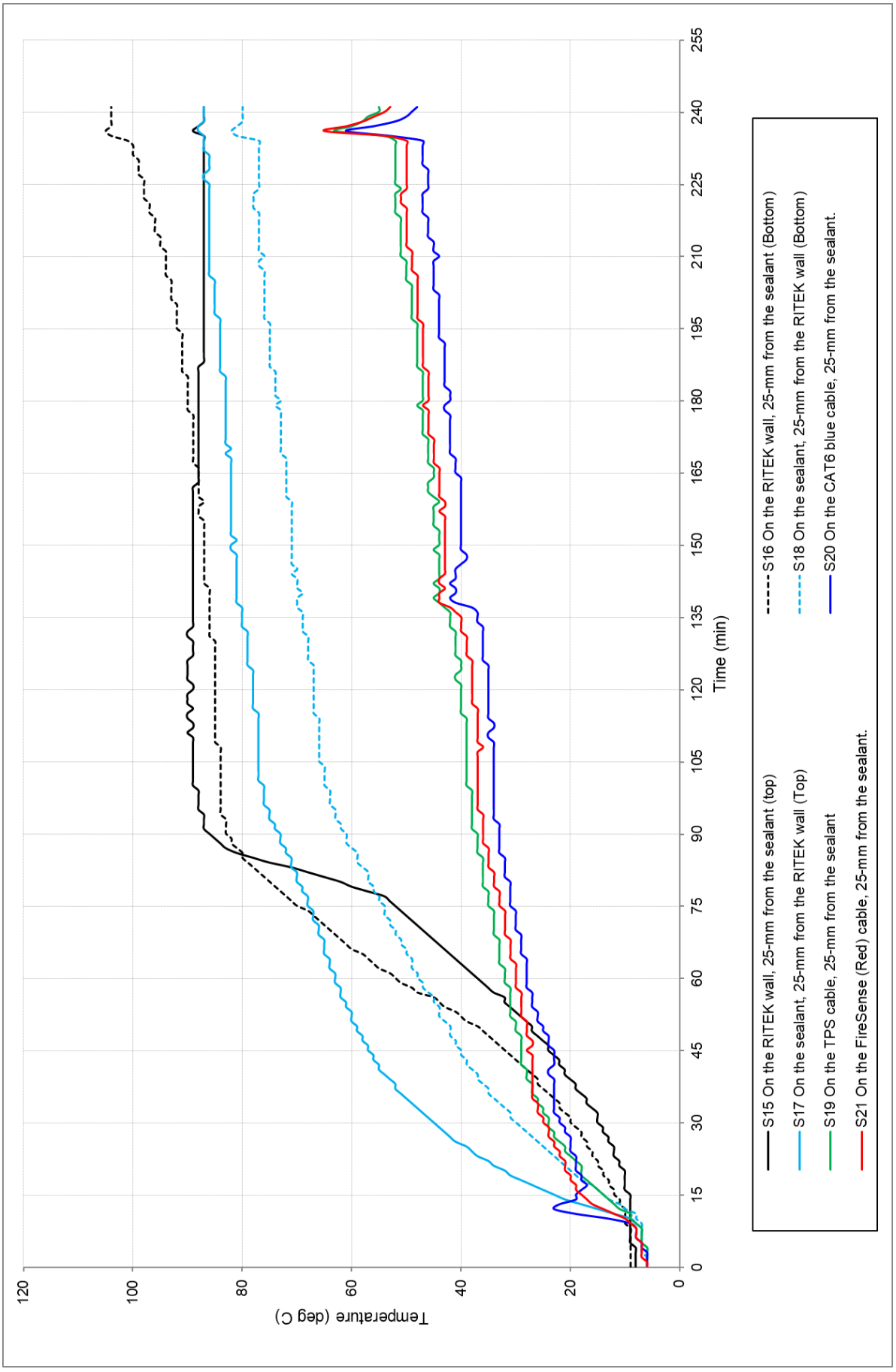


FIGURE 8 – TEMPERATURE VERSUS TIME ASSOCIATED WITH SPECIMEN 5

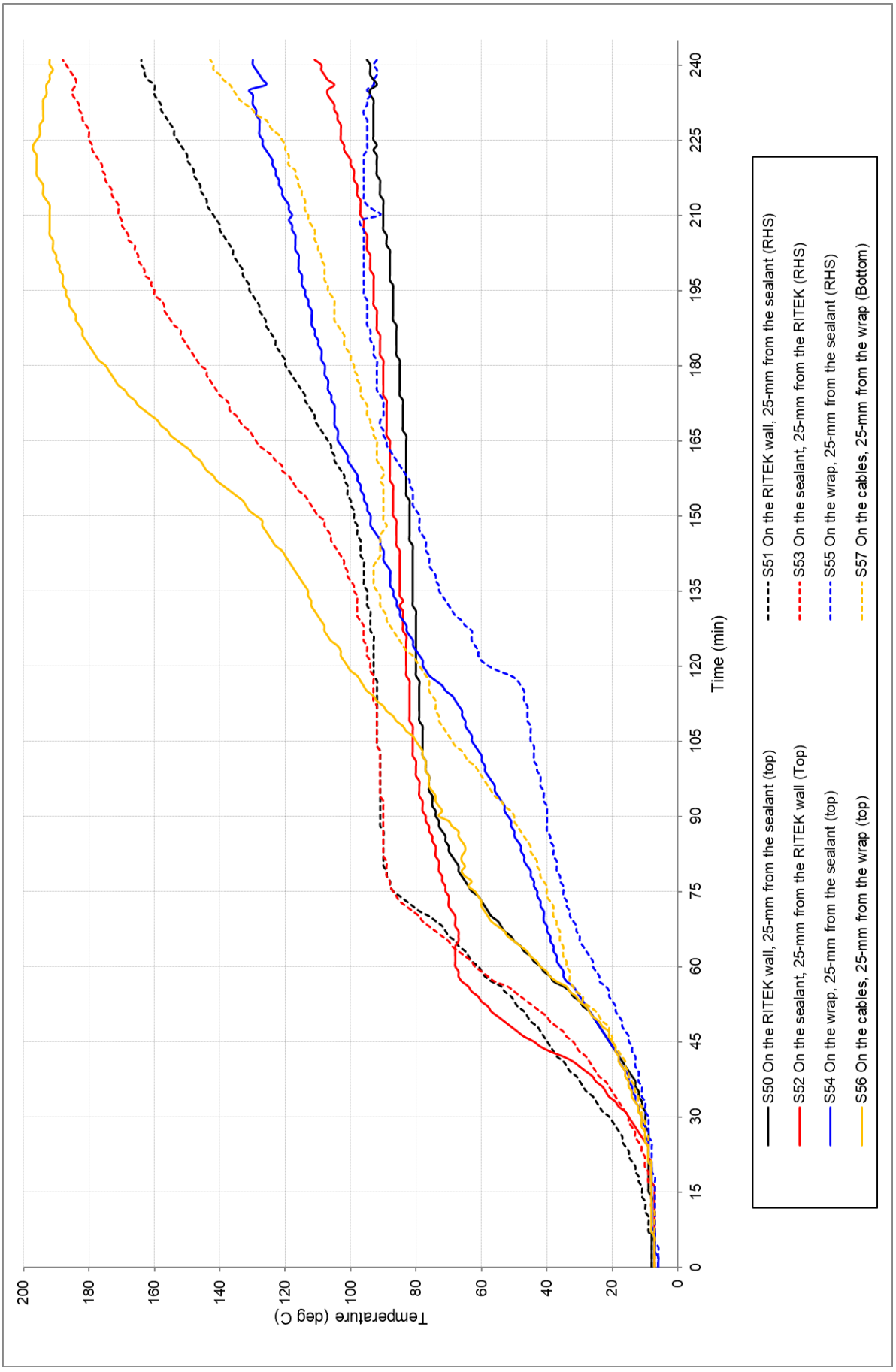


FIGURE 9 – TEMPERATURE VERSUS TIME ASSOCIATED WITH SPECIMEN 6

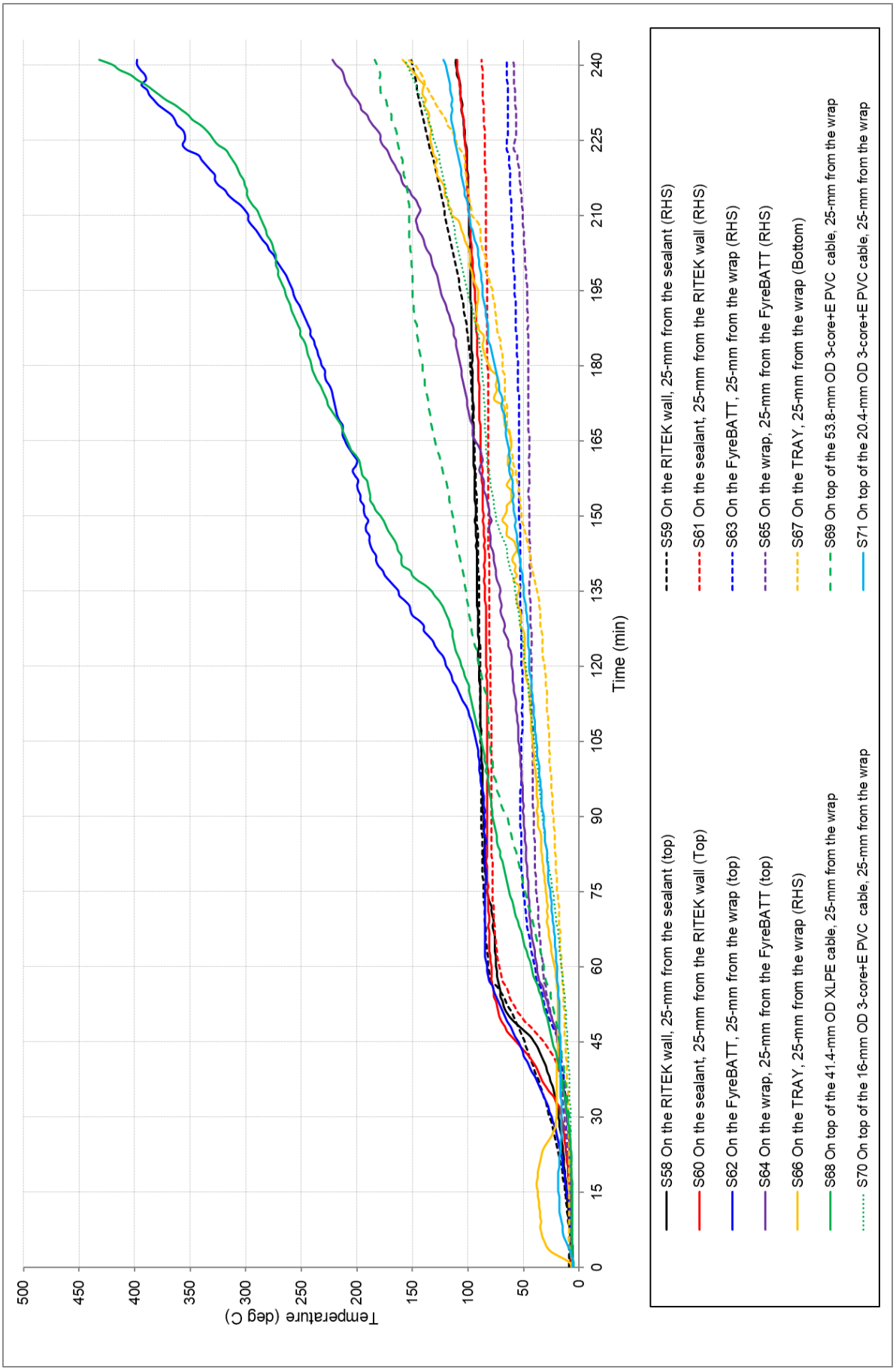


FIGURE 10 – TEMPERATURE VERSUS TIME ASSOCIATED WITH SPECIMEN 7

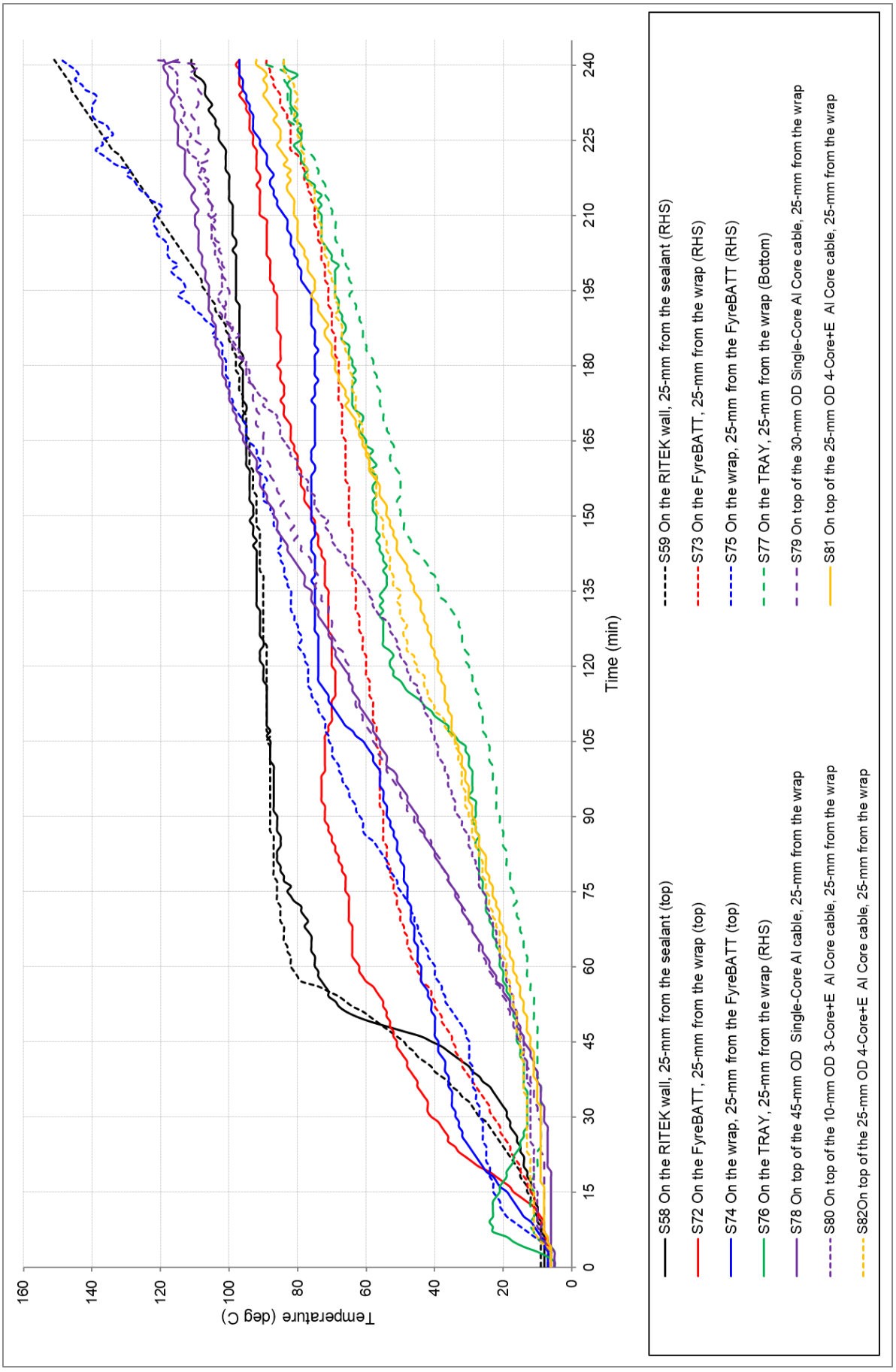


FIGURE 11 – TEMPERATURE VERSUS TIME ASSOCIATED WITH SPECIMEN 8

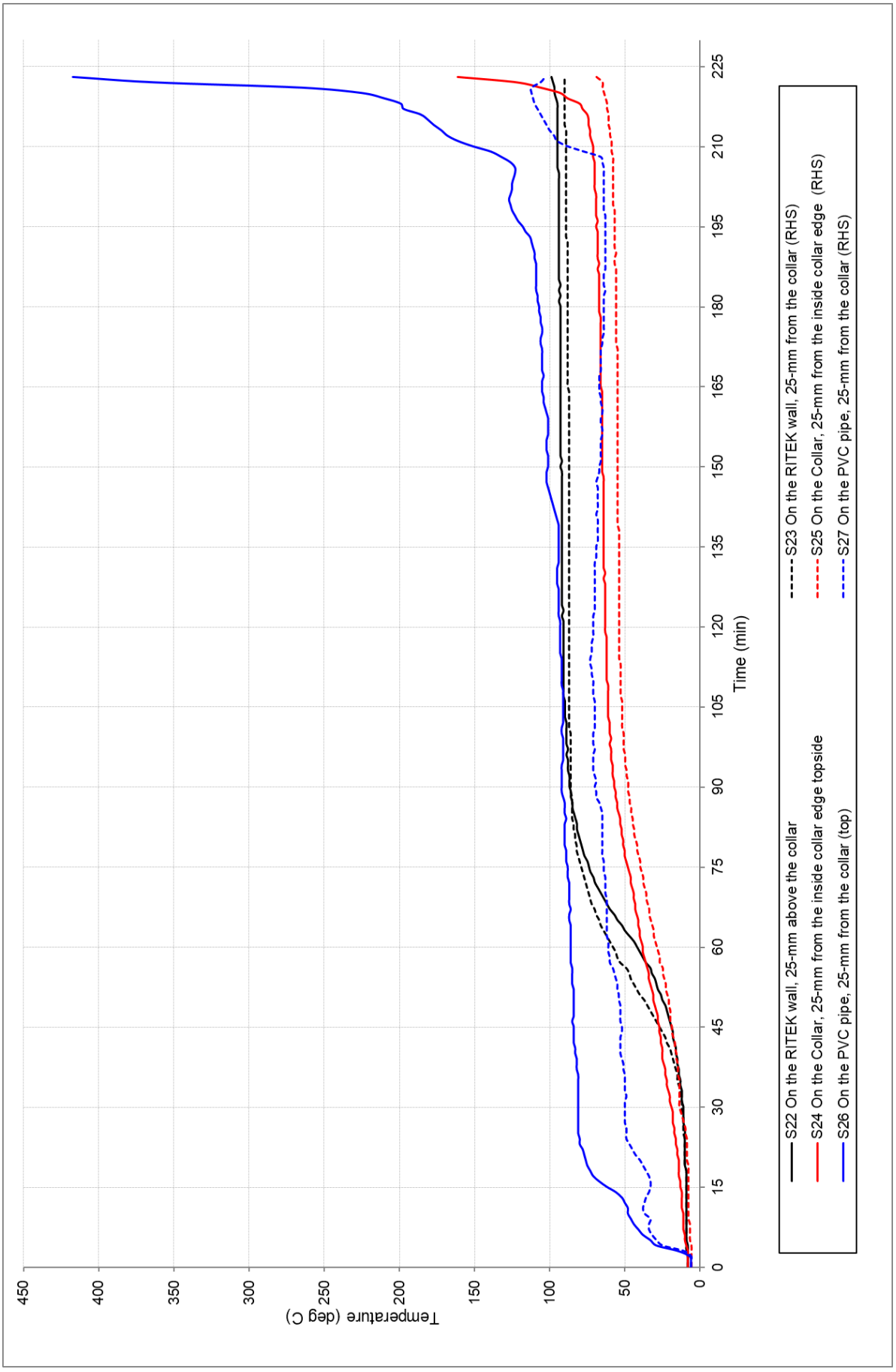


FIGURE 12 – TEMPERATURE VERSUS TIME ASSOCIATED WITH SPECIMEN 9

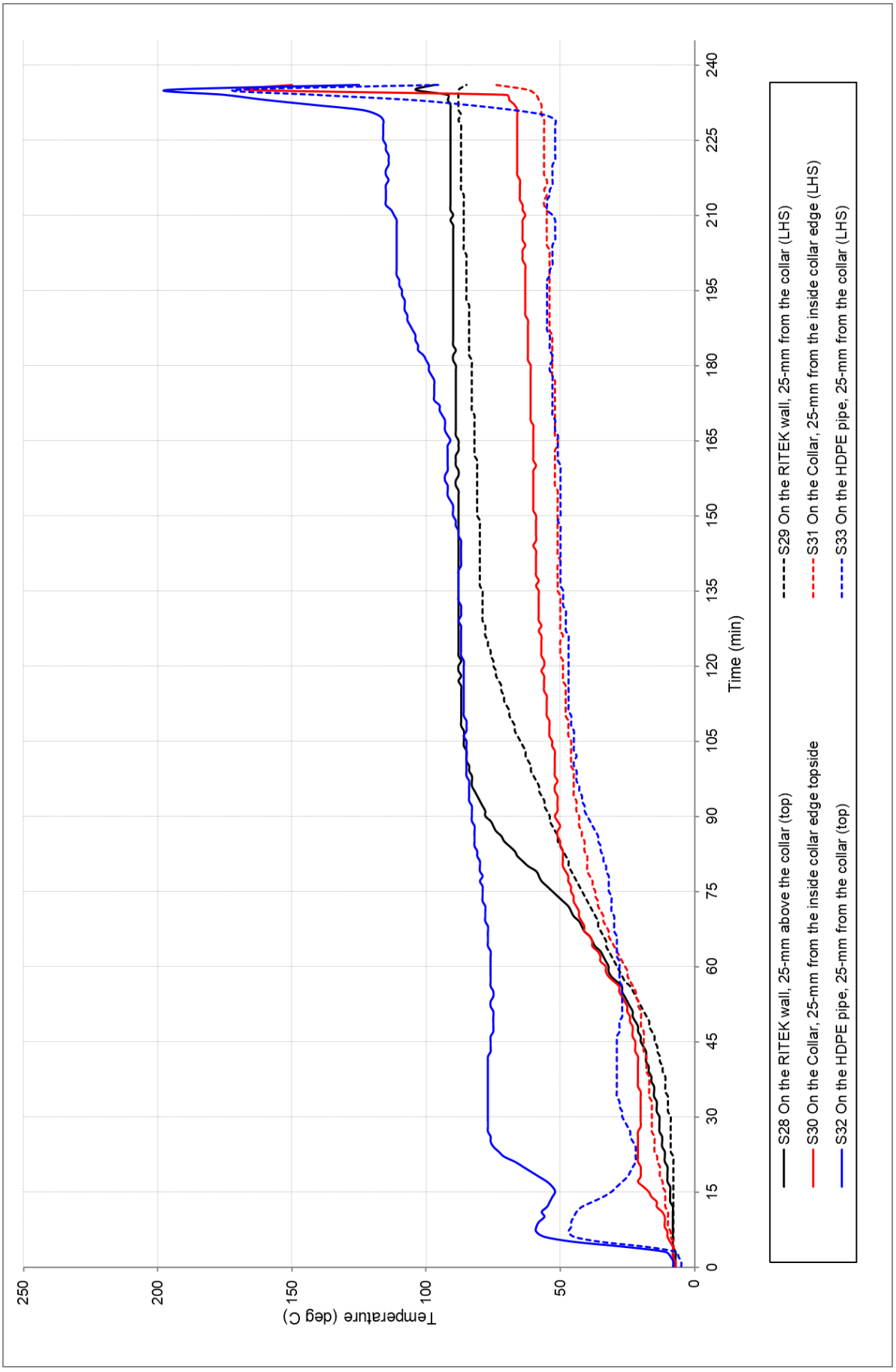
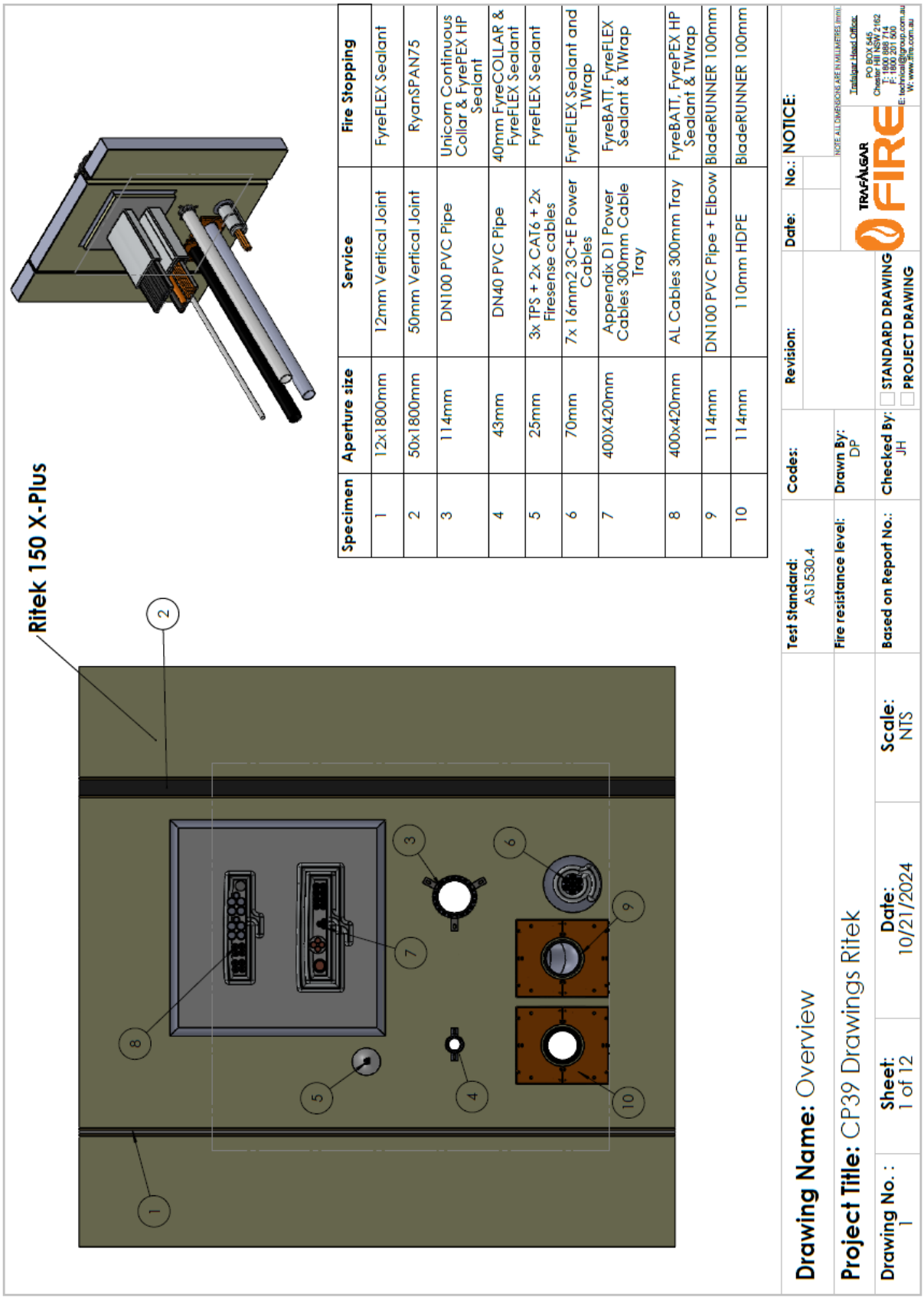


FIGURE 13 – TEMPERATURE VERSUS TIME ASSOCIATED WITH SPECIMEN 10

Appendix D – Specimen drawings



Specimen	Aperture size	Service	Fire Stopping
1	12x1800mm	12mm Vertical Joint	FyreFLEX Sealant
2	50x1800mm	50mm Vertical Joint	RyanSPAN75
3	114mm	DN100 PVC Pipe	Unicorn Continuous Collar & FyrePEX HP Sealant
4	43mm	DN40 PVC Pipe	40mm FyreCOLLAR & FyreFLEX Sealant
5	25mm	3x TPS + 2x CAT6 + 2x Firesense cables	FyreFLEX Sealant
6	70mm	7x 16mm2 3C+E Power Cables	FyreFLEX Sealant and TWrap
7	400X420mm	Appendix D1 Power Cables 300mm Cable Tray	FyreBATT, FyreFLEX Sealant & TWrap
8	400x420mm	AL Cables 300mm Tray	FyreBATT, FyrePEX HP Sealant & TWrap
9	114mm	DN100 PVC Pipe + Elbow	BladeRUNNER 100mm
10	114mm	110mm HDPE	BladeRUNNER 100mm

Drawing Name: Overview

Project Title: CP39 Drawings Ritek

Drawing No.:	Sheet:	Date:	Scale:
1	1 of 12	10/21/2024	NTS

Test Standard: AS1530.4	Codes:	Revision:	Date:	No.: NOTICE:
Fire resistance level:	Drawn By: DP			
Based on Report No.:	Checked By: JH	☐ STANDARD DRAWING ☐ PROJECT DRAWING		

NOTE ALL DIMENSIONS ARE IN MILLIMETRES (mm)

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Chester Hill NSW 2162
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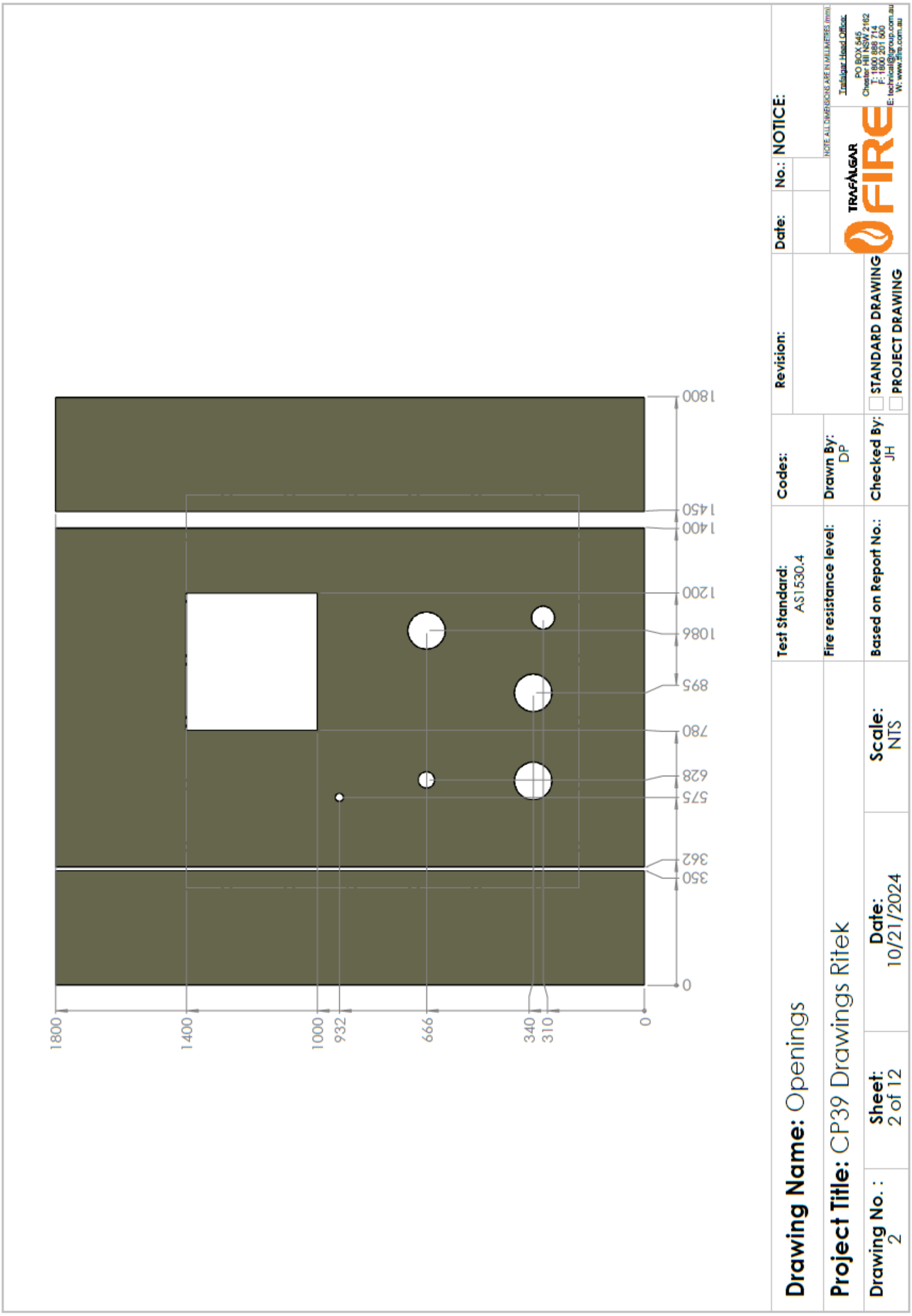
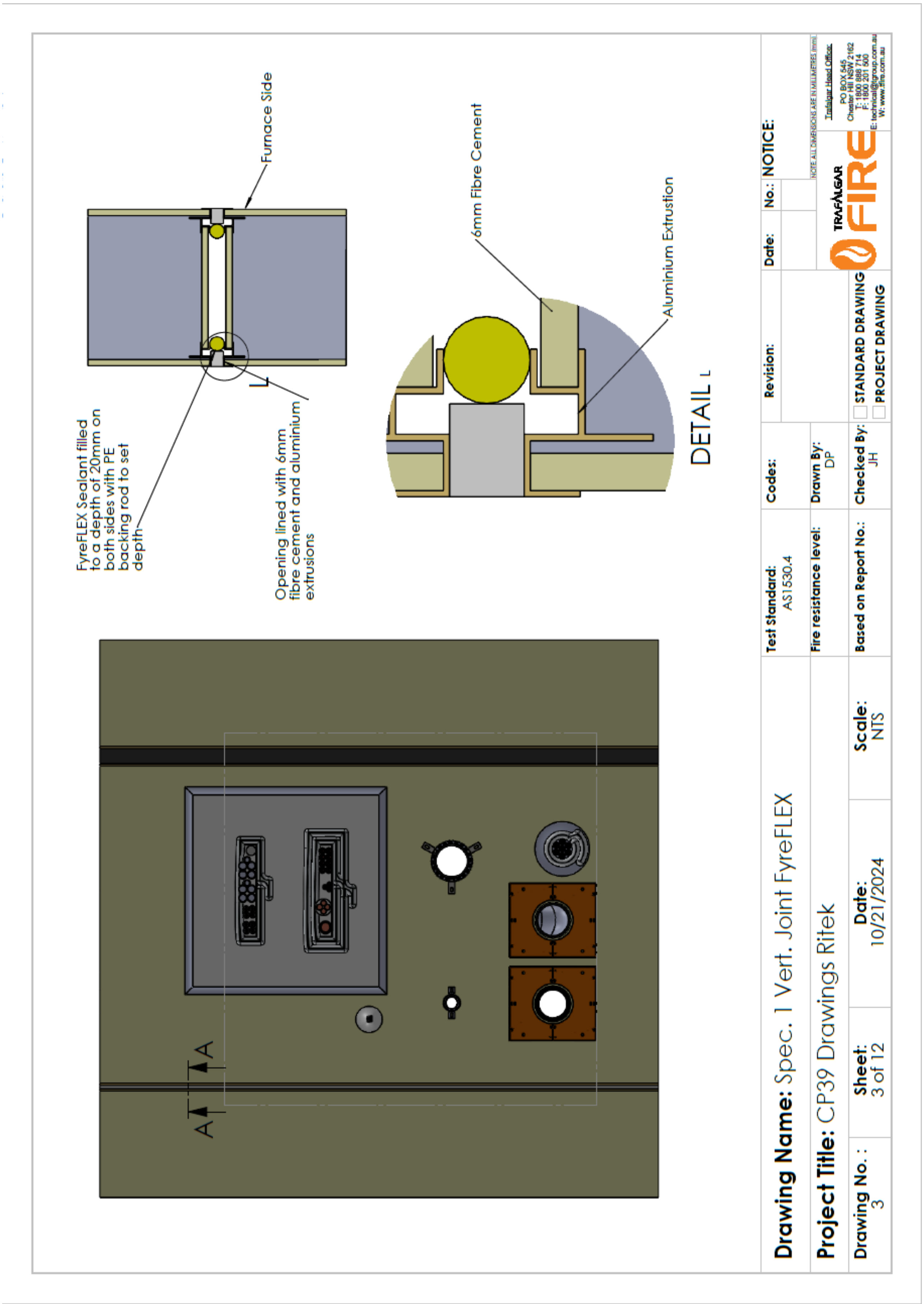
E: technical@tgroup.com.au
W: www.tfire.com.au

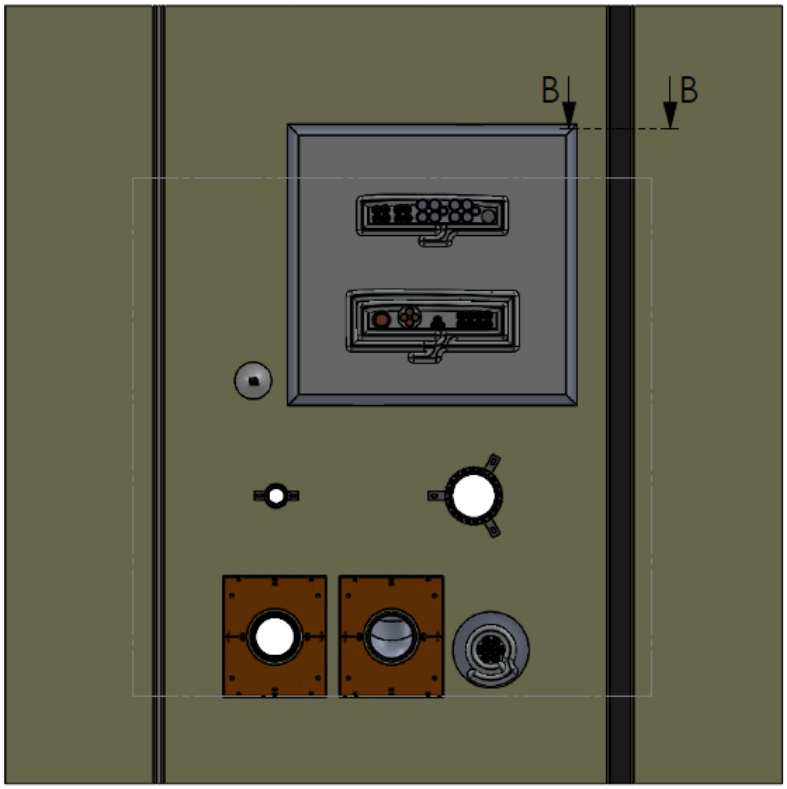
DRAWING TITLED OVERVIEW, SHEET 1 OF 12, DATED 21 OCTOBER 2024, BY TRAFALGAR PTY LTD.

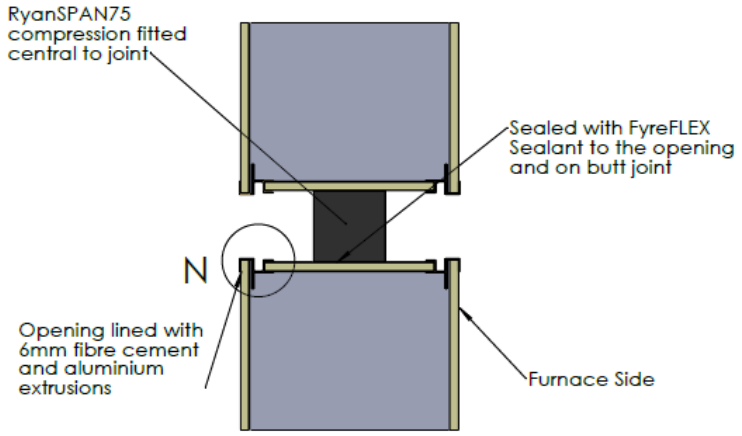


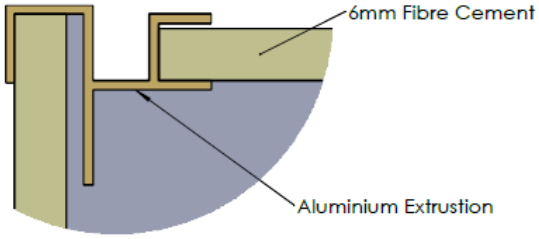
DRAWING TITLED OPENING, SHEET 2 OF 12, DATED 21 OCTOBER 2024, BY TRAFALGAR PTY LTD.



DRAWING TITLED SPEC 1 VERT. JOINT FYREFLEX, SHEET 3 OF 12, DATED 21 OCTOBER 2024, BY TRAFALGAR PTY LTD.

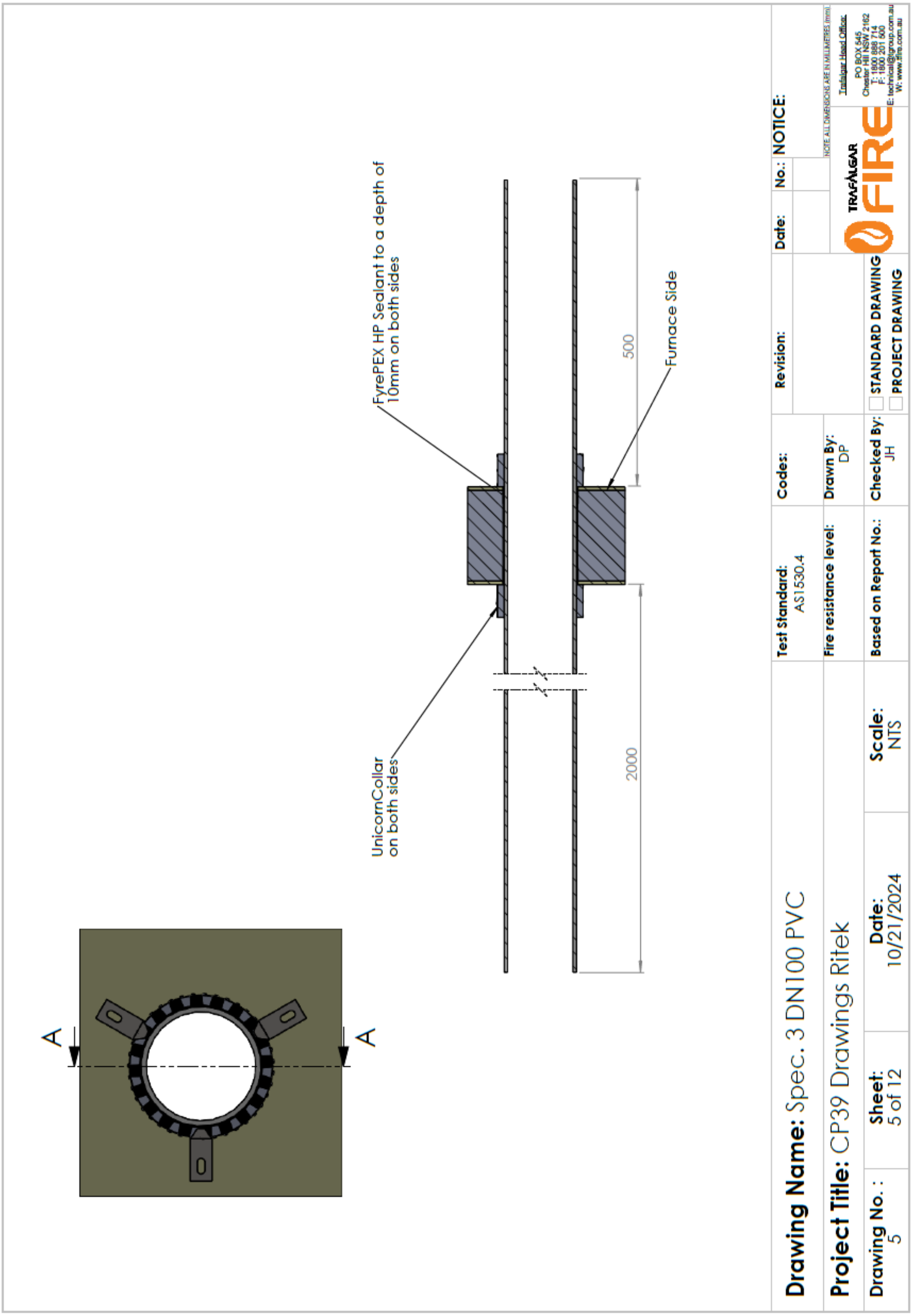




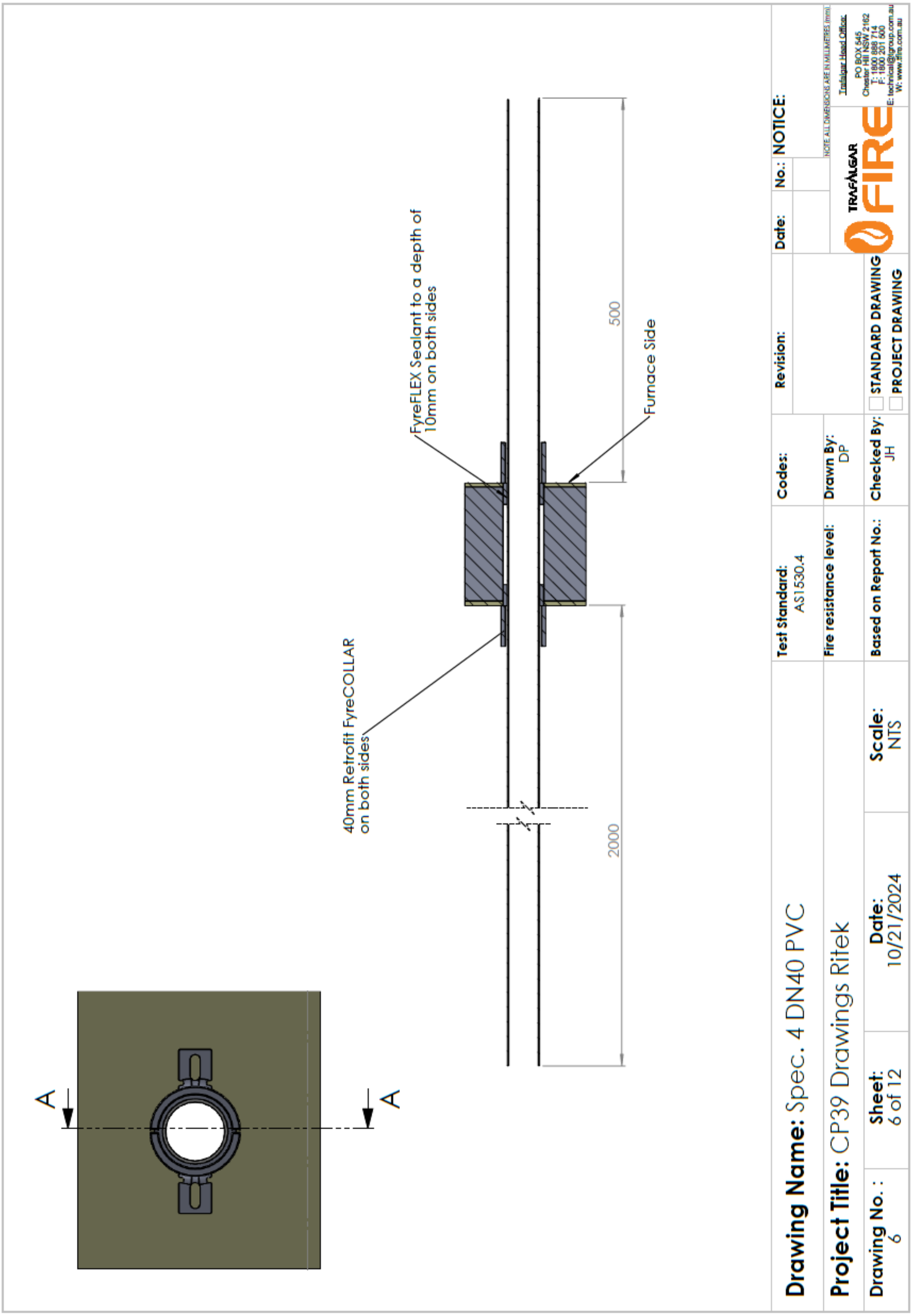


DETAIL N

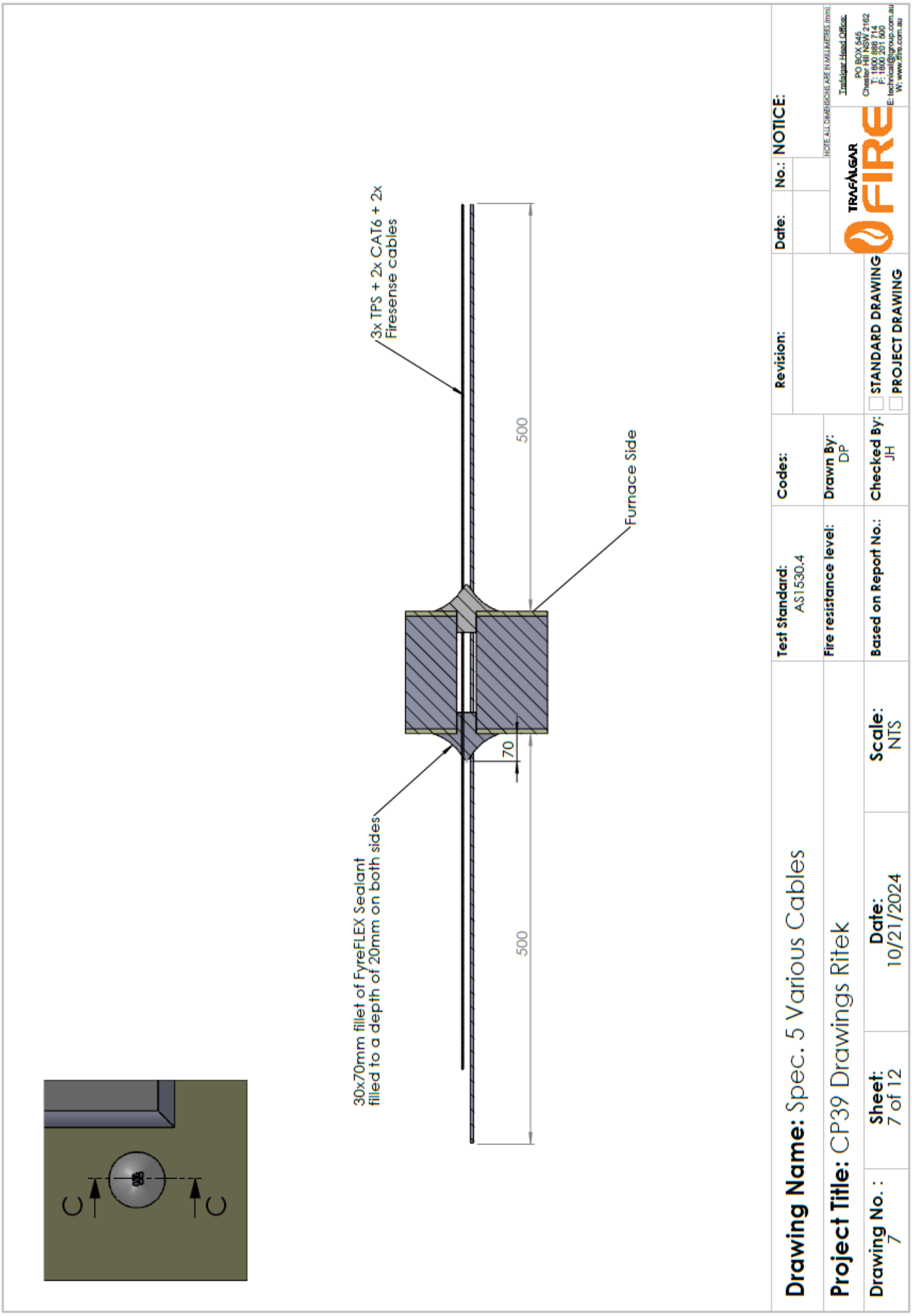
Drawing Name: Spec. 2 Vert. Joint RyanSPAN				**Test Standard:** AS1530.4	**Codes:**	**Revision:**	**Date:**	**No.:** **NOTICE:**
Project Title: CP39 Drawings Ritek				**Fire resistance level:**	**Drawn By:** DP			NOTE: ALL DIMENSIONS ARE IN MILLIMETRES (mm)
Drawing No. : 4	**Sheet:** 4 of 12	**Date:** 10/21/2024	**Scale:** NTS	**Based on Report No.:**	**Checked By:** JH	☐ STANDARD DRAWING ☐ PROJECT DRAWING	TRAFALGAR FIRE	Trafalgar Head Office: PO BOX 545 Chester Hill NSW 2162 T: 1800 888 714 F: 1800 201 500 E: technical@tfgroup.com.au W: www.tfire.com.au



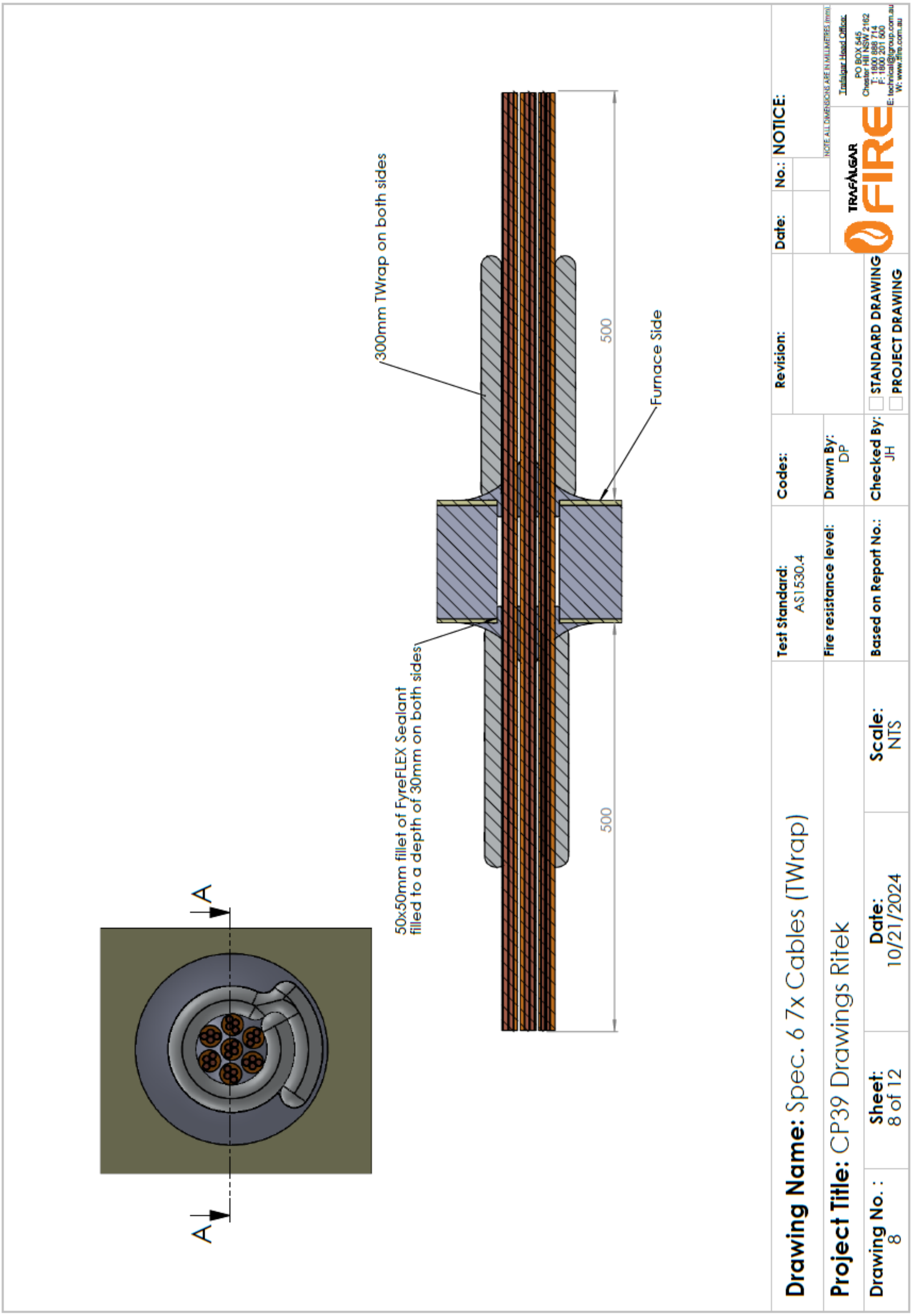
DRAWING TITLED SPEC 3- 3DN100PVC, SHEET 5 OF 12, DATED 21 OCTOBER 2024, BY TRAFALGAR PTY LTD.



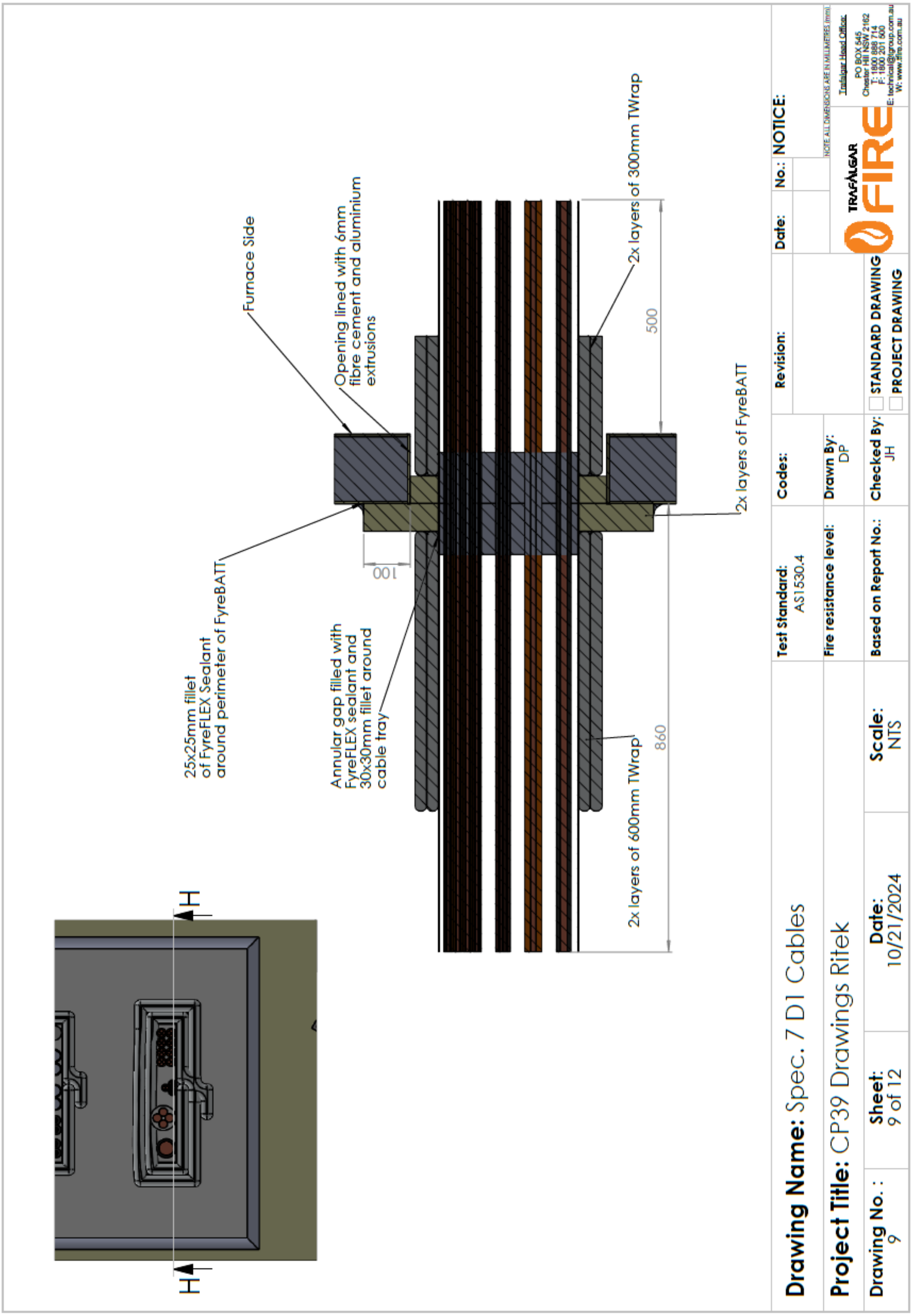
DRAWING TITLED SPEC 4- 3DN40PVC, SHEET 6 OF 12, DATED 21 OCTOBER 2024, BY TRAFALGAR PTY LTD.



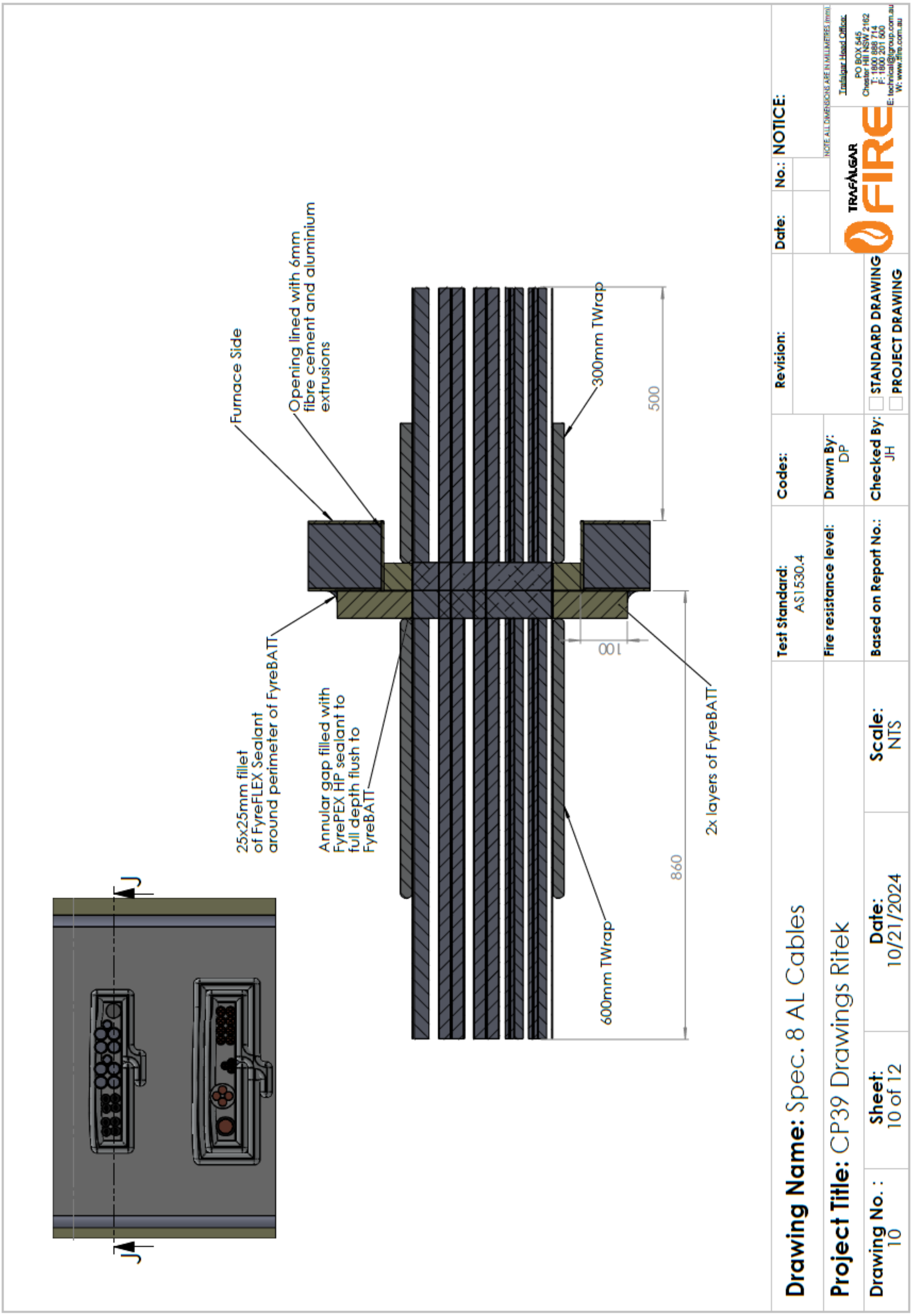
DRAWING TITLED SPEC 5- VARIOUS CABLES, SHEET 7 OF 12, DATED 21 OCTOBER 2024, BY TRAFALGAR PTY LTD.



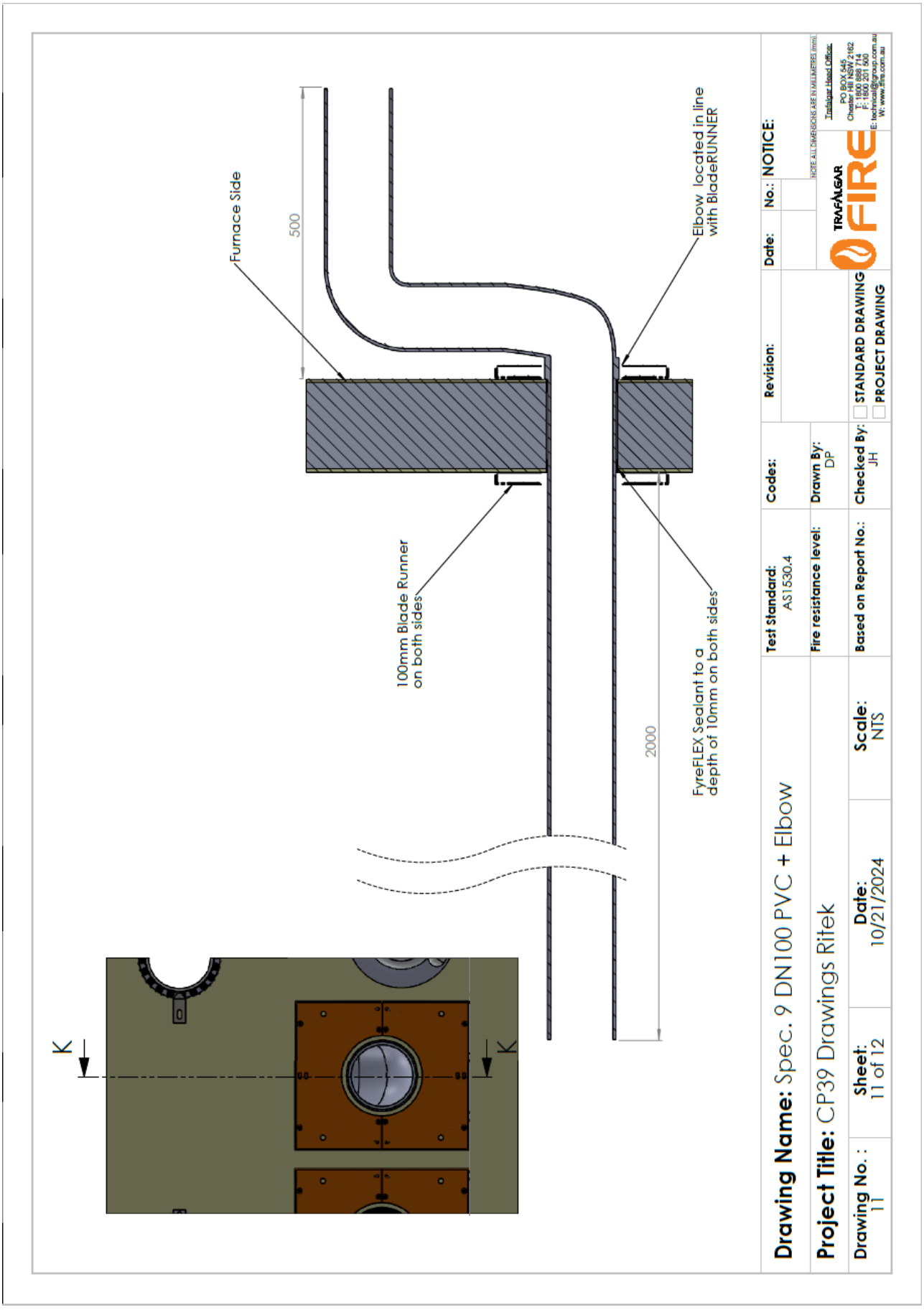
DRAWING TITLED SPEC 6- 7 CABLES (TWRAP), SHEET 8 OF 12, DATED 21 OCTOBER 2024, BY TRAFALGAR PTY LTD.



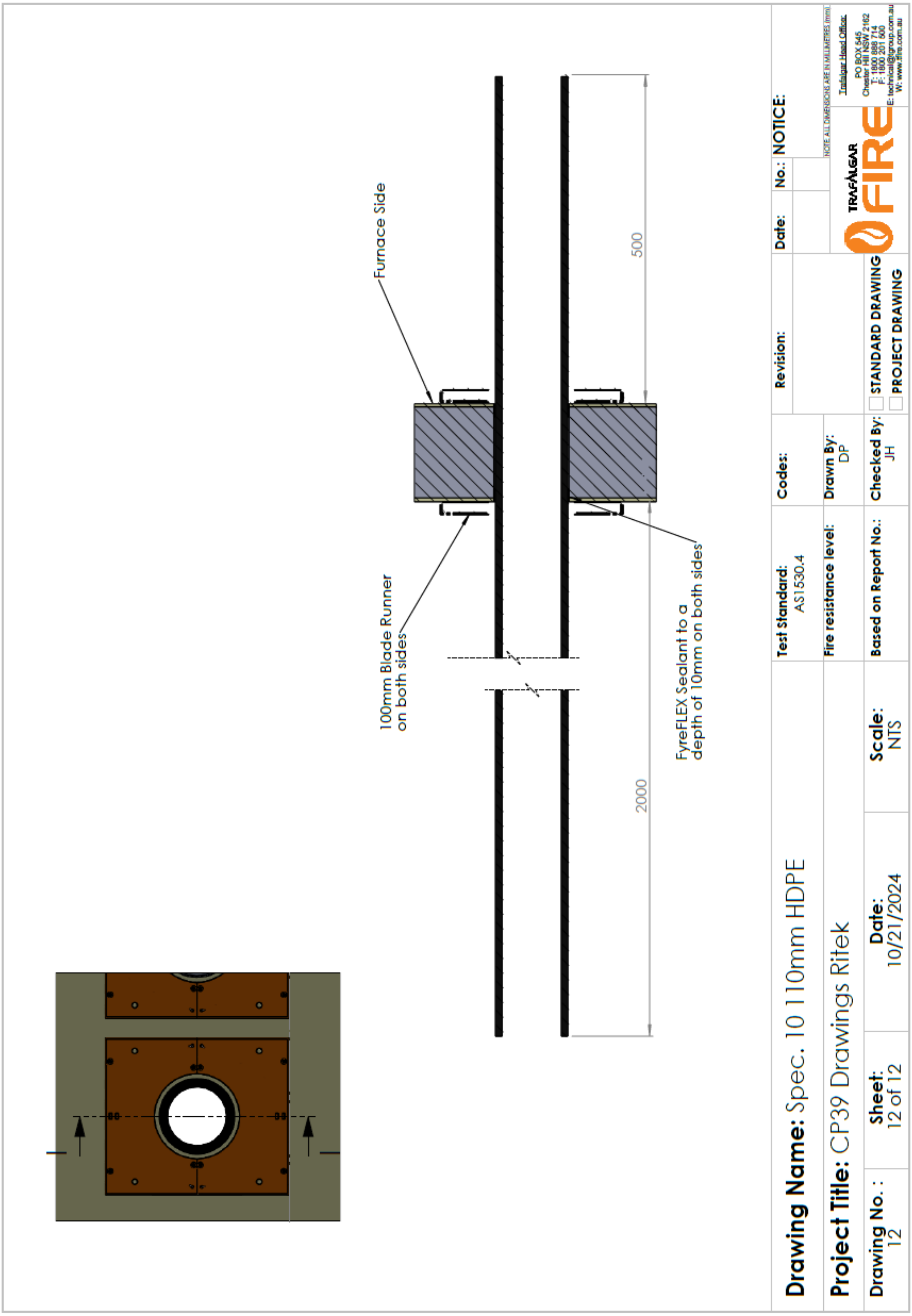
DRAWING TITLED SPEC 7- D1 CABLES, SHEET 9 OF 12, DATED 21 OCTOBER 2024, BY TRAFALGAR PTY LTD.



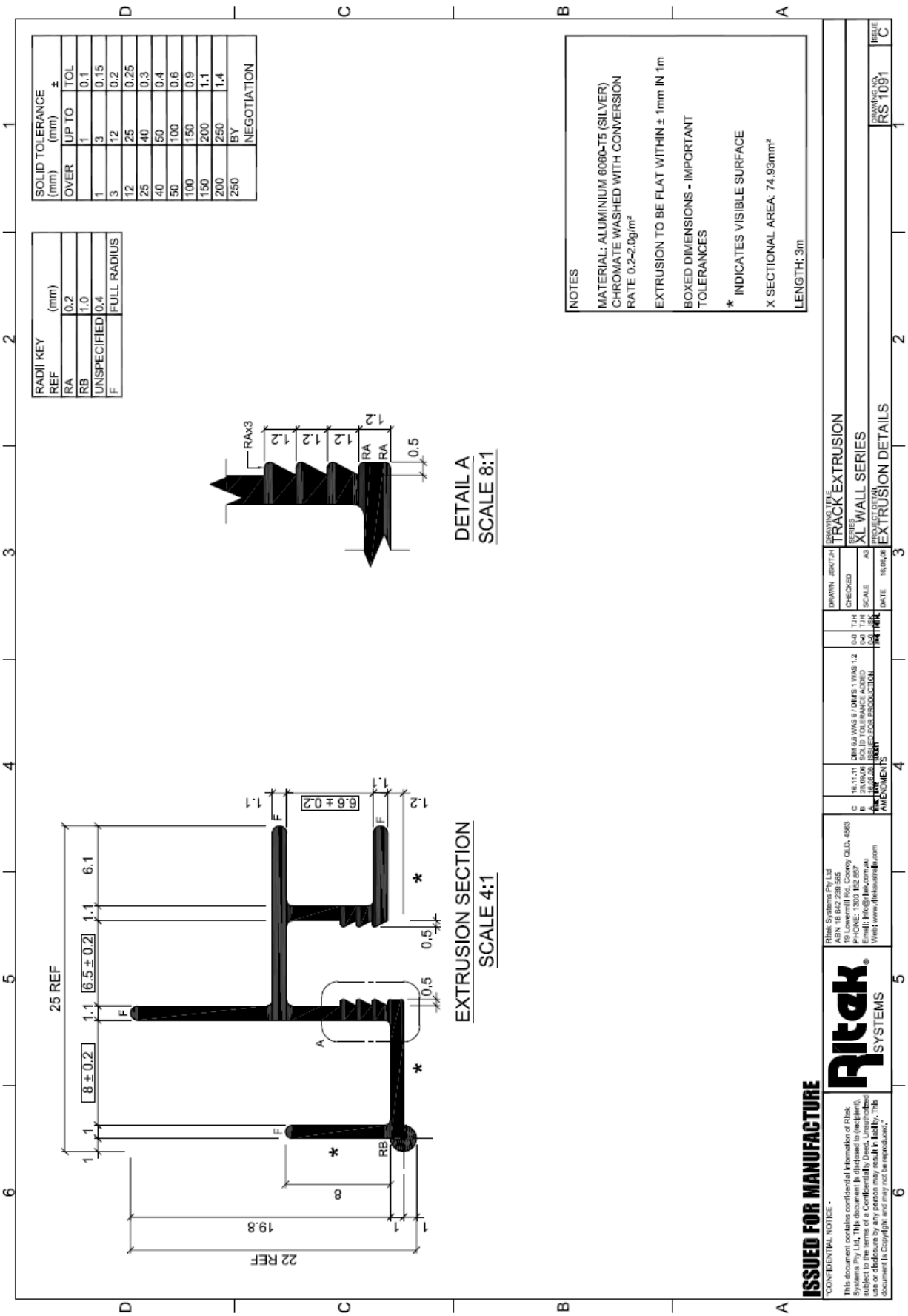
DRAWING TITLED SPEC 8- AL CABLES, SHEET 10 OF 12, DATED 21 OCTOBER 2024, BY TRAFALGAR PTY LTD.



DRAWING TITLED SPEC 9- DN100PVC+ELBOW, SHEET 11 OF 12, DATED 21 OCTOBER 2024, BY TRAFALGAR PTY LTD.



DRAWING TITLED SPEC 10- 110MM HDPE, SHEET 12 OF 12, DATED 21 OCTOBER 2024, BY TRAFALGAR PTY LTD.



DRAWING TITLED TRACK EXTRUSION, DATED 16 JUNE 2006, BY RITEK SYSTEM PTY LTD.

References

The following informative documents are referred to in this Report:

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

END OF REPORT

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