Test report # PF23016

Test Number 23016

Client: Tech Coatings NZ Limited

Fire resistance test for the steel penetrations through the wall

Test method: AS 1530.4:2014

Report Date 14/02/2024

1. Table of Contents

1.1 Document revision schedule

Revision #	Date	Description
1	04/06/2023	Initial Issue for Client review
2	12/07/2023	Issued to Client
3	14/02/2024	Fig. 2, 5, 7, 9 photos amended

1.2 Signatories

Report	Name	Signature	Date
Prepared by:	Alexey Kokorin (Technical Manager)		14/02/2024
Authorized by:	Andrew Bain (Authorized signatory)		14/02/2024

ACCREDITED
TESTING LABORATORY

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

2. Contact details

2.1 IANZ registered Testing Laboratory

Fire TS Lab - Passive Fire Inspection and Test Services Ltd

Accreditation N$^{o:}$ 1335

1/113 Pavilion Drive, Mangere, Auckland, 2022

New Zealand

Contact e-mail: tests@firelab.co.nz

2.2 Client/Applicant

Tech Coatings NZ Limited

12 Tokomaru Street, Welbourn, New Plymouth, 4312

New Zealand

E-mail: shanew@techcoatings.co.nz

2.3 Manufacturer/Supplier

Intumescent coating – FBL-100 paint:

Tech Coatings NZ Limited

12 Tokomaru Street, Welbourn, New Plymouth, 4312

New Zealand

PFP materials – various suppliers

3. Test Results

Specimen #	Service	Actual Integrity (min)	Actual insulation (min)	FRL*
A	**HST 200/12**	**63 NF**	**63 NF**	**-/60/60**
B	**HST 250/18**	**63 NF**	**63 NF**	**-/60/60**
C	**HST 300/18**	**63 NF**	**63 NF**	**-/60/60**
D	**HST 400/30**	**63 NF**	**63 NF**	**-/60/60**

All specimens had asymmetrical assembly, results apply if exposed to fire as tested.

NF – No failure during the test

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The test results relate to the specimens of the product in the form in which they were tested. Differences in the composition or thickness of the product may significantly affect the performance during the test and may therefore invalidate the test results. Care should be taken to ensure that any product, which is supplied or used, is fully represented by the specimens, which were tested.

The specimens were supplied by the sponsor and the Laboratory was not involved in any of selection or sampling procedures.

The results of this fire test may be used to directly assess fire hazard, but it should be recognized that a single test method will not provide a full assessment of fire hazard under all fire conditions.

4. Test Details

Test Specification Fire Resistance:
Failure shall be deemed to have occurred when one of the following occurs:

a) the temperature at any location on the unexposed face of the test specimen exceeds the initial temperature by more than 180 °C

b) Integrity failure shall be deemed to have occurred upon ignition of the cotton pad when glowing or flaming occurs or for a period of 30 seconds.

c) Flaming to the unexposed face for 10 seconds or longer shall be deemed to be an Integrity failure.

Testing scope:
AS 1530.4-2014 Section 10 Service penetrations and control joints

Documentation:
Testing products were verified and tested based on Client description, refer to Specimens description below.

Testing date:	**Installation completion date:**
07/03/2023	06/02/2023

Specimens conditioning and delivery to Laboratory:

Separating element was built by Laboratory in line with Client instructions. Installation of fire stopping system was performed by Laboratory. Coating application was performed by Client. The Laboratory was not involved in sampling of the materials. Laboratory verified materials during construction of the specimen.

Termination of The Test:
The test was discontinued at 63 minutes.

Use of Reports:
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This report details the methods of construction, test conditions and the results obtained when the specific element of construction described herein was tested following the procedure outlined in AS 1530.4. Any significant variation with respect to size, constructional details, loads, stresses, edge or end conditions, other than that 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.

5. Equipment

Furnace:
1200X1200 Indicative Furnace designed to operate to AS1530.4:2014

Temperature:
Furnace Temperature measurements were controlled with four 3mm Type K MIMS thermocouples set within 50-100 mm from the face of the specimens in line with AS1530.4-2014. All thermocouples are calibrated by ISO/IEC 17025 accredited laboratory - a signatory to the International Laboratory Accreditation Corporation (ILAC) through their Mutual Recognition Agreement (MRA) to the accuracy required by AS 1530.4-2014.

Pressure measurement:
Kepware Siemens Data logging system including multi-channel recording data at 5 second intervals. Calibrated by ISO/IEC 17025 accredited laboratory - a signatory to the International Laboratory Accreditation Corporation (ILAC) through their Mutual Recognition Agreement (MRA) to the accuracy required by AS 1530.4-2014.

Ambient Temperature:
Ambient temperature was recorded 15 minutes before the test was commenced, at the start of the test and monitored during the test. All thermocouples are calibrated by ISO/IEC 17025 accredited laboratory - a signatory to the International Laboratory Accreditation Corporation (ILAC) through their MRA to the accuracy required by AS 1530.4-2014.

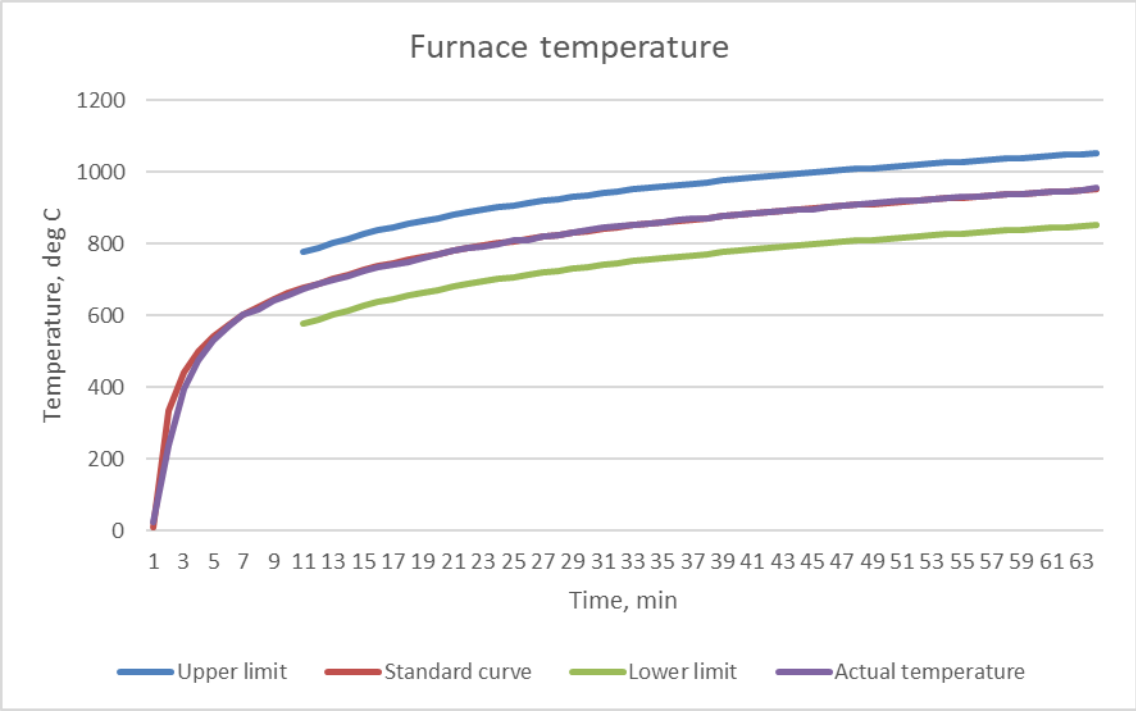
Specimen thermocouples:
Specimen thermocouples were installed to the unexposed face. Type K copper disk thermocouples fixed within the required locations referenced from AS1530.4-2014. Thermocouples are calibrated by ISO/IEC 17025 accredited laboratory - a signatory to the International Laboratory Accreditation Corporation (ILAC) through their MRA to the accuracy required by AS 1530.4-2014.

Dimensional measurements:
All linear measurements were made with equipment calibrated by ISO/IEC 17025 accredited laboratory - a signatory to the International Laboratory Accreditation Corporation (ILAC) through their Mutual Recognition Agreement (MRA) to the accuracy required by AS 1530.4-2014.

6. Test Conditions

6.1 Furnace Temperature

The furnace was controlled to follow the temperature/time relationship specified in AS 1530.4-2014.

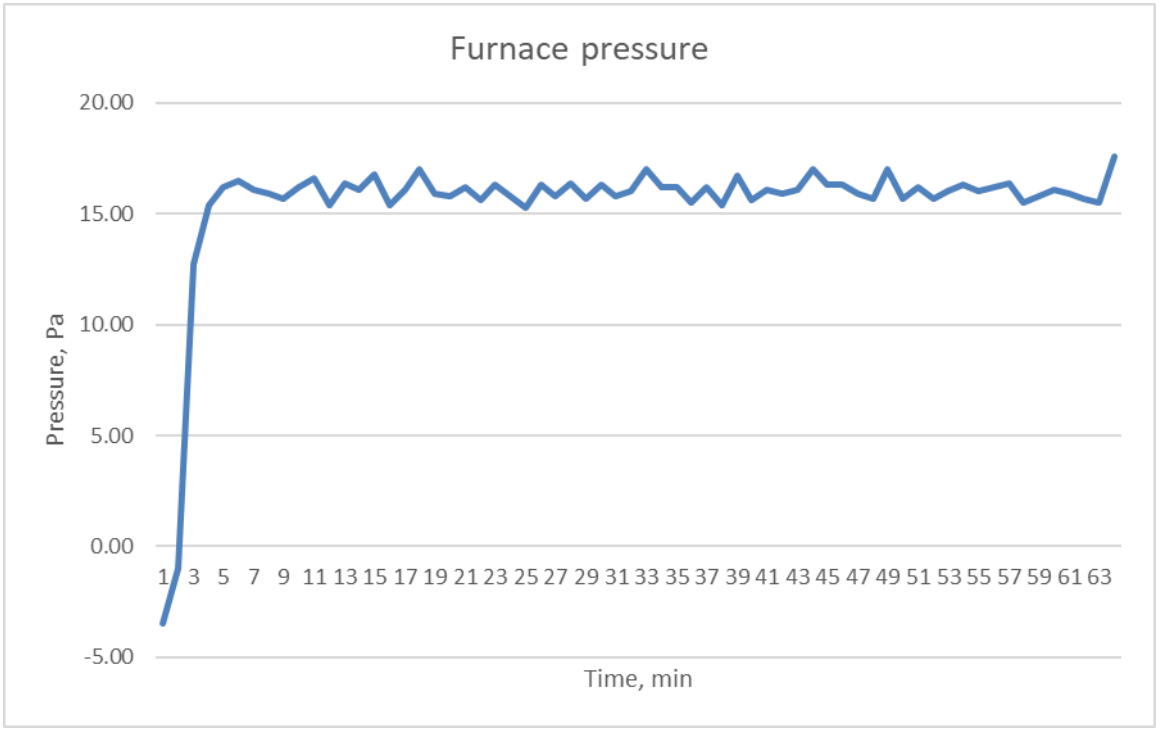


6.2 Ambient Temperature

The ambient temperature of the test area 15 minutes before the test and at the commencement of the test was 24 °C.

6.3 Pressure Readings

The probe was located 500mm above the furnace floor.



7. Schedule of materials

Separating Element		
1.1	Item / Product Name	Timber Frame and FR plasterboard separating element
	Measurements	Width / Height (W/H): 1200 x 1200mm
		Thickness (T): 116mm
	Installation	The separating element was constructed by the laboratory. The separating element consisted of a timber top and bottom plate, three studs and two nogs (1.2). The top plate, bottom plate and two studs were fixed to the perimeter of the refractory frame. The additional stud was installed at 600mm centres. The nogs were installed at 600mm centres. All timber was fixed using framing nails (4.1) Each face of the timber frame was then lined with one layer of plasterboard (1.3), fixed with screws (4.2) at 300mm centres. The apertures were then cut from the plasterboard, with one aperture centred in each quarter of the timber frame.

1.2	Item / Product Name	Laser Frame Timber SG8
	Measurements	Width / Height (W/H): 90 x 45 mm
	Installation	Used to construct separating element
1.3	Item / Product Name	GIB Fyreline Plasterboard
	Measurements	Width / Height (W/H): 1200 x 3000 mm
		Thickness (T): 13mm
	Installation	Used to construct separating element

Services		
2.1	Item / Product Name	HST 200/12 Purlin
	Measurements	Width / Height (W/H): 203mm x 70mm (nominal)
		Thickness (T): 1.15mm (nominal)

	Additional Info	Specimen A
2.2	Item / Product Name	HST 250/18 Purlin
	Measurements	Width / Height (W/H): 250mm x 85mm (nominal)
		Thickness (T): 1.75mm (nominal)
	Additional Info	Specimen B
2.3	Item / Product Name	HST 300/18 Purlin
	Measurements	Width / Height (W/H):300mm x 100mm (nominal)
		Thickness (T): 1.75mm (nominal)
	Additional Info	Specimen C
2.4	Item / Product Name	HST 400/30 Purlin
	Measurements	Width / Height (W/H): 400mm x 100mm (nominal)
		Thickness (T): 3.0mm (nominal)
	Additional Info	Specimen D

Sealants / Coatings		
3.1	Item / Product Name	GIB Fire Soundseal
	Measurements	310mL tube
	Installation	Installed between pattress and service
3.2	Item / Product Name	Paint Plus Galv Coat Primer
	Measurements	10 Litre Bucket
	Installation	Applied to purlins after installation into separating element.
3.3	Item / Product Name	FBL-100 paint
	Measurements	20L Bucket
	Installation	Applied to purlins on top of primer.

Fixings		
4.1	Item / Product Name	Paslode Framing Nails
	Measurements	90mm
	Installation	Used to fix timber studs
4.2	Item / Product Name	GIB Grabber Self Tapping Screws
	Measurements	41mm
	Installation	Used to fix plasterboard to timber frame Used to fix plasterboard pattress to separating element

Additional Fire protection products		
5.1	Item / Product Name	GIB Fyreline Plasterboard
	Measurements	Width / Height (W/H): 1200 x 3000 mm
	Thickness	Thickness (T): 13mm
	Installation	Pattresses cut from plasterboard, installed around services
5.2	Item / Product Name	Shinagawa Ceramic Fibre
	Measurements	Width / Height (W/H): 610 x 7200 mm
	Thickness	Thickness (T): 25mm
	Installation	Sections of ceramic fibre installed to annular gaps between pattress and service

8. Test Specimens instrumentation

8.1 Thermocouple Positions Table

Sp#	TC#	THERMOCOUPLE LOCATION DESCRIPTION
A	1	On separating element, at the top of the specimen, 25mm from the plasterboard pattress
A	2	On separating element, mid height of specimen on the left side, 25mm from the Plasterboard pattress
A	3	On separating element, mid height of specimen on the right side, 25mm from the Plasterboard pattress
A	4	On pattress, at the top of the specimen, 25mm from the aperture edge
A	5	On pattress, mid height of specimen on the left side, 25mm from the aperture edge
A	6	On pattress, mid height of specimen right side, 25mm from the aperture edge
A	7	On the Purlin top side, centre of the specimen, 25 mm from the aperture edge
A	8	On the Purlinmid height of the specimen (internal side), 25 mm from the aperture edge
A	9	On the Purlinmid height of the specimen (external side), 25 mm from the aperture edge
B	10	On separating element, at the top of the specimen, 25mm from the plasterboard pattress
B	11	On separating element, mid height of specimen on the right side, 25mm from the Plasterboard pattress
B	12	On separating element, mid height of specimen on the left side, 25mm from the Plasterboard pattress
B	13	On pattress, at the top of the specimen, 25mm from the aperture edge
B	14	On pattress, mid height of specimen on the right side, 25mm from the aperture edge
B	15	On pattress, mid height of specimen left side, 25mm from the aperture edge

B	16	On the Purlin top side, centre of the specimen, 25 mm from the aperture edge
B	17	On the Purlinmid height of the specimen (internal side), 25 mm from the aperture edge
B	18	On the Purlinmid height of the specimen (external side), 25 mm from the aperture edge
C	19	On separating element, at the top of the specimen, 25mm from the plasterboard pattress
C	20	On separating element, mid height of specimen on the left side, 25mm from the Plasterboard pattress
C	21	On separating element, mid height of specimen on the right side, 25mm from the Plasterboard pattress
C	22	On pattress, at the top of the specimen, 25mm from the aperture edge
C	23	On pattress, mid height of specimen on the left side, 25mm from the aperture edge
C	24	On pattress, mid height of specimen right side, 25mm from the aperture edge
C	25	On the Purlin top side, centre of the specimen, 25 mm from the aperture edge
C	26	On the Purlinmid height of the specimen (internal side), 25 mm from the aperture edge
C	27	On the Purlinmid height of the specimen (external side), 25 mm from the aperture edge
D	28	On separating element, at the top of the specimen, 25mm from the plasterboard pattress
D	29	On separating element, mid height of specimen on the right side, 25mm from the Plasterboard pattress
D	30	On separating element, mid height of specimen on the left side, 25mm from the Plasterboard pattress
D	31	On pattress, at the top of the specimen, 25mm from the aperture edge
D	32	On pattress, mid height of specimen on the right side, 25mm from the aperture edge
D	33	On pattress, mid height of specimen left side, 25mm from the aperture edge

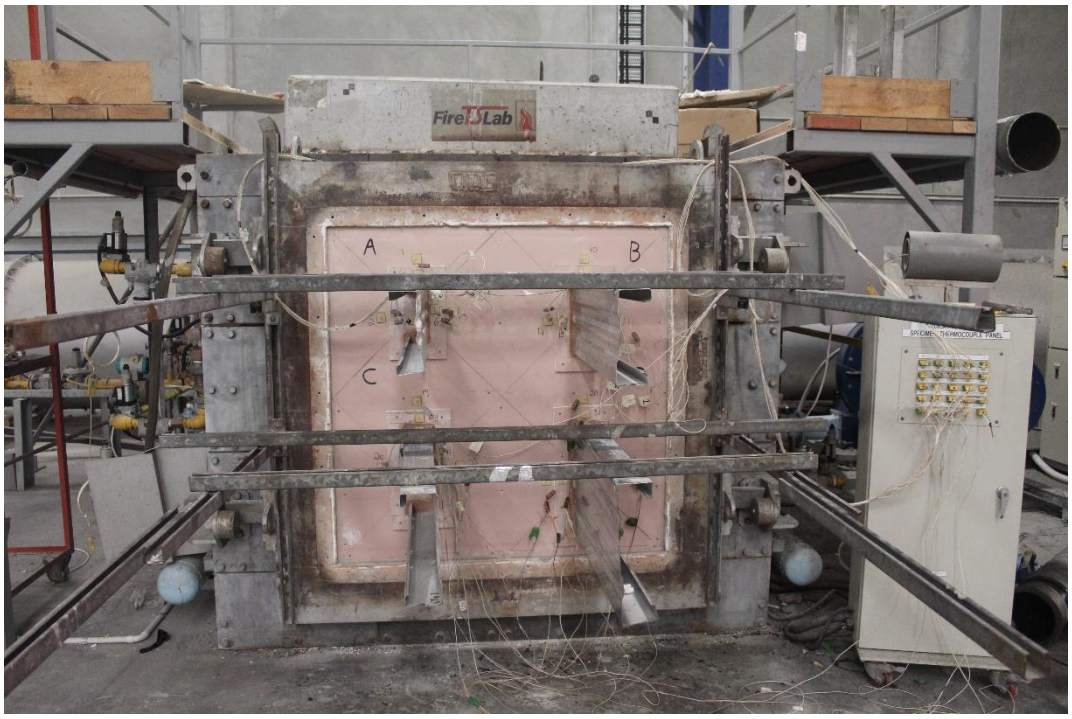
D	34	On the Purlin top side, centre of the specimen, 25 mm from the aperture edge
D	35	On the Purlinmid height of the specimen (internal side), 25 mm from the aperture edge
D	36	On the Purlinmid height of the specimen (external side), 25 mm from the aperture edge

9. Observations

Time Minutes	Test Face	SP#	Observations
4	E	ALL	Coating expansion on all the specimens
5	U	B	Visible smoke top right corner above specimen B
8	U	D	Visible smoke on the left side of the plasterboard pattress
10	U	A	Visible smoke on the left side of the plasterboard pattress
17	U	D	Noticeable smoke at the bottom of the purlin
20	U	A	Visible smoke top left corner above specimen A
22	U	D	Large increase in amount of smoke at the bottom of the purlin
25	E	ALL	Further expansion of the coating
30	U	ALL	No notable changes
31	E	A	Small visible cracking on the coating (between coating and plasterboard patch)
37	U	A	Increased amount of smoke
45	U	D	Discolouring at the top side of the plasterboard pattress
45	U	D	Discolouring at the left side of the plasterboard pattress
50	E	ALL	No notable changes
60	U	ALL	No notable changes
67			TEST DISCONTINUED

Key: U = unexposed face. E = Exposed face.

10. Specimens



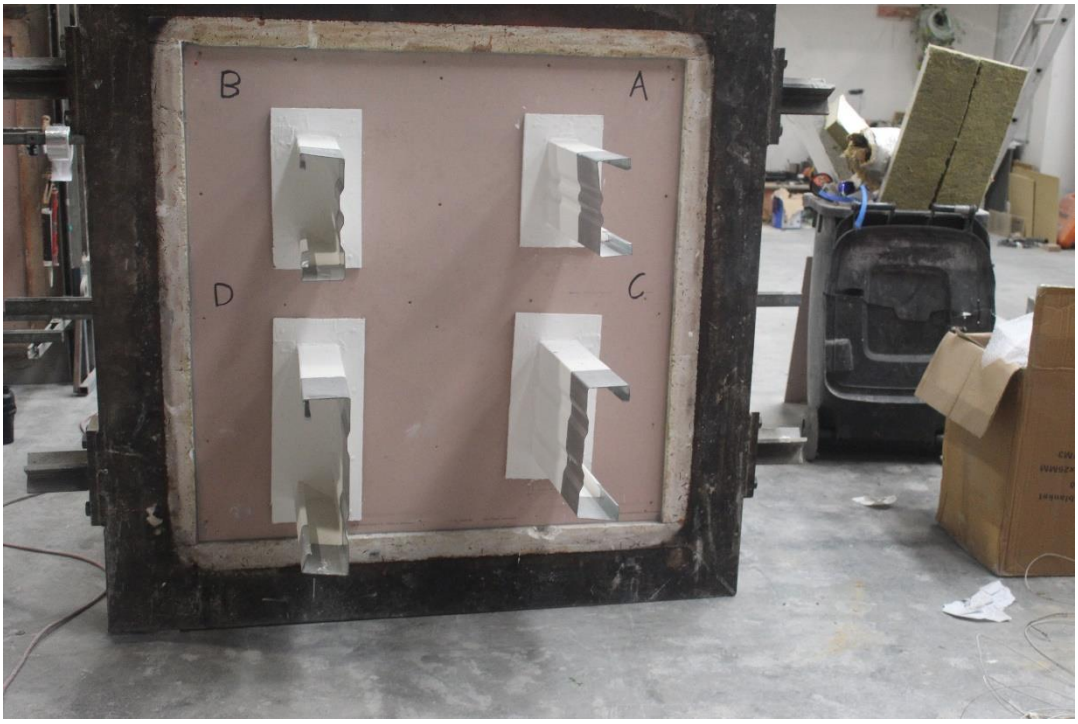


Fig.1 – Test specimens. Unexposed (top) and exposed (bottom) face.

10.1 Specimen A

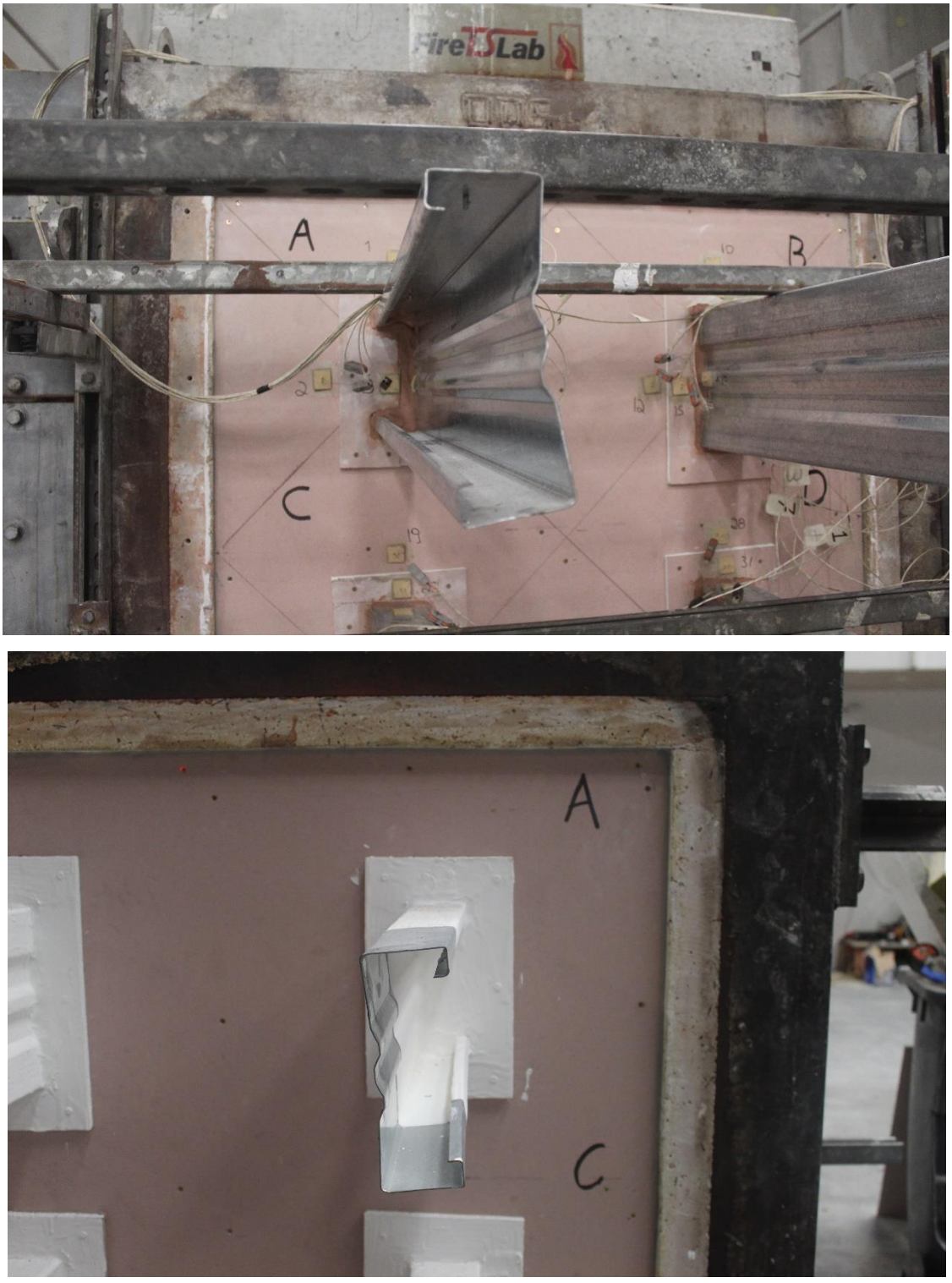


Fig.2 – Specimen A. Unexposed (top) and exposed (bottom) face.

Penetration System		
A	Service	HST 200/12 Purlin
	System Details	Purlin (2.1), Sealant (3.1), Primer (3.2), Coating (3.3), Screws (4.2), Plasterboard (5.1), Ceramic Fibre (5.2)
	Service Support	Unistrut structure at 300mm and 1000mm
	Aperture Size	105mm x 225mm
	Annular Spacing	Min: 5mm Max: 17.5mm
	Local Fire-stopping Protection	
	Application	Asymmetrical
	Protection Used	The aperture was cut from the separating element, through both faces of the plasterboard. The purlin (2.1) was passed through the aperture, extending 500mm from the exposed face. A plasterboard pattress (5.1) was cut to the profile of the purlin, with a 10mm offset (nominal). This reduced the annular spacing to 10mm (nominal). The pattress overlapped the separating element plasterboard by 50mm on each side of the purlin. A pattress was fixed to both faces of the separating element, fixed directly to the plasterboard. Gaps larger than 10mm between the pattress and purlin, within the purlin opening were packed with ceramic fibre (5.2). The remaining annular gaps between the purlin and the pattress was filled with sealant (3.1), resulting in a 13mm depth, 10mm (nominal) seal. Sealant was also applied over the top of the ceramic fibre. A coat of primer (3.2) was applied to the exposed side of the purlin, measuring 300mm from the exposed face of the separating element. Once dry, a coat of FBL-100 paint (3.3) was applied to the primed area, with a WFT measurement of 1000µm.

Test results	
Structural adequacy	**Not applicable**
Integrity	**No failure at 63 min**
Insulation	**No failure at 63 min**

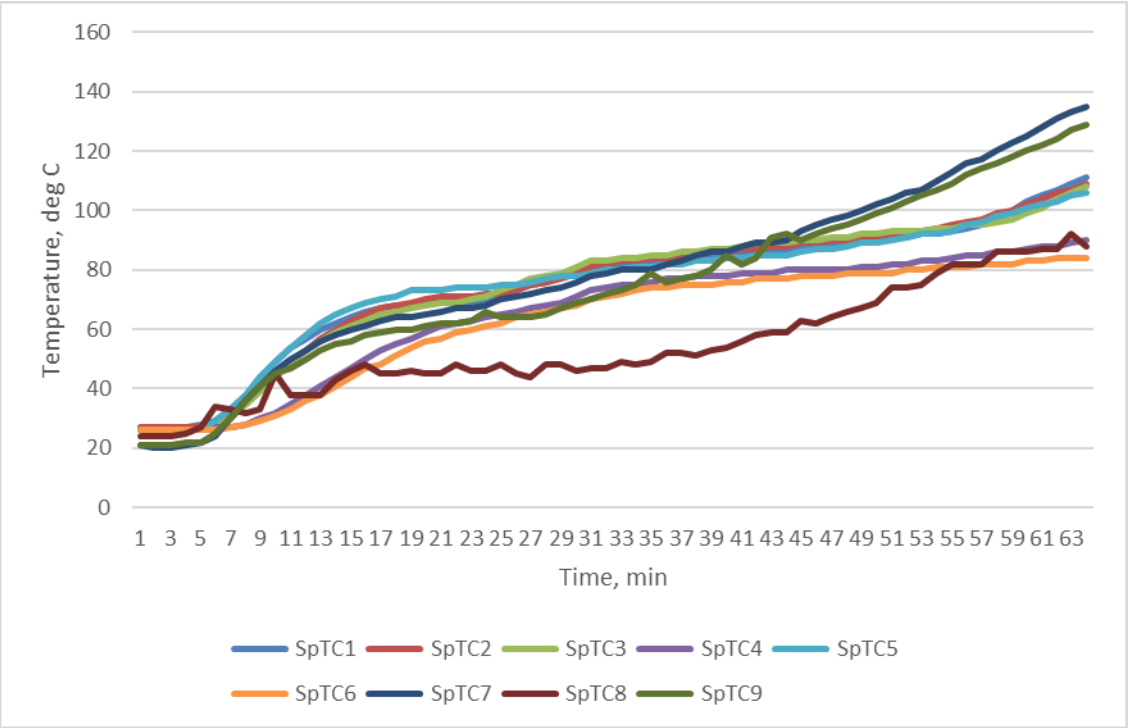


Fig. 5 – Specimen A. Thermocouples data

10.2 Specimen B

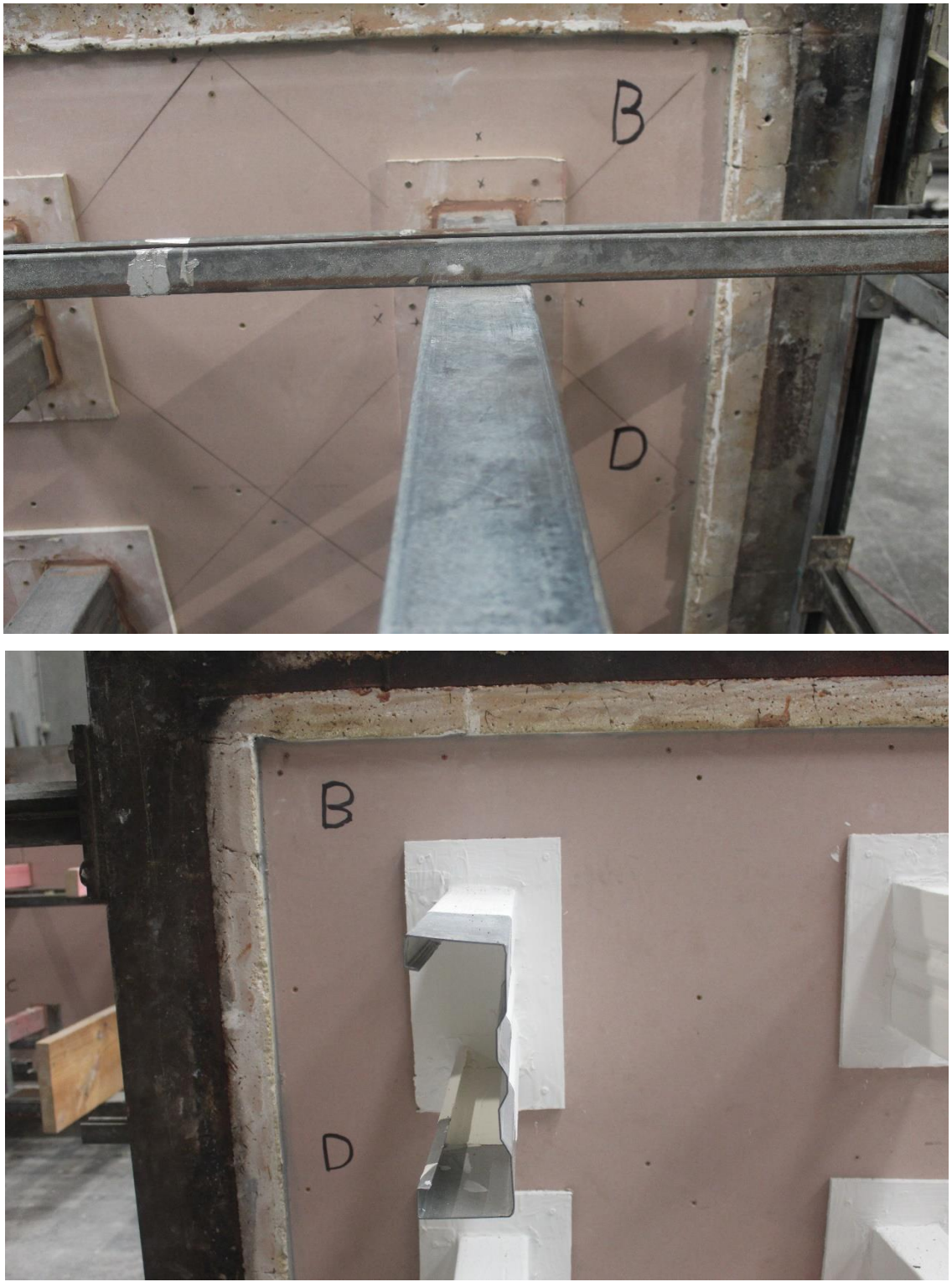


Fig. 5 – Specimen B. Unexposed (top) and exposed (bottom) face.

Penetration System		
B	Service	HST 250/18 Purlin
	Syestem Details	Purlin (2.2), Sealant (3.1), Primer (3.2), Coating (3.3), Screws (4.2), Plasterboard (5.1), Ceramic Fibre (5.2)
	Service Support	Unistrut structure at 300mm and 1000mm
	Aperture Size	105mm x 275mm
	Annular Spacing	Min: 5mm Max: 17.5mm
	Local Fire-stopping Protection	
	Application	Asymmetrical
	Protection Used	The aperture was cut from the separating element, through both faces of the plasterboard. The purlin (2.2) was passed through the aperture, extending 500mm from the exposed face. A plasterboard pattress (5.1) was cut to the profile of the purlin, with a 10mm offset (nominal). This reduced the annular spacing to 10mm (nominal). The pattress overlapped the separating element plasterboard by 50mm on each side of the purlin. A pattress was fixed to both faces of the separating element, fixed directly to the plasterboard. Gaps larger than 10mm between the pattress and purlin, within the purlin opening were packed with ceramic fibre (5.2). The remaining annular gaps between the purlin and the pattress was filled with sealant (3.1), resulting in a 13mm depth, 10mm (nominal) seal. Sealant was also applied over the top of the ceramic fibre. A coat of primer (3.2) was applied to the exposed side of the purlin, measuring 300mm from the exposed face of the separating element. Once dry, a coat of FBL-100 paint (3.3) was applied to the primed area, with a WFT measurement of 1000µm.

Test results	
Structural adequacy	**Not applicable**
Integrity	**No failure at 63 min**
Insulation	**No failure at 63 min**

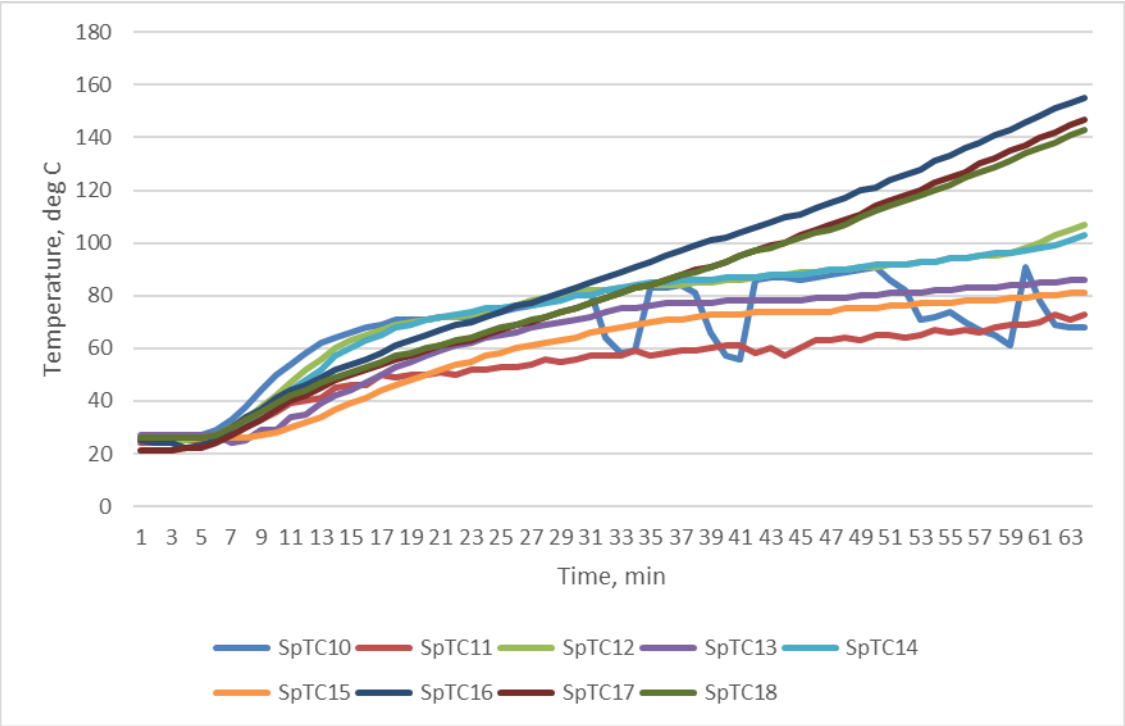


Fig. 7 – Specimen B. Thermocouples data.

10.3 Specimen C

Fig. 7 – Specimen C. Unexposed (top) and exposed (bottom) face.

Penetration System		
C	Service	HST 300/18 Purlin
	System Details	Purlin (2.3), Sealant (3.1), Primer (3.2), Coating (3.3), Screws (4.2), Plasterboard (5.1), Ceramic Fibre (5.2)
	Service Support	Unistrut structure at 300mm and 1000mm
	Aperture Size	120mm x 330mm
	Annular Spacing	Min: 5mm Max: 17.5mm
	Local Fire-stopping Protection	
	Application	Asymmetrical
	Protection Used	The aperture was cut from the separating element, through both faces of the plasterboard. The purlin (2.3) was passed through the aperture, extending 500mm from the exposed face. A plasterboard pattress (5.1) was cut to the profile of the purlin, with a 10mm offset (nominal). This reduced the annular spacing to 10mm (nominal). The pattress overlapped the separating element plasterboard by 50mm on each side of the purlin. A pattress was fixed to both faces of the separating element, fixed directly to the plasterboard. Gaps larger than 10mm between the pattress and purlin, within the purlin opening were packed with ceramic fibre (5.2). The remaining annular gaps between the purlin and the pattress was filled with sealant (3.1), resulting in a 13mm depth, 10mm (nominal) seal. Sealant was also applied over the top of the ceramic fibre. A coat of primer (3.2) was applied to the exposed side of the purlin, measuring 300mm from the exposed face of the separating element. Once dry, a coat of FBL-100 paint (3.3) was applied to the primed area, with a WFT measurement of 1000µm.

Test results	
Structural adequacy	**Not applicable**
Integrity	**No failure at 63 min**
Insulation	**No failure at 63 min**

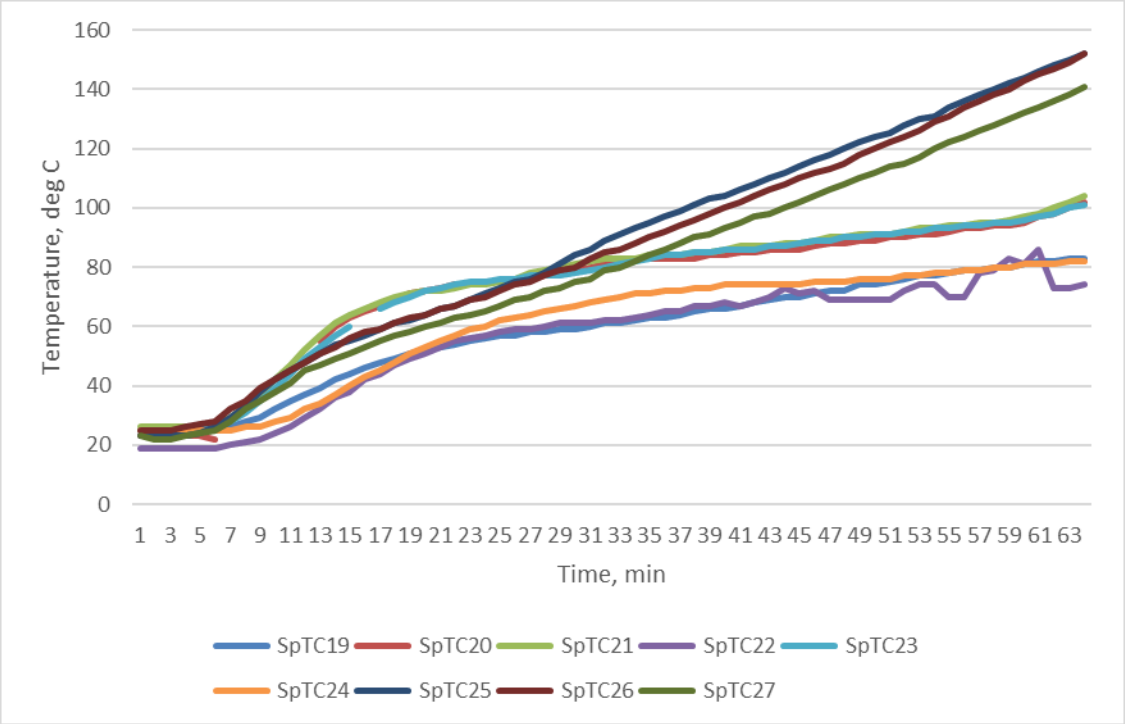


Fig. 9 – Specimen C. Thermocouples data.

10.4 Specimen D

Fig. 9 – Specimen D. Unexposed (top) and exposed (bottom) face.

Penetration System		
D	Service	HST 400/30 Purlin
	System Details	Purlin (2.4), Sealant (3.1), Primer (3.2), Coating (3.3), Screws (4.2), Plasterboard (5.1), Ceramic Fibre (5.2)
	Service Support	Unistrut structure at 300mm and 1000mm
	Aperture Size	120mm x 425mm
	Annular Spacing	Min: 5mm Max: 17.5mm
	Local Fire-stopping Protection	
	Application	Asymmetrical
	Protection Used	The aperture was cut from the separating element, through both faces of the plasterboard. The purlin (2.4) was passed through the aperture, extending 500mm from the exposed face. A plasterboard pattress (5.1) was cut to the profile of the purlin, with a 10mm offset (nominal). This reduced the annular spacing to 10mm (nominal). The pattress overlapped the separating element plasterboard by 50mm on each side of the purlin. A pattress was fixed to both faces of the separating element, fixed directly to the plasterboard. Gaps larger than 10mm between the pattress and purlin, within the purlin opening were packed with ceramic fibre (5.2). The remaining annular gaps between the purlin and the pattress was filled with sealant (3.1), resulting in a 13mm depth, 10mm (nominal) seal. Sealant was also applied over the top of the ceramic fibre. A coat of primer (3.2) was applied to the exposed side of the purlin, measuring 300mm from the exposed face of the separating element. Once dry, a coat of FBL-100 paint (3.3) was applied to the primed area, with a WFT measurement of 1000µm.

Test results	
Structural adequacy	**Not applicable**
Integrity	**No failure at 63 min**
Insulation	**No failure at 63 min**

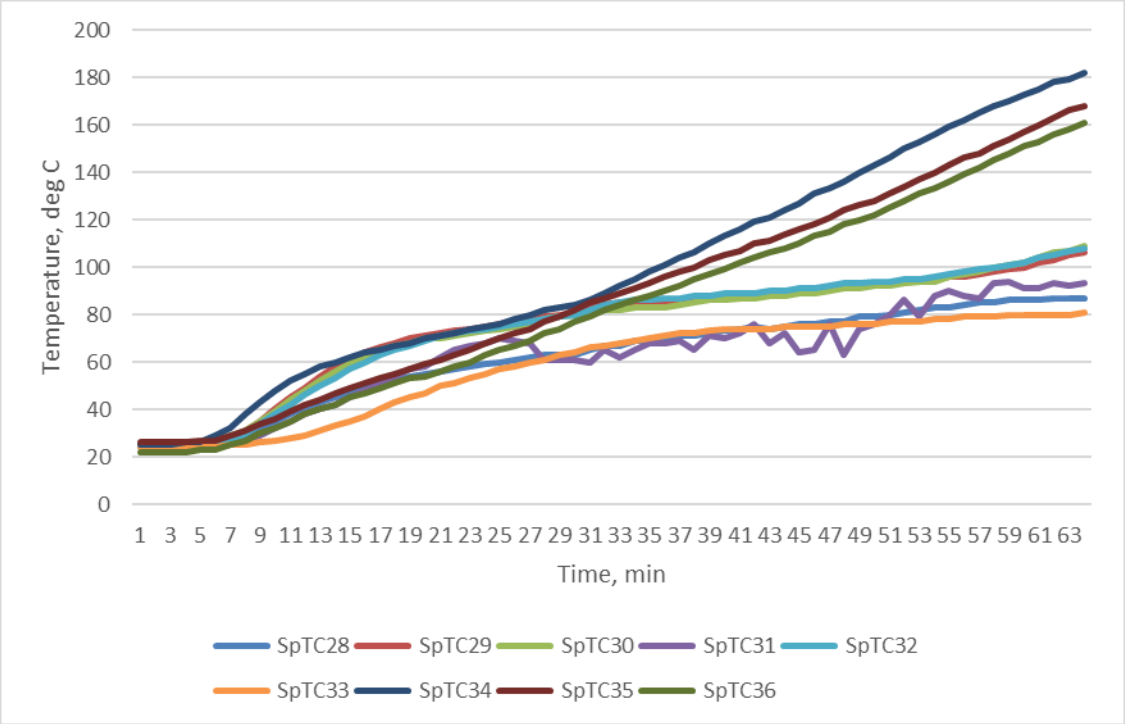


Fig. 11 – Specimen D. Thermocouples data.

11. Additional photographs

11.1 During and after the test

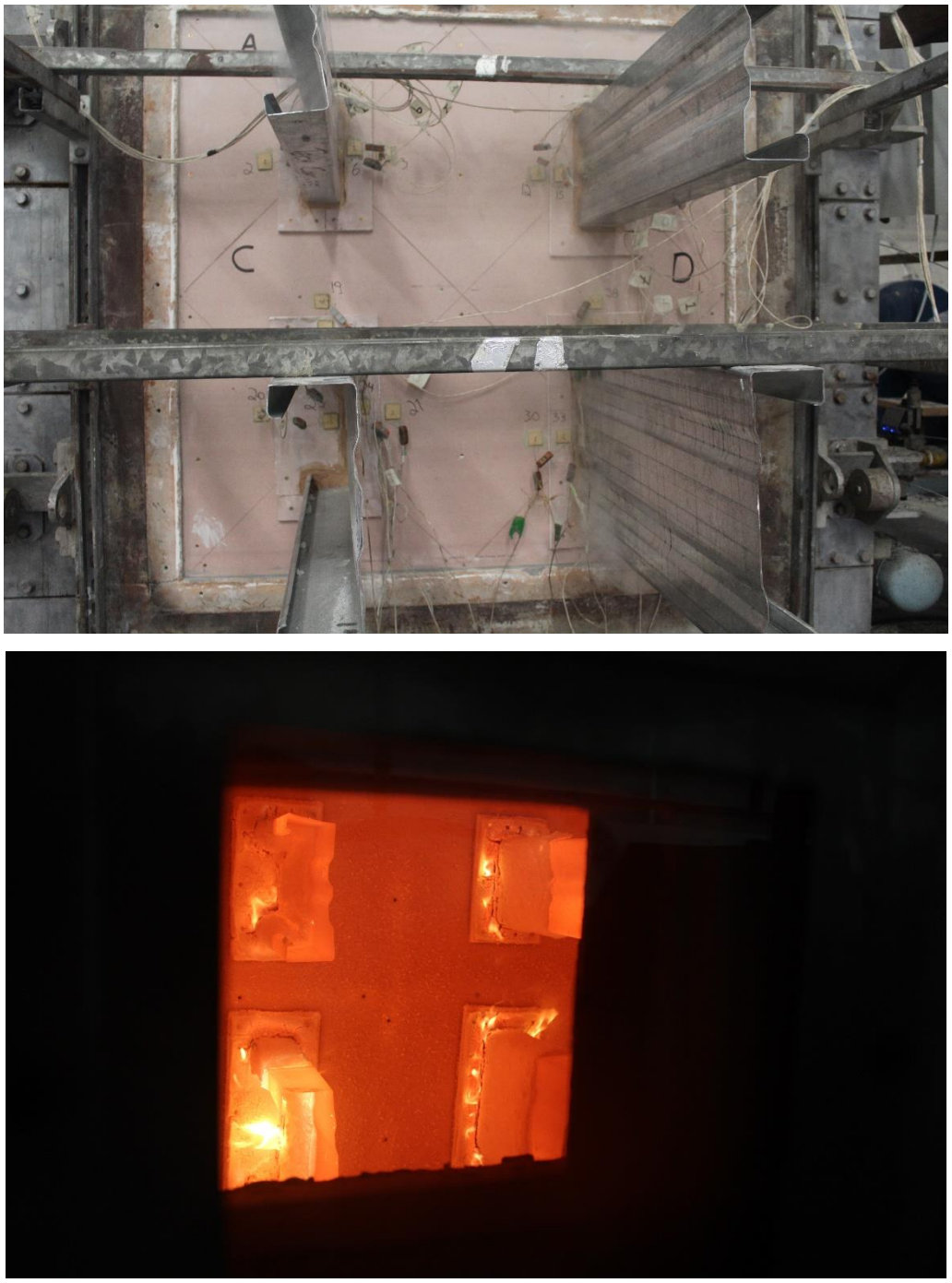
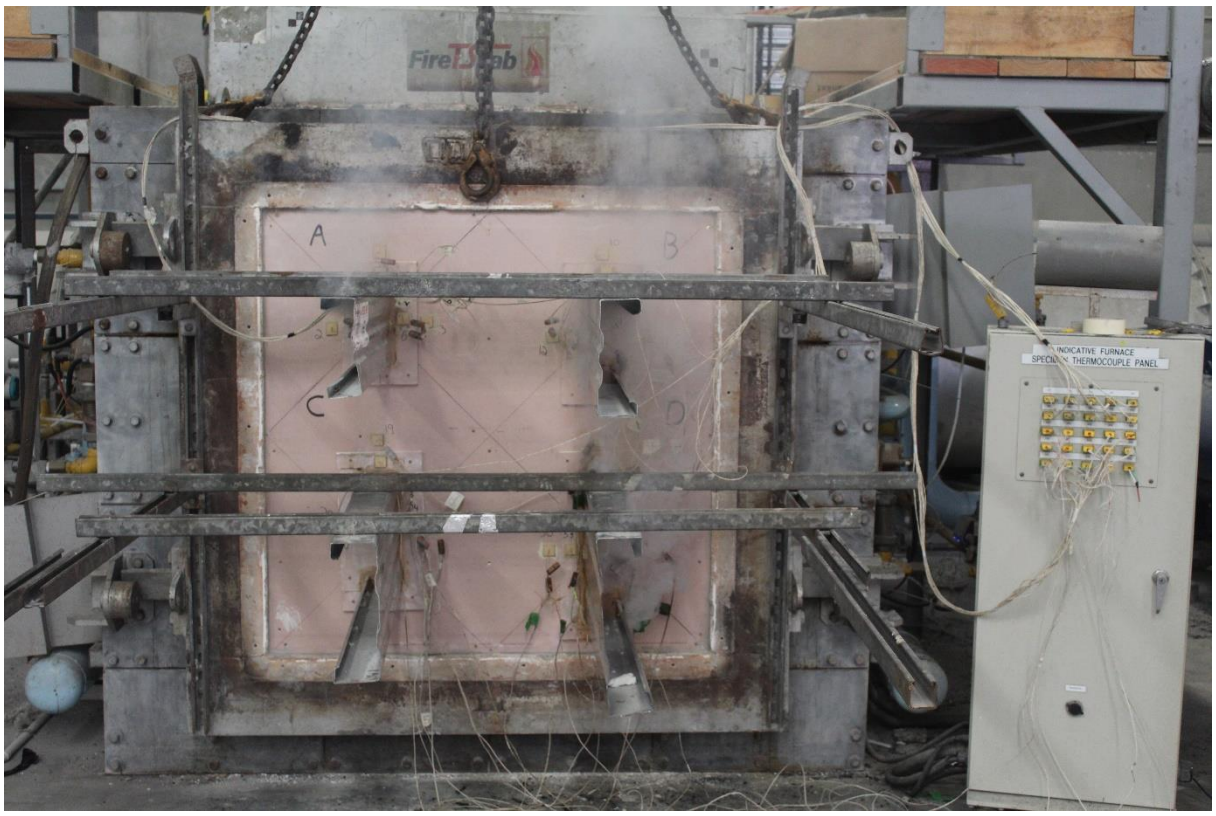


Fig. 12 – 30 minutes



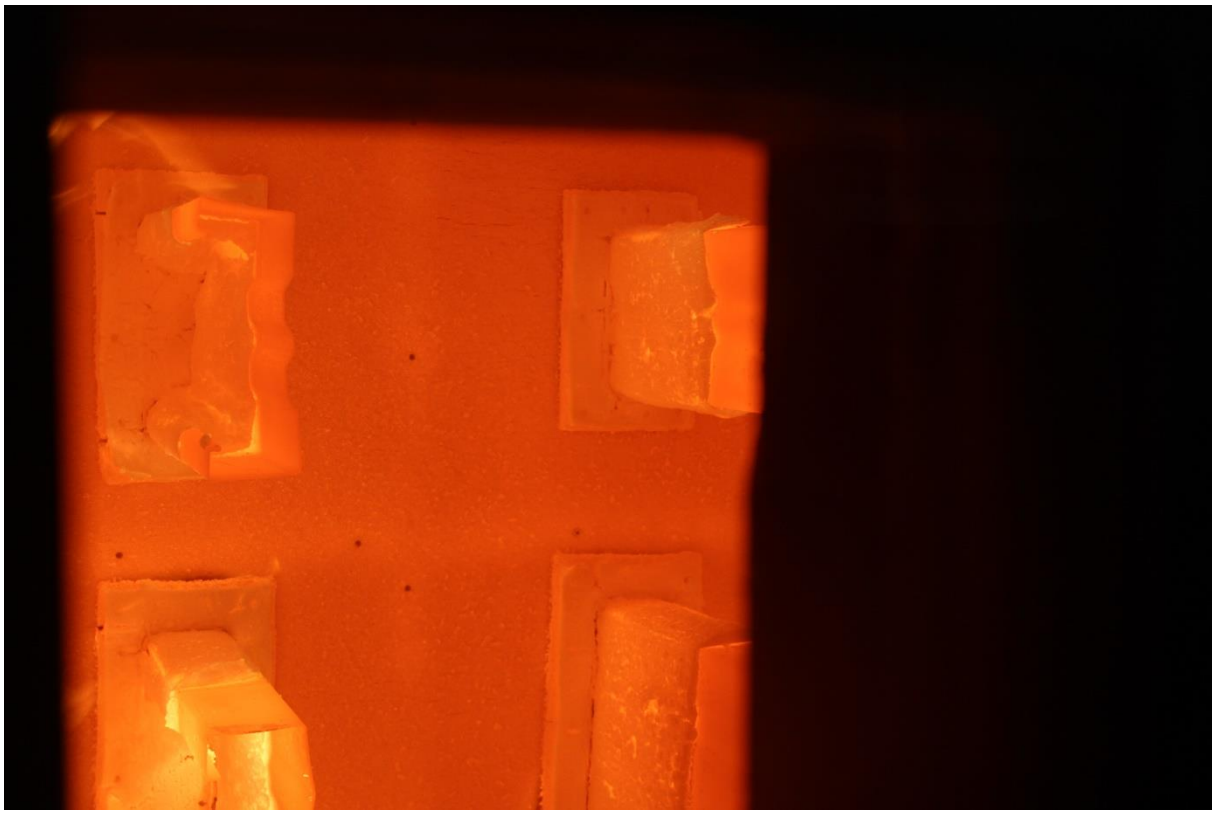


Fig. 13 – 60 minutes

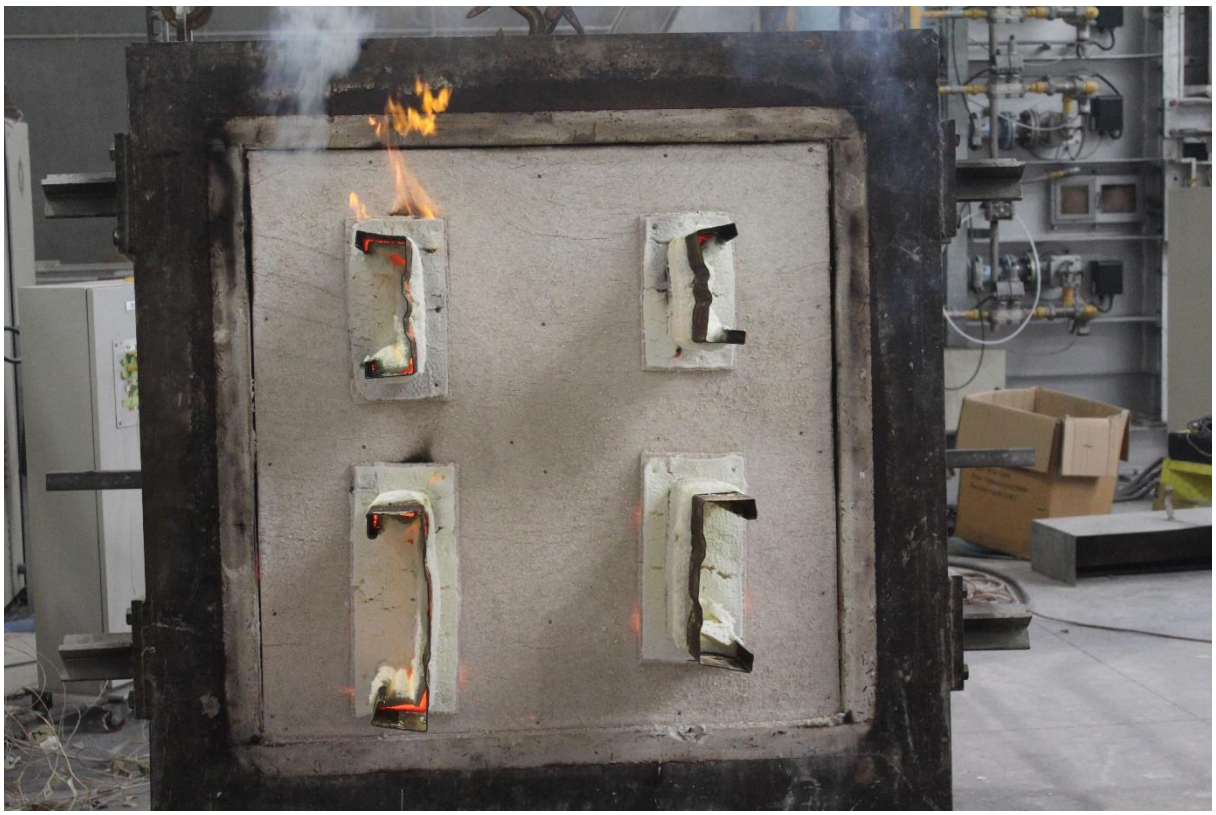


Fig. 14 – After the test