



United Kingdom  
Testing and  
Certification

# Test Report

The fire resistance performance of two fully insulated, timber, single acting single door assembly when tested in accordance with BS 476-22: 1987 § 6.

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**Prepared For** Complete Fire Protection  
Unit 2 Ferry Steps Industrial Estate  
Albert Road  
Bristol  
BS2 0XW



21542


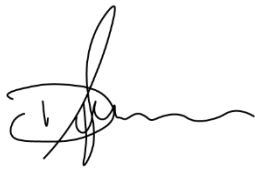
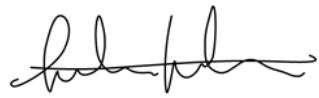
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Trusted to ensure.

## Change History

Issue Date	Revision	Created by	Authorised by	Description of Change
28/04/2022	A	N.S	D.F	Initial Issue

## Signatories

		
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\*For and on behalf of United Kingdom Testing and Certification.

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# 1 Executive Summary

## 1.1 Specimen Summary

Specimen A had overall nominal dimensions of 1014 mm wide by 2110 mm high, incorporating a single door leaf with overall dimensions of 932 mm wide by 2040 mm high by 44 mm thick. The door leaf was formed from a graduated density chipboard core with 8 mm thick hardwood lipping's to all four edges. The specimen had had an intumescent edge guard fixed to the bottom lipping and "Fireplug framefit" packers fixed into the frame reveal. The leaf was hung in a softwood frame on three steel hinges, such that it opened into the heating conditions of the test. The doorset was unlatched for the duration of the test. The doors assembly incorporated the following hardware:

Item No.	Description	Reference
11	Door Closer	Arrone – AR8209

Specimen B had overall nominal dimensions of 1014 mm wide by 2110 mm high, incorporating a single door leaf with overall dimensions of 932 mm wide by 2040 mm high by 54 mm thick. The door leaf was formed from a graduated density chipboard core with 8 mm thick hardwood lipping's to the vertical edges. The specimen had had an intumescent edge guard fixed to the bottom lipping and "Fireplug framefit" packers fixed into the frame reveal. The leaf was hung in a hardwood frame on three steel hinges, such that it opened into the heating conditions of the test. The doorset was unlatched for the duration of the test. The doors assembly incorporated the following hardware:

Item No.	Description	Reference
24	Door Closer	Arrone – AR8209

## 1.2 Specimen Verification

United Kingdom Testing and Certification carried out a comprehensive survey to verify the information provided by the Test Sponsor. This included verifying the materials, dimensions, and manufacturing methodologies of the test specimens wherever possible. Refer to page 14 for full details of this survey.

## 1.3 Specimen Installation and Fixity

Specimen A was installed into the test construction by United Kingdom Testing and Certification. The specimen was installed such that the door leaf opened towards the heating conditions at the request of the Test Sponsor. The specimen was unlatched prior to the commencement of the test at the request of the test sponsor.

Specimen B was installed into the test construction by United Kingdom Testing and Certification. The specimen was installed such that the door leaf opened towards the heating conditions at the request of the Test Sponsor. The specimen was unlatched and unbolted prior to the commencement of the test at the request of the test sponsor.

## 1.4 Sampling

United Kingdom Testing and Certification were not involved in the sampling or selection of the test specimen or any of the components. The results obtained during the test apply to the specimens as received and tested by United Kingdom Testing and Certification.

## 1.5 Expression of Results

The performance criterion specified in BS 476-20: 1987 § 10 was satisfied for the following intervals:

<b>Integrity<sup>1</sup></b>	Specimen A	41 minutes	No failure*
	Specimen B	63 minutes	No failure**
<b>Insulation<sup>2</sup></b>	Specimen A	41 minutes	No failure*
	Specimen B	63 minutes	No failure**

\*Specimen covered over at sponsor request.

\*\*The test was discontinued after a period of 63 minutes at sponsor request.

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<sup>1</sup> The time(s) in completed minutes for which the test specimen(s) continues to maintain its separating function without: a) causing ignition to the cotton pad applied in accordance with BS 476-20:1987 § 10.3.2; b) permitting the penetration of a gap gauge as specified in BS 476-20: 1987 § 10.3.2; c) resulting in sustained flaming

<sup>2</sup> The time(s) in completed minutes for which the test specimen(s) continues to maintain its separating function without developing temperatures on its unexposed surface which: a) increase the average temperature above the initial average temperature by more than 140 °C; b) increase at any location (including the roving thermocouple) above the initial average temperature by more than 180°C.

## 2 Pre-test Examination

### 2.1 Closing Force Measurement

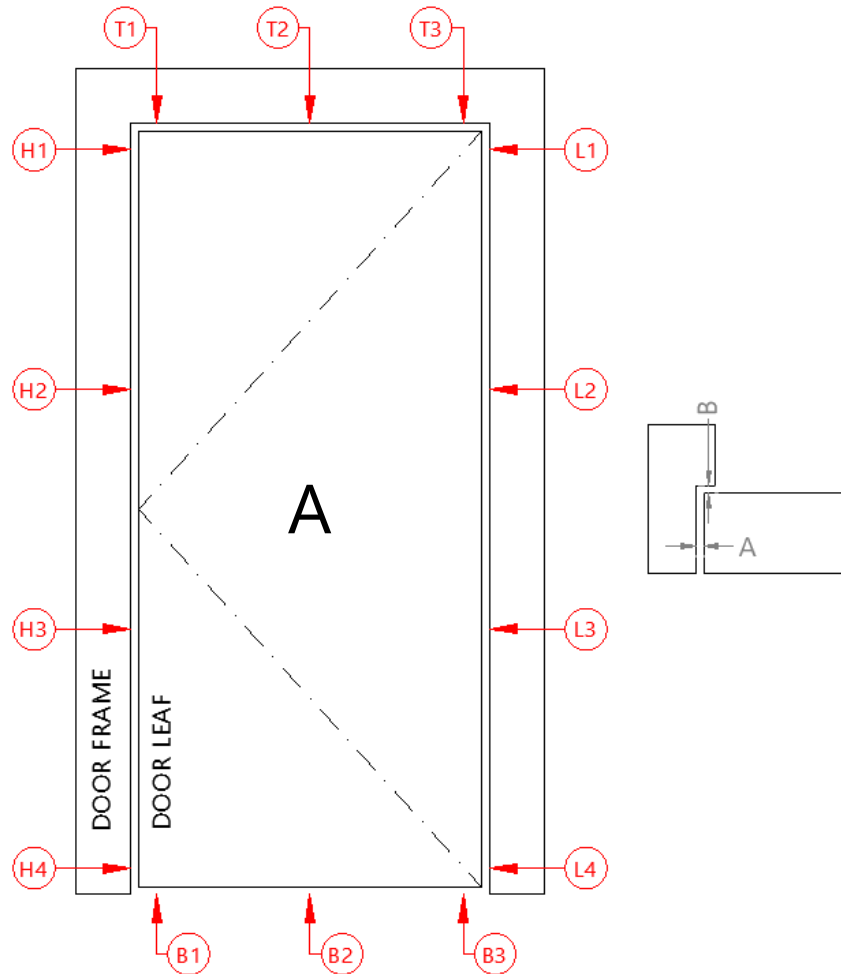
The door closing forces were measured and recorded three times. The results are presented below:

Measurement	Maximum Recorded Force (N)	Distance from Pivot to Measurement Location (m)	Moment (Nm)
Closing Force Specimen A	27.4	0.75	20.5
Opening Force Specimen A	82.6	0.75	61.95
Closing Force Specimen B	25.4	0.75	19.05
Opening Force Specimen B	88.4	0.75	66.3

### 2.2 Specimen Conditioning

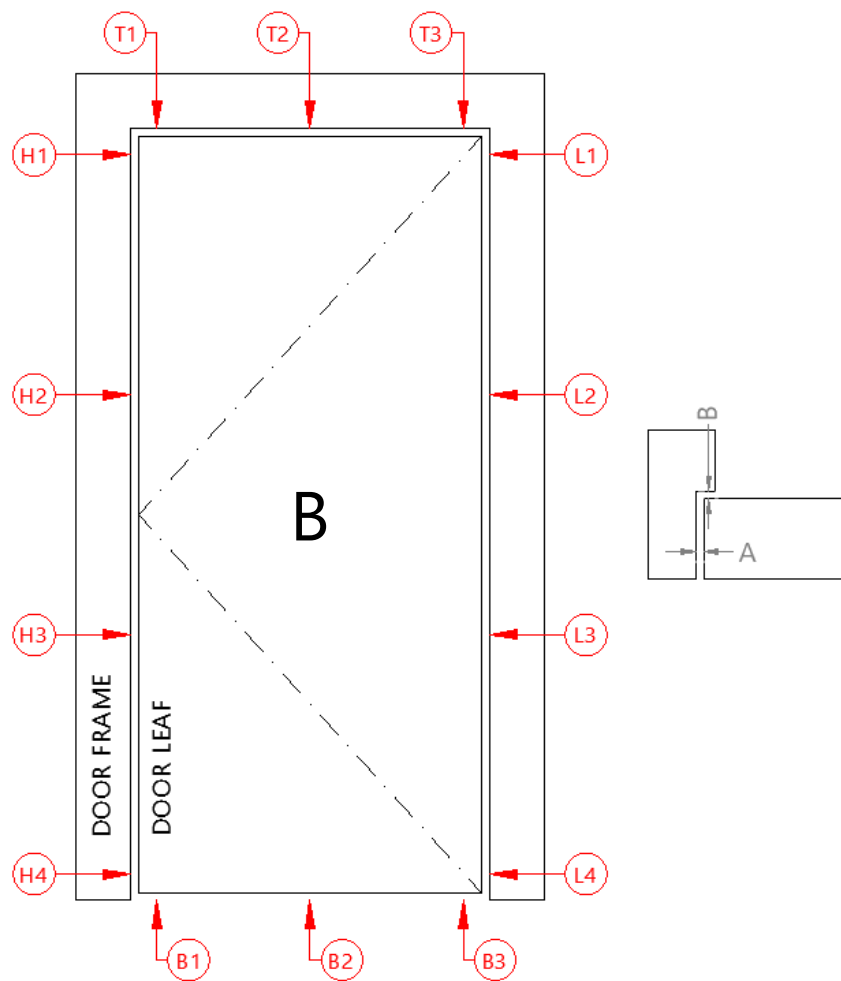
The specimen's storage, construction, and test preparation took place in the test laboratory over a total, combined time of 3 days. Throughout this period, both the temperature and the humidity of the laboratory were measured and recorded as being within a range of from 11.1 °C to 12.0 °C and 69.9 % to 75.8 % respectively.

### 2.3 Gap Measurements



Hanging Stile	A	B	Closing Stile	A	B
H1	1.4	0.4	L1	2.9	0.5
H2	1.4	0.4	L2	2.4	0.9
H3	1.1	0.5	L3	1.7	0.7
H4	0.5	1.0	L4	1.9	1.5
<b>Mean</b>	<b>1.1</b>	X	<b>Mean</b>	<b>2.2</b>	X
<b>Max</b>	<b>1.4</b>		<b>Max</b>	<b>2.9</b>	
<b>Min</b>	<b>0.5</b>		<b>Min</b>	<b>1.7</b>	
<b>Top Edge</b>	<b>A</b>	<b>B</b>	<b>Bottom Edge</b>	<b>A</b>	X
T1	3.5	0.0	B1	2.2	
T2	2.5	0.1	B2	0.9	
T3	3.9	0.6	B3	2.4	
<b>Mean</b>	<b>3.3</b>	X	<b>Mean</b>	<b>1.8</b>	
<b>Max</b>	<b>3.9</b>		<b>Max</b>	<b>2.4</b>	
<b>Min</b>	<b>2.5</b>		<b>Min</b>	<b>0.9</b>	





Hanging Stile	A	B	Closing Stile	A	B
H1	1.7	0.3	L1	3.5	0.3
H2	0.8	0.0	L2	3.4	0.1
H3	1.0	0.0	L3	2.0	0.6
H4	0.8	1.1	L4	2.0	2.9
<b>Mean</b>	<b>1.1</b>	X	<b>Mean</b>	<b>2.7</b>	X
<b>Max</b>	<b>1.7</b>		<b>Max</b>	<b>3.5</b>	
<b>Min</b>	<b>0.8</b>		<b>Min</b>	<b>2.0</b>	
<b>Top Edge</b>	<b>A</b>	<b>B</b>	<b>Bottom Edge</b>	<b>A</b>	X
T1	1.3	0.3	B1	0.9	
T2	1.4	0.0	B2	0.0	
T3	1.5	0.3	B3	0.7	
<b>Mean</b>	<b>1.4</b>	X	<b>Mean</b>	<b>0.5</b>	
<b>Max</b>	<b>1.5</b>		<b>Max</b>	<b>0.9</b>	
<b>Min</b>	<b>1.3</b>		<b>Min</b>	<b>0.0</b>	

### 3 Test Specimen Drawings

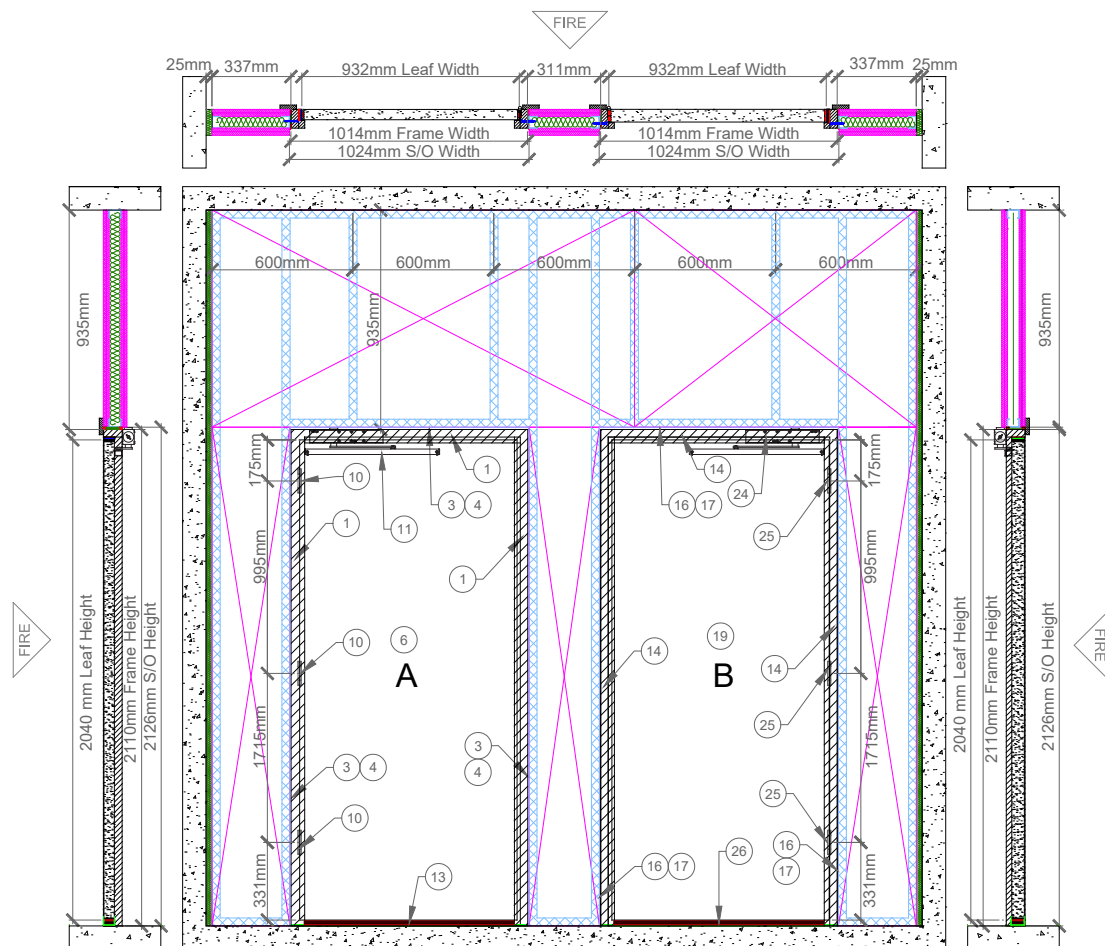


Figure 1 - General arrangement of test construction viewed from the unexposed surface

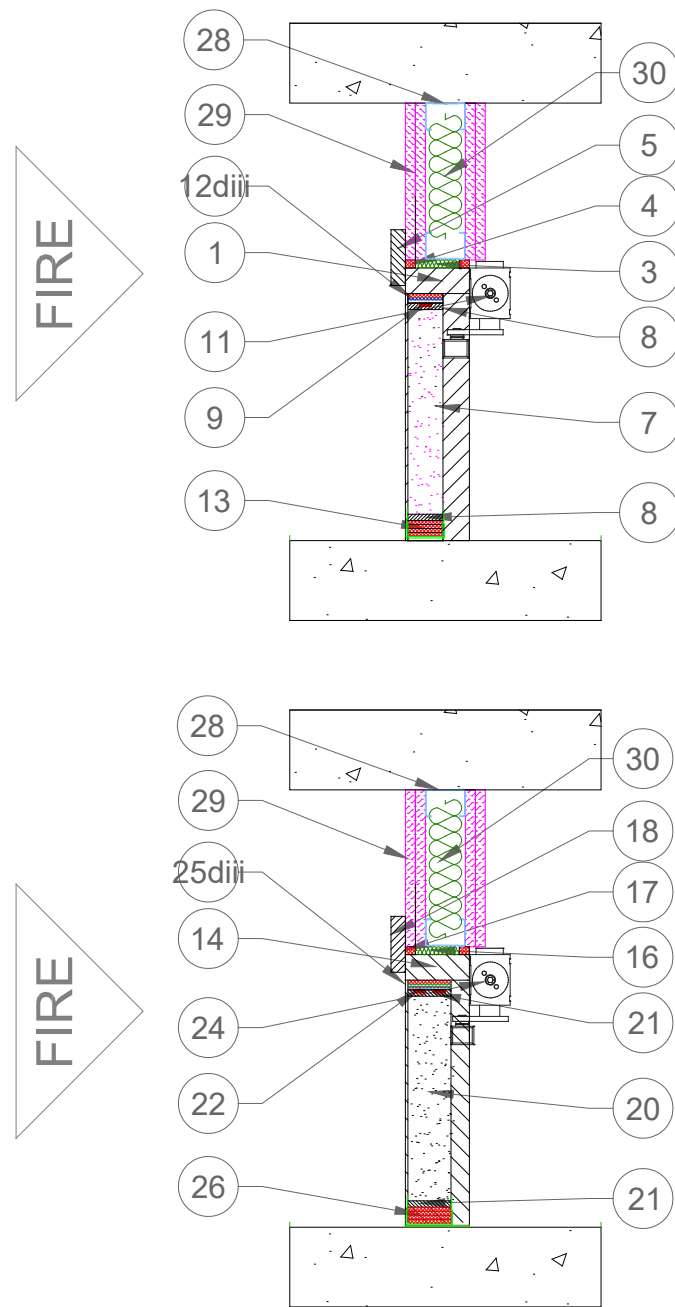


Figure 2 - Typical vertical section through the specimens

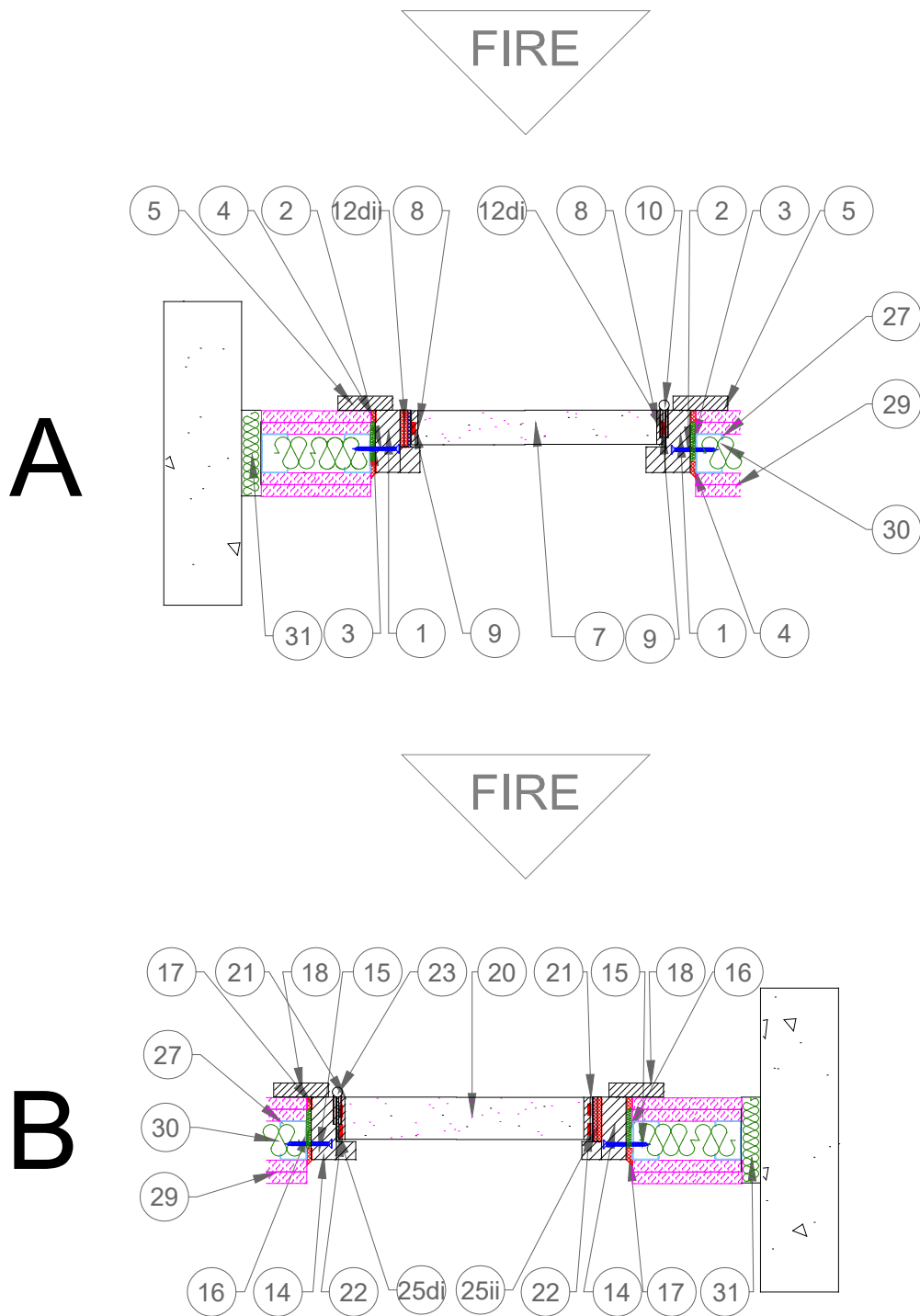


Figure 3 - Typical horizontal section through the specimens

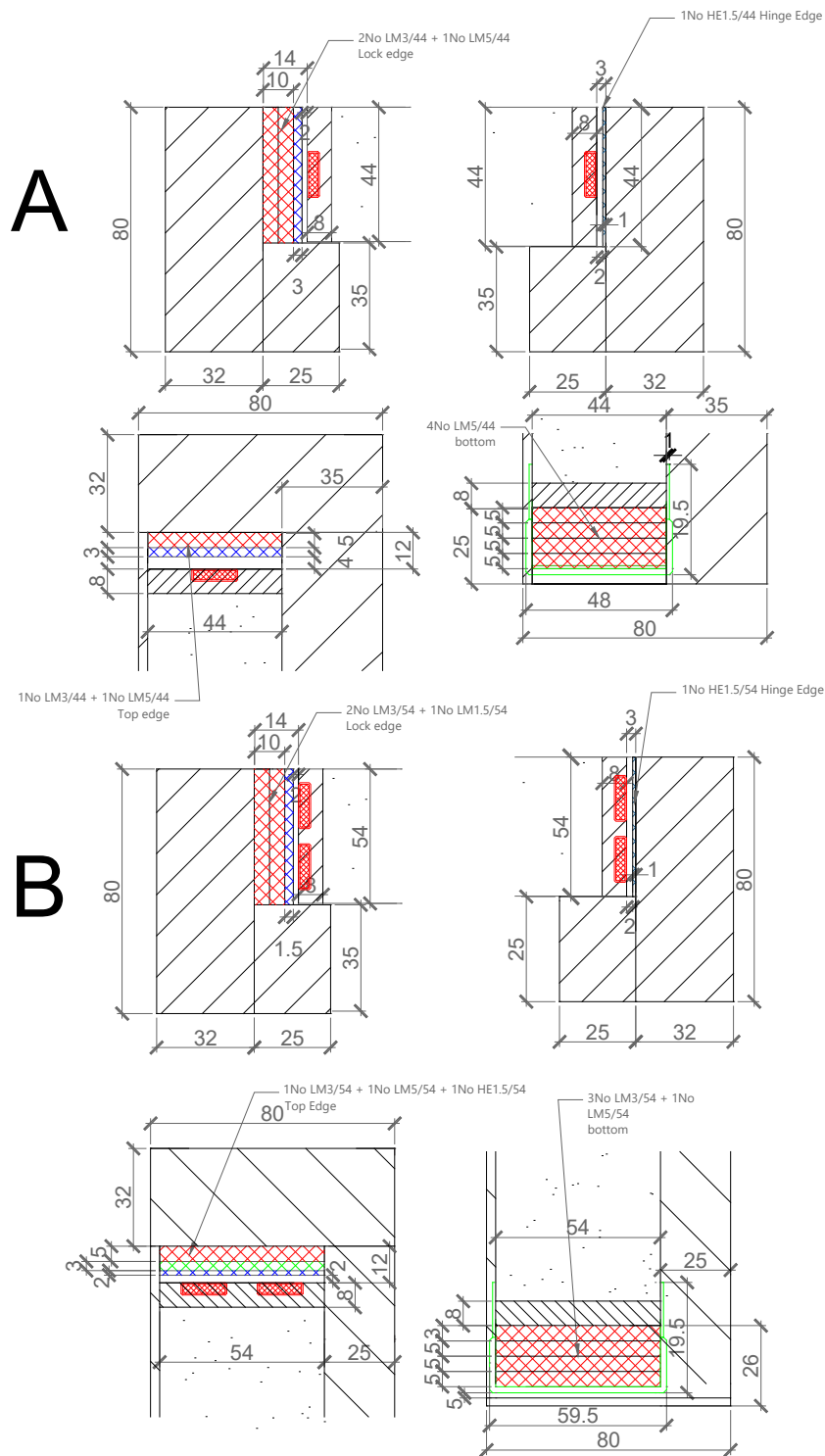


Figure 4 – Framefit Gaps details

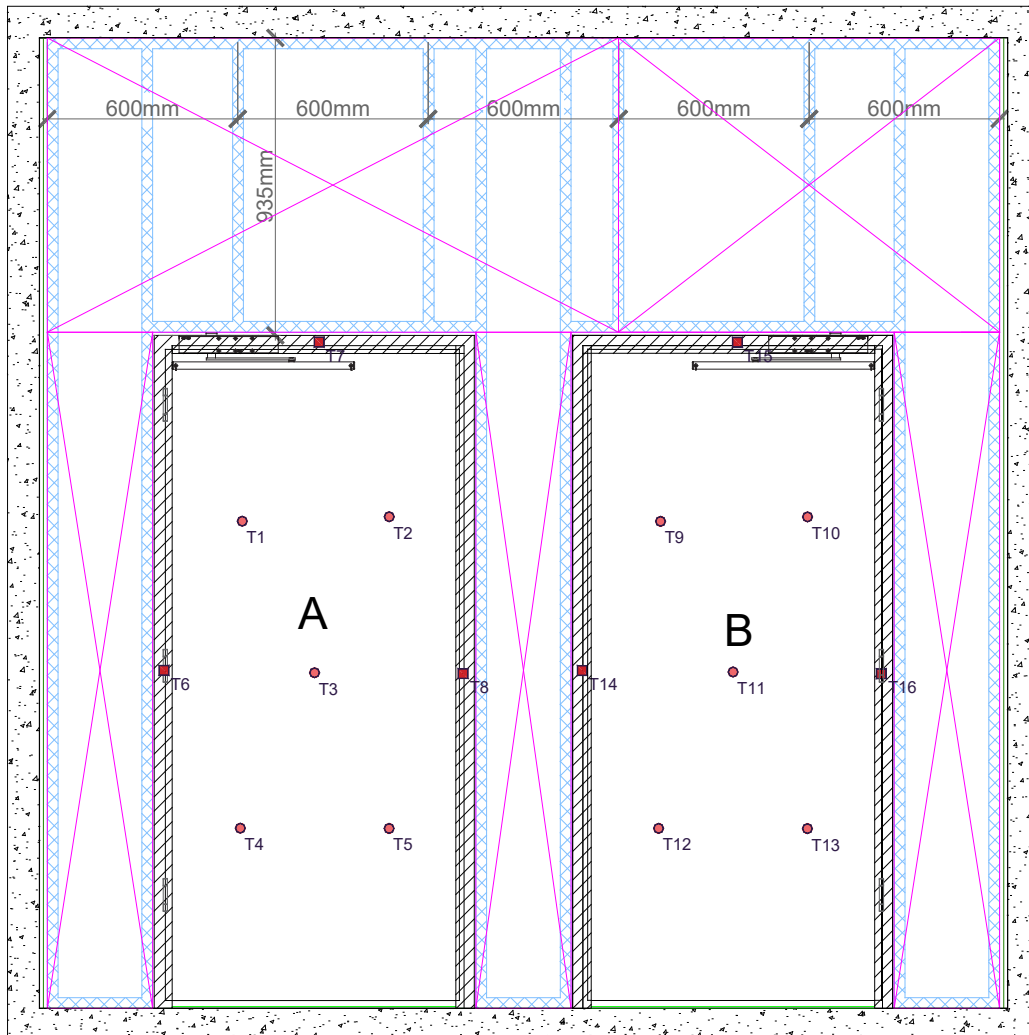


Figure 5 - Layout of instrumentation viewed from the unexposed surface of the test construction

## 4 Technical Schedule

All dimensions are in millimetres (mm) unless otherwise stated.

\* Information provided by the Test Sponsor. Not verified by United Kingdom Testing and Certification.

\*\* Nominal value.

\*\*\* Information is commercial in confidence. Full details retained on file by United Kingdom Testing and Certification.

### 4.1 Specimen A

1. Frame	
Manufacturer	S A Joinery
Reference	FD30
Material	Red Deal Softwood
Density	510 kg/m <sup>3</sup> *
Moisture content	10.5 % *
a. Overall size	2110 mm high x 1014 mm wide x 80 mm wide
i. Frame (Head)	80 mm wide x 32 mm thick
ii. Frame (Jambs)	80 mm wide x 32 mm thick
iii. Stop	25 mm wide x 25 mm deep
Jamb to Head jointing method, fixing detail and location	20 mm Stub Tenon
Stop to Frame jointing method, fixing detail and location	1.5 mm x 50 mm Gas fired pins @ 200 mm centres
b. Adhesive(s)	D4 PVA
i. Manufacturer	Ever build
ii. Type	D4 PVA
iii. Reference	EN204
iv. Curing method	Air
v. Application method	Squeezed & brushed
2. Frame Fixing Method to Supporting Construction	
Manufacturer	Turbo Outdoor

Reference	3917X
Type & material	Carbon Steel PZ double countersunk screws
Overall size	Ø 5 mm x 80 mm long
Spacing	150 mm from top corner of jamb, 150 mm from bottom corner of jamb and at no more than 600 mm centres
Does the fixing penetrate intumescent seal within frame reveal	N/a
Packing Material	Certitek PVC U Shims
Packing Material Dimension	101 mm x 43 mm assorted thicknesses
Packing Material Location	At each fixing location
<b>3. Frame to supporting construction fire stopping detail</b>	
Manufacturer	Saint-Gobain
Reference	Isover Insulation
Material	Mineral Wool
Overall dimension	50 mm deep x 2 mm to 10 mm wide
Application method	Compression fitted
<b>4. Sealant to fire stopping detail</b>	
Manufacturer	Certitek
Reference	DM-01 Intumescent & Acoustic Acrylic Sealant
Material	Acrylic Sealant
Overall section size	10 mm deep x 2 mm to 10 mm wide
Application method	Using a cartridge gunned
Location	Gaps between the head and jambs and supporting construction
<b>5. Architrave</b>	
Manufacturer	S A Joinery
Reference	Ark
Material	Red Deal Softwood
Overall section size	70 mm x 18 mm
Location	6 mm Back from inside edge (Fire side)



Application method, fixings and fixing frequency required	PVA D4 Glued & Pinned 1.5 x 38 gas fired nails
<b>6. Door Leaf</b>	
Supplier	S A Joinery
Reference	Prima
Quantity of leaves on doorset	1
Glazing location relative to the head and closing edge	N/a
Overall leaf size supplied for testing	2040 mm high x 932 mm wide x 44 mm thick
<b>7. Core element</b>	
Manufacturer	Halspan
Reference	Prima
Material	Graduated Density Chipboard
Density	630 kg/m <sup>3</sup> <sup>3</sup>
Overall thickness	44 mm thick
<b>8. Lippings / Edge banding</b>	
Manufacturer	S A Joinery
Reference	Lipping
Material	Sapele
Density	640 kg/m <sup>3</sup> *
Moisture content	9% *
Overall size	54 mm deep x 2100 mm wide x 8 mm thick
Fixing method	Glued & Hydraulicly Pressed
Location	All round Door 4 sides
a. Adhesives	
i. Manufacturer	ARO-BOND 947
ii. Type	MCPU

<sup>3</sup> <https://halspan.com/wp-content/uploads/2020/09/door-blanks-cores-range-brochure.pdf>

iii. Reference	947
iv. Curing method	Air
v. Application method	Damp cloth to clean edges & add moisture, squeeze bottle to apply glue & uniform spread with spatula
b. Presence of Mechanical Fixings	N/a
<b>9. Intumescent Leaf Edge</b>	
Quantity	1
Manufacturer	Pyroplex
Reference	Cf355
Material	Graphite
Overall section size	15 mm wide x 4 mm thick
Application method	Self-adhesive backing
Location (relative to the opening face of the door leaf)	14.5mm – 15 mm– 14.5mm on 3 edges only none on bottom
Presence of Adhesives	N/a
<b>10. Hinges</b>	
Supplier	Royde & Tucker
Reference	102
Quantity	3
Primary material	Steel
Type	HI Load 102
a. Size	
vi. Knuckle	Ø 14 mm x 104 mm high
vii. Blades	100 mm high x 35 mm wide x 3 mm thick
b. Fixings	
i. Type	Countersunk wood screws
ii. Material	Stainless Steel
iii. Size	Ø 5 mm x 32 mm long
iv. Number off per blade	5

Position of each hinge relative to the head of the leaf	175 mm, 995 mm, and 1715 mm
Details of intumescent protection	1 mm Interdens
Interruptions to Intumescent within the frame reveal	N/a
<b>11. Door Closer</b>	
Manufacturer	Arrone
Reference	AR8209 Track Arm Closer. CF770
a. Material	
i. Body	Stainless Steel
ii. Closer arm	Stainless Steel
iii. Cover	Stainless Steel
Configuration	
b. Overall size	
i. Slide arm	524 mm wide x 22 mm thick x 33 mm deep
ii. Body	60 mm high x 296 mm wide x 48 mm deep
iii. Cover	56 mm high x 296 mm wide x 0.5 mm deep
Fixing method	2 No. at Ø 8 mm x 60 mm wood screws on sliding arm & 4 No. at Ø 8 mm x 50 mm
<b>12. Fireplug Framefit System Details</b>	
Manufacturer	Complete Fire Protection Ltd
Reference	Fireplug FrameFit System for 30-minute fire doors - Ref FF30
Material	Low modulus fire retardant graphite intumescent
c. System Components	
i. Gap spacers (LM Range for 30-minute doors)	Low Modulus (LM) fire retardant intumescent Ref: LM2/44, LM3/44, LM4/44, LM5/44
ii. Hinge Side (HE44 for 30-minute doors)	High expansion intumescent Ref: HE44
d. Overall Size	
i. LM/44 Range	44 mm wide x 2100 mm long x 2/3/4/5 mm thick
ii. HE44	44 mm wide x 2100 mm long x 1.5 mm thick

e. Application Method	Fix required LM profiles to the door frame opposite the door edges by using the double-sided adhesive tape found on the reverse side of each profile. Once the correct number of LM profiles are in place, pin fix through all layers into the door frame using a minimum of 20mm long panel pins @ 400mm centres. The HE44 is generally used on the hinged side only. It is fitted using the double-sided adhesive tape found on the reverse side of each profile.
f. Door Edge Gap sizes	<b>FrameFit Configuration</b>
i. Hinge (3 mm Gap)	1No HE44 only
ii. Leading edge (15 mm gap)	2No LM3/44 + 1No LM5/44
iii. Top Edge (12 mm)	1No LM3/44 + 1No LM5/44
<b>13. Fireplug Framefit BDS30</b>	
Manufacturer	Complete Fire Protection Ltd
Reference	Fireplug Framefit BDS30 - for 30-minute doors
Material	Low modulus fire retardant graphite intumescent
Overall section size	As LM Range
Location (relative to the opening face of the door leaf)	Located on the bottom door edge
Application Method	Fix required LM profiles to the bottom door edge by using the double-sided adhesive tape found on the reverse side of each profile. Once the correct number of LM profiles are in place, encase the profiles with the appropriate BDS cover strip. Then screw/pin fix through all layers into the bottom of the door edge using a minimum of 40 mm long screws/panel pins @ 200 mm centres ensuring screws/pins penetrate door edge by minimum of 10 mm.
<b>Door Edge Gaps</b>	<b>FrameFit configuration</b>
Bottom of leaf (24 mm)	Framefit BDS30 with 4No LM5/44

## 4.2 Specimen B

<b>14. Frame</b>	
Manufacturer	S A Joinery
Reference	FD60
Material	Sapele Hardwood
Density	640 kg/m <sup>3</sup> *
Moisture content	9 % *

a.	Overall size	2110 mm high x 1014 mm wide x 80 mm wide
i.	Frame (Head)	80 mm wide x 32 mm thick
ii.	Frame (Jambs)	80 mm wide x 32 mm thick
iii.	Stop	25 mm wide x 35 mm deep
Jamb to Head jointing method, fixing detail and location		20 mm Stub Tenon
Stop to Frame jointing method, fixing detail and location		1.5 mm x 38 mm Gas fired pins @ 200 mm centres
b.	Adhesive(s)	D4 PVA
i.	Manufacturer	Ever build
ii.	Type	D4 PVA
iii.	Reference	EN204
iv.	Curing method	Air
v.	Application method	Squeezed & brushed
<b>15. Frame Fixing Method to Supporting Construction</b>		
Manufacturer		Turbo Outdoor
Reference		3917X
Type & material		Carbon Steel PZ double countersunk screws
Overall size		Ø 5 mm x 80 mm long
Spacing		150 mm from top corner of jamb, 150 mm from bottom corner of jamb and at no more than 600 mm centres
Does the fixing penetrate intumescent seal within frame reveal		N/a
Packing Material		Certitek PVC U Shims
Packing Material Dimension		101 mm x 43 mm assorted thicknesses
Packing Material Location		At each fixing location
<b>16. Frame to supporting construction fire stopping detail</b>		
Manufacturer		Saint-Gobain
Reference		Isover Insulation
Material		Mineral Wool

Overall dimension	50 mm deep x 2 mm to 10 mm wide
Application method	Compression fitted
<b>17. Sealant to fire stopping detail</b>	
Manufacturer	Certitek
Reference	DM-01 Intumescent & Acoustic Acrylic Sealant
Material	Acrylic Sealant
Overall section size	10 mm deep x 2 mm to 10 mm wide
Application method	Using a cartridge gunned
Location	Gaps between the head and jambs and supporting construction
<b>18. Architrave</b>	
Manufacturer	S A Joinery
Reference	Ark
Material	Sapele
Overall section size	70 mm x 18 mm
Location	6 mm Back from inside edge (Fire side)
Application method, fixings and fixing frequency required	PVA D4 Glued & Pinned Ø 1.5 mm x 38 mm gas fired nails
<b>19. Door Leaf</b>	
Manufacturer	Halspan
Reference	Prima
Quantity of leaves on doorset	1
Glazing location relative to the head and closing edge	N/a
Overall leaf size supplied for testing	2040 mm high x 932 mm wide x 54 mm thick
<b>20. Core element</b>	
Manufacturer	Halspan
Reference	Prima
Material	Graduated Density Chipboard

Density	630 kg/m <sup>3</sup> <sup>4</sup>
Overall thickness	54 mm thick
<b>21. Lippings / Edge banding</b>	
Manufacturer	S A Joinery
Reference	Lipping
Material	Sapele
Density	640 kg/m <sup>3</sup> *
Moisture content	9% *
Overall size	54 mm deep x 2100 mm wide x 8 mm thick
Fixing method	Glued & Hydraulically Pressed
Location	All round Door 4 sides
a. Adhesives	
i. Manufacturer	ARO-BOND 947
ii. Type	MCPU
iii. Reference	947
iv. Curing method	Air
v. Application method	Damp cloth to clean edges & add moisture, Squeeze bottle to apply glue & uniform spread with spatula
b. Presence of Mechanical Fixings	N/a
<b>22. Intumescent Leaf Edge</b>	
Quantity	2
Manufacturer	Pyroplex
Reference	Cf355
Material	Graphite
Overall section size	15 mm wide x 4 mm thick

<sup>4</sup> <https://halspan.com/wp-content/uploads/2020/09/door-blanks-cores-range-brochure.pdf>

Application method	Self-adhesive backing
Location (relative to the opening face of the door leaf)	7 mm – 15mm – 10mm – 15mm – 7 mm on 3 edges only none on bottom
Presence of Adhesives	N/a
<b>23. Hinges</b>	
Supplier	Royde & Tucker
Reference	102
Quantity	3
Primary material	Steel
Type	HI Load 102
a. Size	
i. Knuckle	Ø 14 mm x 104 mm high
ii. Blades	100 mm high x 35 mm wide x 3 mm thick
iii. Fixings	
b. Type	Countersunk wood screws
i. Material	Stainless Steel
ii. Size	Ø 5 mm x 32 mm long
iii. Number off per blade	5
iv. Position of each hinge relative to the head of the leaf	175 mm, 995 mm, and 1715 mm
Details of intumescent protection	1 mm Interdens
<b>24. Door Closer</b>	
Manufacturer	Arrone
Reference	AR8209 Track Arm Closer. CF770
a. Material	
i. Body	Stainless Steel
ii. Closer arm	Stainless Steel
iii. Cover	Stainless Steel



Configuration	EN 2 – 4
b. Overall size	
i. Body	60 mm high x 296 mm wide x 48 mm deep
ii. Cover	56 mm high x 296 mm wide x 0.5 mm deep
Fixing method	2 No. at Ø 8 mm x 60 mm wood screws on sliding arm & 4 No. at Ø 8 mm x 50 mm
<b>25. Fireplug Framefit System Details</b>	
Manufacturer	Complete Fire Protection Ltd
Reference	Fireplug FrameFit System for 60-minute fire doors - Ref FF60
Material	Low modulus fire retardant graphite intumescent
a. System Components	
iii. Gap spacers (LM Range for 60-minute doors)	Low Modulus (LM) fire retardant intumescent Ref: LM2/54, LM3/54, LM4/54, LM5/54 (eg LM3/54)
iv. Hinge Side (HE54 for 60-minute doors)	High expansion intumescent Ref: HE54
b. Overall Size	
i. LM/54 Range	54mm wide x 2/3/4/5mm thick (eg LM3/54 = 54mm wide x 3mm thick )
ii. HE54	54 mm wide x 2100 mm long x 1.5 mm thick
c. Application Method	Fix required LM profiles to the door frame opposite the door edges by using the double-sided adhesive tape found on the reverse side of each profile. Once the correct number of LM profiles are in place, pin fix through all layers into the door frame using a minimum of 20 mm long panel pins @ 400mm centres. The HE54 is generally used on the hinged side only. It is fitted using the double-sided adhesive tape found on the reverse side of each profile.
d. Door Edge Gap sizes	FrameFit Configuration
iii. Hinge (3 mm Gap)	1No HE54 only
iv. Leading edge (15 mm gap)	2No LM3/54 + 1No LM5/54
v. Top Edge (12 mm gap)	1No LM3/54 + 1No LM5/54 + 1No HE54
<b>26. Fireplug Framefit BDS60</b>	
Manufacturer	Complete Fire Protection Ltd

Reference	Fireplug Framefit BDS60 - For 60-minute doors
Material	Low modulus fire retardant graphite intumescent
Overall section size	As LM Range
Location (relative to the opening face of the door leaf)	Located on the bottom door edge
Application Method	Fix required LM profiles to the bottom door edge by using the double-sided adhesive tape found on the reverse side of each profile. Once the correct number of LM profiles are in place, encase the profiles with the appropriate BDS cover strip. Then screw/pin fix through all layers into the bottom of the door edge using a minimum of 40 mm long screws/panel pins @ 200 mm centres ensuring screws/pins penetrate door edge by minimum of 10 mm.
<b>Gap Size</b>	<b>FrameFit configuration</b>
Bottom of leaf (25mm)	Framefit BDS60 with 3No LM5/54 + 1No LM3/54

### 4.3 Supporting Construction

<b>27. Metal Frame</b>	
Supplier	UKTC Provided
e. Supporting Structure	
vi. Type & Material	Steel C Stud
vii. Thickness & Size	50 mm wide x 34 mm thick x 3000 mm long
viii. Centres	600 mm centres 25 mm space between testing frame and wall frame
ix. Additional Wall Construction Requests	N/a
<b>28. Head/ Floor Track</b>	
Supplier	United Kingdom Testing and Certification
Type & Material	Rolled steel U-Track
Dimensions	52 mm deep x 25 mm wide x 3000 mm long x 0.5 mm thick
Centres	600 mm Centres 20 mm Space between testing frame and wall frame for insulation.
Fixing(s)	Ø 7.5 x 50 mm long self-tapping screws staggered at max 600 mm centres

<b>29. Plasterboard</b>	
Supplier	UKTC Provided
Type & Material	Gypsum Plasterboard Tapered Edge
Layer Quantity	2
Thickness & Size	12.5 mm per layer 30 mm total x 2400 mm x 1200 mm per Sheet
Fixings	Plasterboard Screw Fixings Ø 5 mm x 25 mm
Joints Filled & Taped With	Limestone filler & Butyl rubber
<b>30. Wall Insulation</b>	
Supplier	UKTC Provided
Type & Material	Mineral Wool
Installation Method	Compression Fitted
Thickness	50 mm
Density	12 kg/m <sup>3</sup>
Locations	Centrally Located in the wall
Additional Wall Construction Requests	N/a
<b>31. Free Edge Gasket</b>	
Manufacturer	Morgan Advance Materials
Reference	Superwool HT
Density	128 kg/m <sup>3</sup>
Dimensions (w x h x d)	200 mm wide x 3050 mm high x 25 mm deep
Fixing Method	Compression fitted between the supporting construction and restraint frame

## 5 Specimen Photographs



Figure 6 - Item 11 & 24



Figure 7 - Item 2 & 15



Figure 8 - Item 10 & 23

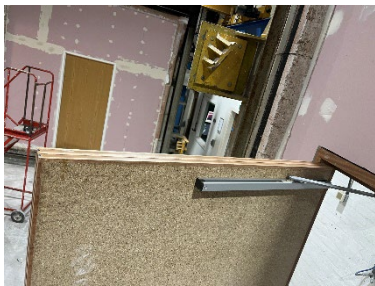


Figure 9 - Item 22



Figure 10 - Item 12 & 25



Figure 11 - Item 12 & 25



Figure 12 - Item 12 & 25



Figure 13 - Item 5 & 18



Figure 14 - Item 12 & 25

## 6 Test Procedure

### 6.1 Heating Conditions

The specimens were subject to heating conditions in accordance with BS 476-20:1987 § 3.1. This was monitored and controlled for the duration of the test using type K thermocouples which were distributed across a vertical plane  $100 \pm 10$  mm from the exposed surface of the test construction. The resulting Time-Temperature distribution is presented in Figure 27.

### 6.2 Pressure Conditions

The specimens were subject to a pressure regime in accordance with BS 476-20: 1987 § 3.2. The calculated pressure differential relative to the laboratory atmospheric pressure at a height of 365, 1612 and 2850 mm from the furnace floor level was -5.4, 5.2 and 15.7 Pa respectively which equates to 0 Pa at a height of 1000 mm from the furnace floor level. The furnace was maintained at these pressures within  $\pm 2$  Pa five minutes after the commencement of the test and for the remainder of the test duration. The pressure deviated from the specified conditions on ten instances throughout the duration of the test. The Time-Pressure distribution is presented in Figure 28.

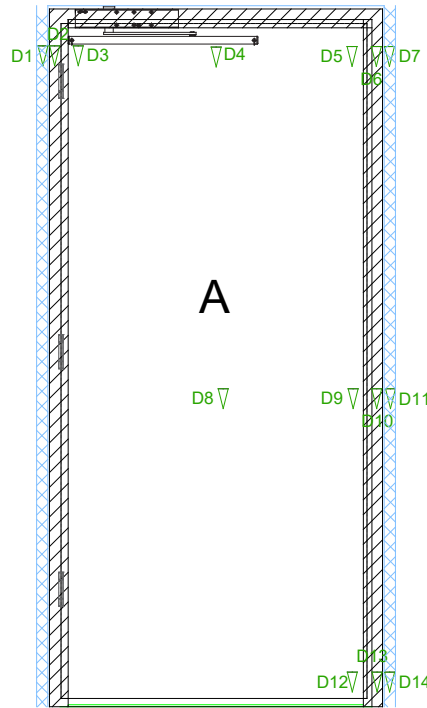
### 6.3 Unexposed Surface Temperature

A roving thermocouple was available for the evaluation of the maximum temperature rise criteria in accordance with BS 476-20: 1987 § 10.4. Any measurements using the roving thermocouple are presented on page 31.

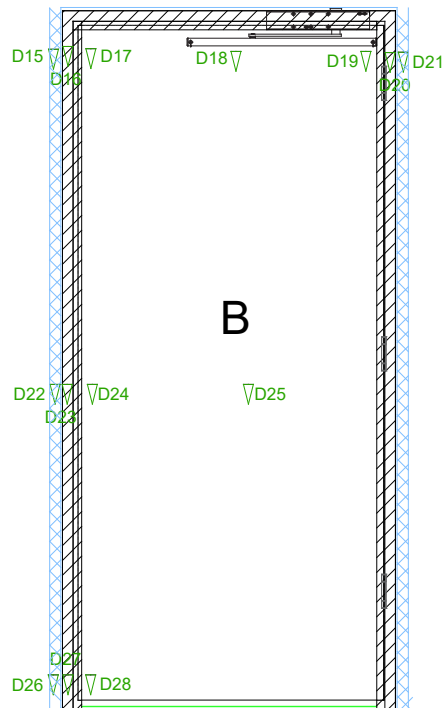
Disc thermocouples were affixed to the unexposed surface of the specimens in accordance with BS 476-22:1987 to measure and monitor the maximum and the mean temperature rise of the unexposed face of the specimen for the duration of the test. A summary of the measurements is presented in Figure 29 and Figure 30 and the locations of these thermocouples is illustrated in Figure 5.

### 6.4 Deflection

All measurements are in millimeters (mm) unless stated otherwise. Positive values indicate movement towards the heating conditions.



Time (mins)	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	4	4	5	6	8	2	3	7	7	7	11	2	2
20	0	4	0	4	8	7	4	1	6	4	6	11	1	0
25	0	3	3	2	8	3	4	-1	4	7	8	14	3	1
30	0	1	2	2	9	5	2	-4	3	4	5	15	1	0
40	1	2	3	-1	14	4	2	-11	0	0	2	16	1	1



Time (mins)	D15	D16	D17	D18	D19	D20	D21	D22	D23	D24	D25	D26	D27	D28
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	9	10	8	7	3	2	2	8	7	5	6	2	4	3
20	3	2	7	4	1	-3	-1	3	4	0	2	4	3	2
25	4	4	9	5	0	-1	3	3	5	1	0	0	1	5
30	0	9	10	5	0	-1	-2	2	3	2	-1	1	5	2
40	4	4	9	4	2	-1	4	2	2	1	-3	2	2	6
50	3	4	12	3	2	0	-3	0	4	-1	-8	4	1	7
55	9	13	20	6	5	-7	3	5	8	3	-8	3	4	10
60	14	17	32	17	14	8	8	9	16	12	-5	2	1	12

## 7 Observations

Specimen	HH	MM	SS	E <sup>5</sup>	U <sup>6</sup>	Observation
	00	00	00			<b>The test commences.</b>
B	00	02	44		X	Smoke/steam release down leading edge of the door leaf.
A	00	03	18		X	Smoke/steam release at top of door leaf, leading edge side.
A	00	05	01		X	Smoke/steam release along top and down leading edge of the door leaf.
B	00	06	53		X	Discolouration to leading edge top corner of the door leaf.
A & B	00	07	23	X		Intumescent around leaf perimeter reacting and running down face of both door leaves.
A	00	09	26		X	Discolouration down leading edge of door leaf.
A & B	00	13	45		X	Further discolouration to leading edge of both door leaves.
A & B	00	20	00		X	No significant visible changes.
A & B	00	27	29		X	No significant visible changes.
A & B	00	29	27		X	No significant visible changes.
A & B	00	35	45		X	No significant visible changes.
A	00	38	16		X	Leading edge black at bottom and top corners of the door leaf.
<b>A</b>	<b>00</b>	<b>41</b>	<b>30</b>		<b>X</b>	<b>Doorset boarded off at sponsor request.</b>
B	00	46	09		X	Smoke/steam release around door closer.
B	00	55	00		X	No significant visible changes.

<sup>5</sup> Viewed from exposed surface of the test construction.

<sup>6</sup> Viewed from unexposed surface of the test construction.



Specimen	HH	MM	SS	E <sup>7</sup>	U <sup>8</sup>	Observation
B	00	59	30		X	Top leading edge of door black.
B	01	01	00		X	Discolouration at hinge locations on the door leaf.
	<b>01</b>	<b>03</b>	<b>00</b>			<b>The test is discontinued at the request of the Test Sponsor.</b>

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<sup>7</sup> Viewed from exposed surface of the test construction.

<sup>8</sup> Viewed from unexposed surface of the test construction.

## 8 Test Images



Figure 15 – The exposed surface of the test construction prior to commencement of the test



Figure 16 - The unexposed surface of the test construction prior to the commencement of the test



Figure 17 - The unexposed surface of the test construction after a test duration of 10 minutes



Figure 18 - The unexposed surface of the test construction after a test duration of 15 minutes



Figure 19 - The unexposed surface of the test construction after a test duration of 20 minutes



Figure 20 - The unexposed surface of the test construction after a test duration of 30 minutes



Figure 21 - The unexposed surface of the test construction after a test duration of 40 minutes



Figure 22 - The unexposed surface of the test construction after a test duration of 46 minutes



Figure 23 - The unexposed surface of the test construction after a test duration of 50 minutes



Figure 24 - The unexposed surface of the test construction after a test duration of 60 minutes



Figure 25 - The unexposed surface of the test construction after a test duration of 63 minutes



Figure 26 - The exposed surface of the test construction after the test was discontinued

## 9 On-going Implications

### 9.1 Limitations

The results relate only to the behaviour of the specimen of the element of construction under the particular conditions of test. They are not intended to be the sole criteria for assessing the potential fire performance of the element in use, nor do they reflect the actual behaviour in fires.

BS 476-20: 1987 § Appendix A provides guidance information on the application of fire resistance tests and the interpretation of results. Application of the results to products of different specification, including but not limited to differences in dimension; installation methodologies; supporting construction and components should be subject to design appraisal by a competent individual.

The tested specimens were asymmetrical and were tested such that the door leaves opened towards the heating conditions of the test. The test results may not be appropriate to situations where the door leaves open away from the heating conditions.

### 9.2 Accuracy of Results

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.

No statement of conformity with the testing specifications is made or implied in this report. However, measurement results are reviewed, where applicable, to establish where measurement results exceed the control parameters established in the relevant resistance to fire test standard.

### 9.3 Fire Test Study Group (FTSG)

Where areas of the test specification are ambiguous or open to interpretation the Fire Test Study Group (FTSG) Resolutions have been followed (where appropriate). These Resolutions provide the basis of common agreements between the fire test laboratories which are members of this Group.



## 10 Figures

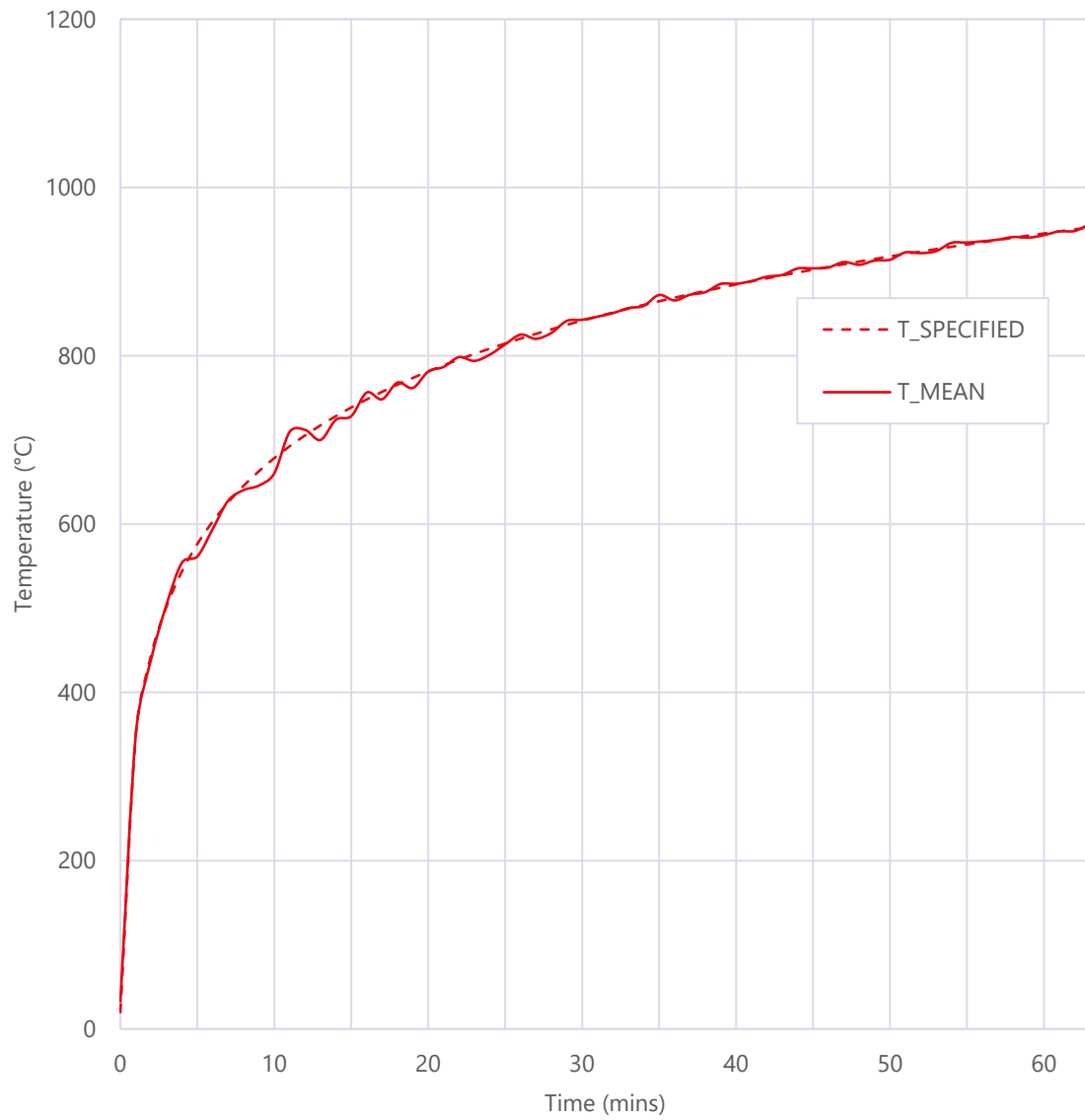


Figure 27 – Graph presenting the Time-Temperature distribution of the furnace

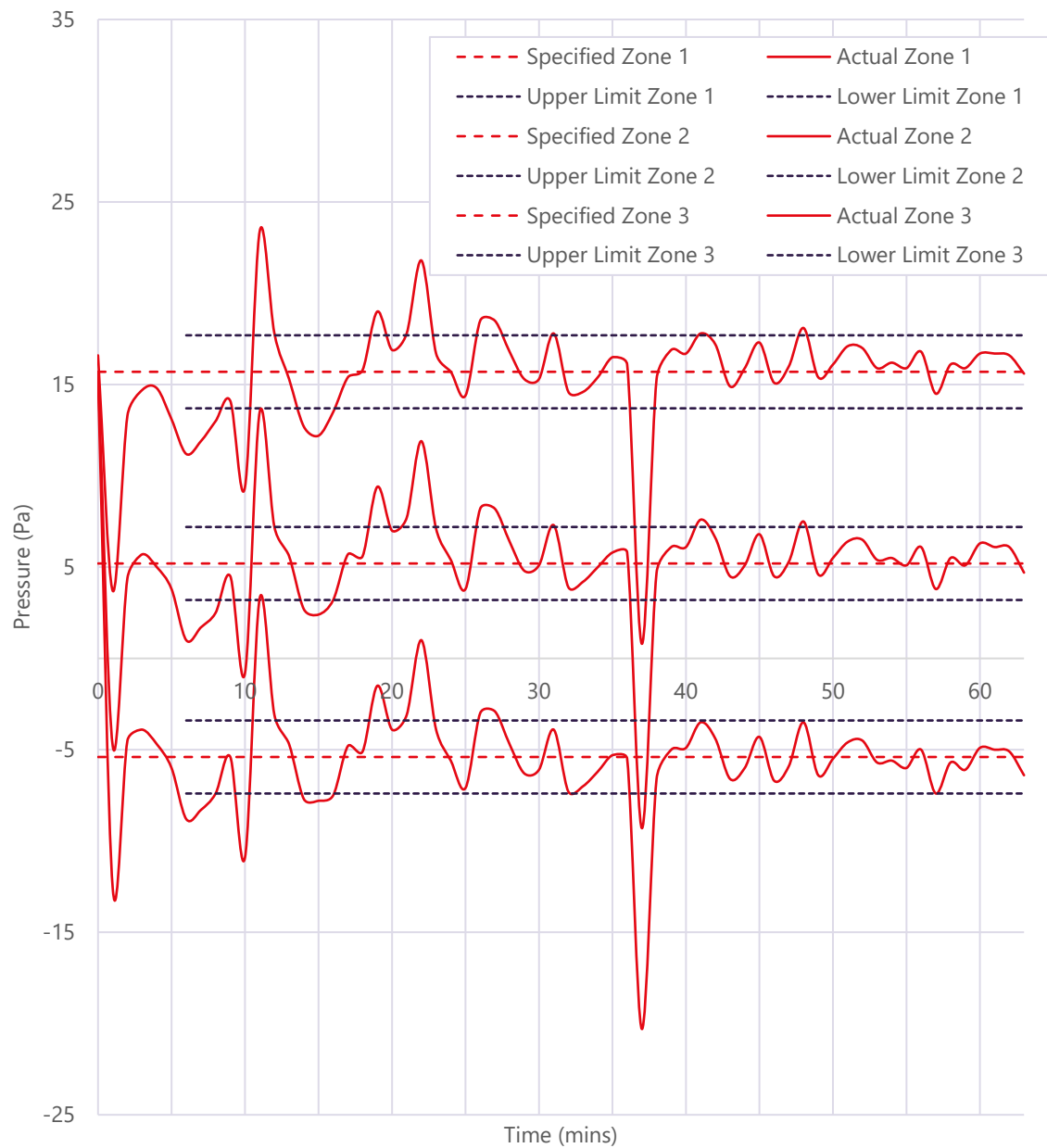


Figure 28 – Graph presenting the Time-Pressure distribution of the furnace

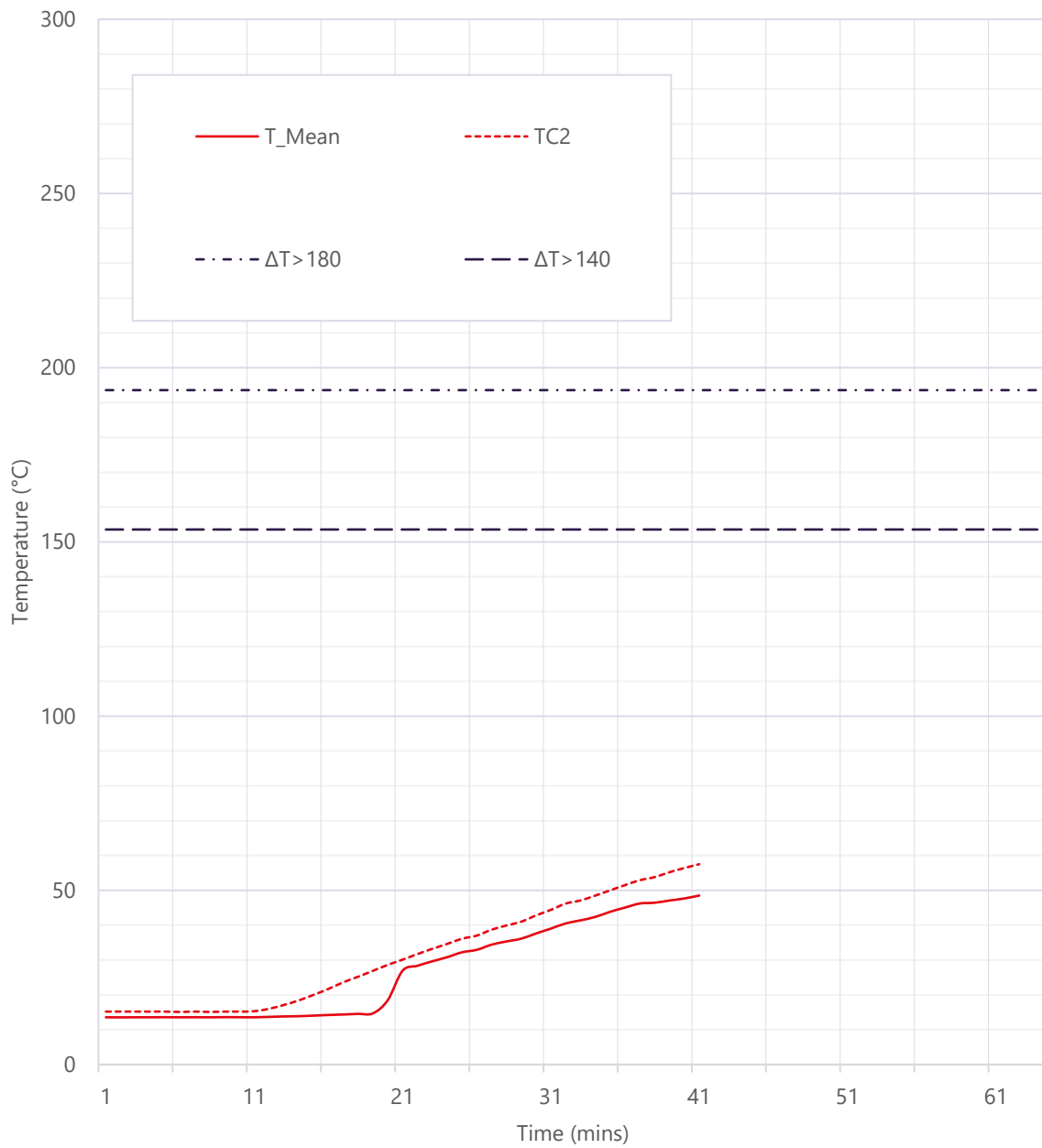


Figure 29 - Graph presenting the Time-Temperature distribution of the unexposed surface of Specimen A

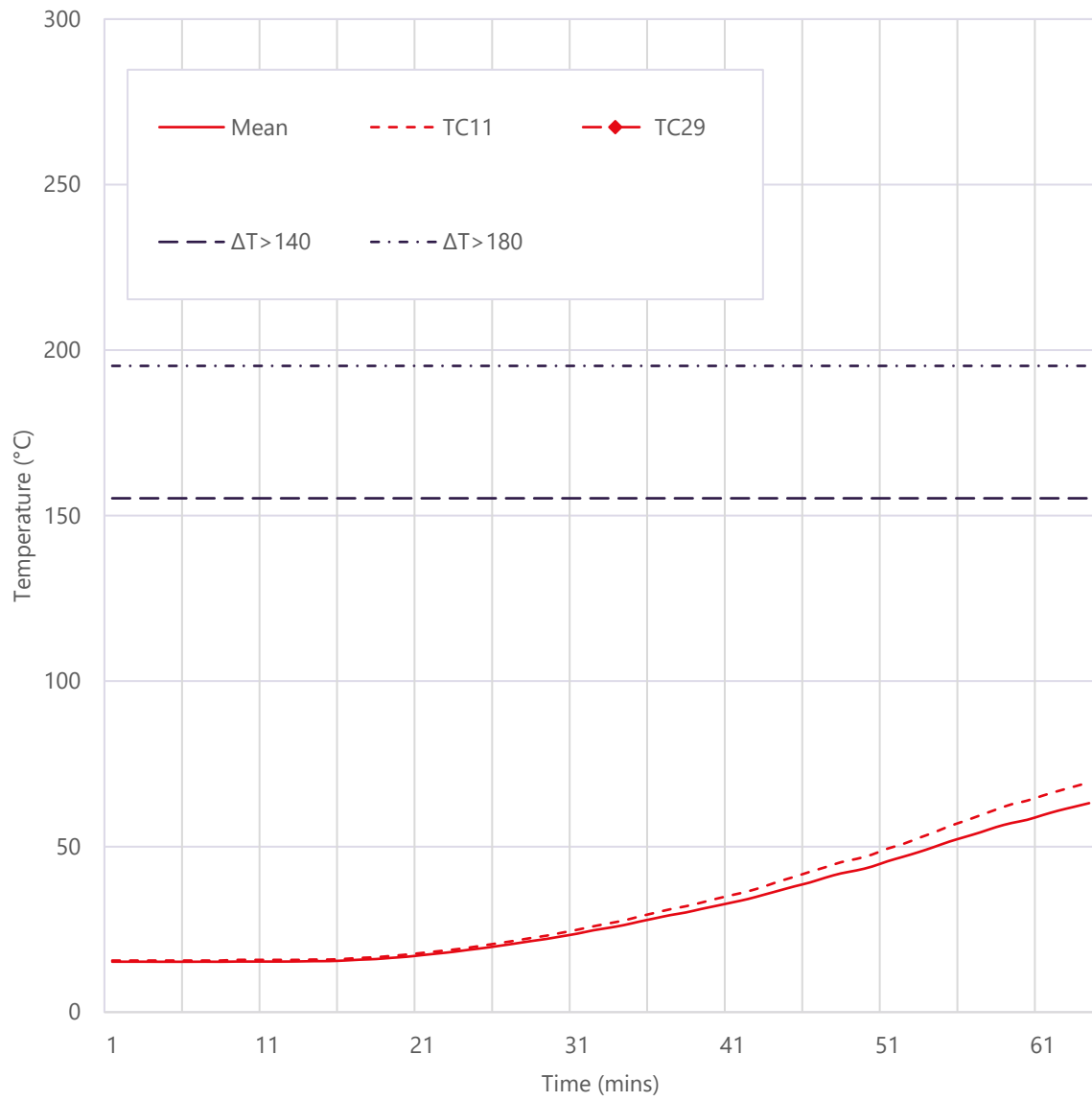


Figure 30 - Graph presenting the Time-Temperature distribution of the unexposed surface of Specimen B

## 11 Tables

Table 1 – The temperatures recorded by the disc thermocouples used evaluate the mean and maximum temperature rise of the unexposed surface of Specimen A. Values are in Degrees Celsius (°C) unless otherwise stated.

Time (mins)	TC1	TC2	TC3	TC4	TC5
0	15.0	15.2	11.8	12.4	13.4
2	15.0	15.2	11.8	12.4	13.4
4	15.0	15.2	11.9	12.4	13.4
6	15.0	15.2	11.9	12.4	13.4
8	15.0	15.2	12.0	12.4	13.4
10	15.0	15.3	11.7	12.4	13.4
12	16.1	17.1	10.0	12.0	13.8
14	18.8	20.0	7.2	9.9	14.3
16	22.6	23.6	3.9	6.5	15.2
18	26.2	26.9	1.1	3.1	16.1
20	29.5	30.1	29.6	28.1	17.3
22	32.8	33.2	33.2	31.1	17.8
24	35.9	36.1	36.4	34.0	18.6
26	38.0	38.7	39.3	36.5	19.5
28	40.0	41.0	41.3	38.4	19.9
30	43.1	44.4	44.9	41.7	21.0
32	45.7	47.1	47.8	44.4	21.9
34	48.3	50.0	51.0	47.2	22.7
36	50.4	52.9	53.7	50.2	23.9
38	52.6	55.2	56.1	46.1	25.4
40	54.8	57.5	58.3	45.6	26.3

Table 2 – The temperatures recorded by the disc thermocouples used to evaluate the maximum temperature rise of Specimen A. Values are in Degrees Celsius (°C) unless otherwise stated.

Time (mins)	TC6	TC7	TC8
0	14.1	13.9	12.4
2	14.1	13.9	12.4
4	14.1	13.9	12.5
6	14.2	14.0	12.4
8	14.1	13.9	12.5
10	14.3	13.8	12.5
12	14.5	14.0	12.5
14	14.6	14.4	*
16	15.0	15.3	*
18	15.5	15.8	*
20	16.5	17.6	*
22	17.9	17.9	*
24	19.7	18.2	*
26	22.0	18.8	*
28	24.6	18.4	*
30	27.6	20.2	*
32	30.3	19.9	*
34	33.1	20.8	29.3
36	35.3	21.7	31.4
38	37.0	22.2	32.0
40	38.5	22.4	32.8

\* Thermocouple reading malfunction

Table 3 – The temperatures recorded by the disc thermocouples used evaluate the mean and maximum temperature rise of the unexposed surface of Specimen B. Values are in Degrees Celsius (°C) unless otherwise stated.

Time (mins)	TC9	TC10	TC11	TC12	TC13
0	15.6	15.5	15.6	15.1	14.4
3	15.6	15.5	15.6	15.1	14.3
6	15.6	15.5	15.6	15.1	14.4
9	15.5	15.6	15.8	15.1	14.4
12	15.6	15.6	15.8	15.2	14.4
15	15.9	15.9	16.1	15.4	14.7
18	16.5	16.8	17.0	16.2	15.5
21	17.5	18.2	18.4	17.5	17.0
24	18.9	20.1	20.2	19.0	18.8
27	20.7	22.4	22.4	20.8	21.0
30	22.9	24.8	24.9	22.8	23.2
33	25.2	27.6	27.7	25.3	25.7
36	28.0	30.7	31.1	28.2	28.6
39	30.5	33.7	34.3	31.0	31.3
42	33.5	37.0	37.9	34.4	34.4
45	37.0	40.5	42.4	38.2	37.8
48	40.2	44.3	46.3	41.9	41.4
51	44.2	48.1	50.8	46.2	45.4
54	48.8	52.4	56.2	50.9	49.4
57	52.8	56.8	61.2	55.3	53.4
60	55.4	60.9	65.4	59.1	56.8
63	58.4	64.7	69.4	62.6	60.6

Table 4 – The temperatures recorded by the disc thermocouples used to evaluate the maximum temperature rise of Specimen B. Values are in Degrees Celsius (°C) unless otherwise stated.

Time (mins)	TC14	TC15	TC16
0	15.1	15.4	14.5
3	15.1	15.3	14.5
6	15.1	15.5	14.6
9	15.1	15.4	14.6
12	15.1	15.8	14.6
15	15.8	19.0	14.9
18	18.2	24.0	15.5
21	22.1	28.3	16.6
24	25.5	31.0	17.9
27	28.5	33.1	20.0
30	30.7	34.9	22.2
33	32.8	36.4	24.9
36	35.1	37.7	28.0
39	36.8	38.8	30.9
42	39.0	40.0	34.1
45	41.4	41.8	37.2
48	43.9	43.3	41.6
51	45.1	45.0	45.8
54	46.5	46.7	49.2
57	47.8	48.0	51.8
60	49.2	48.3	54.0
63	50.6	48.8	56.3