

Fire resistance test report

Issuing laboratory: Warringtonfire Testing and Certification Limited

Test standard: BS EN 1634-1:2014+A1:2018

Test sponsor: Panel Technologies Limited

Product: 2 x Single Leaf Access Panels Installed Into a Low-Density Blockwork Wall Construction

Report number: 549652/R

Test date: 1 February 2025

Version: 2

This report supersedes original issue dates 22 April 2025.

Warringtonfire, accredited for compliance with ISO/IEC 17025:2017 – Testing

Quality management

Version	Date	Information about the report	
1	22 April 2025	Description	Initial issue
		Prepared by	Authorised by
		Name	Lewis Doyle
		Signature	Peter White
			
			
Version	Date	Information about the report	
2	6 May 2025	Description	Structural opening width on Figure 1 and Figure 3 on page 7 & 9 have been amended from 930mm to 935mm to match supporting construction table on page 3.
		Prepared by	Authorised by
		Name	Lewis Doyle
		Signature	Peter White
			
			

Signed for and on behalf of Warringtonfire Testing and Certification Limited

Executive summary

This report documents the findings of the fire resistance test of doorsets in accordance with BS EN 1634-1:2014+A1:2018 with deviations as described in Table 3.

Warringtonfire Testing and Certification Limited (Warringtonfire) performed the test on 1 February 2025 at the request of Panel Technologies Limited.

Table 1 provides a summary of the test specimen, Table 2 gives details of the supporting construction and Table 3 describes the summary of the test results.

Table 1 Test specimen

Item	Detail	Opening direction
Doorset A	Single leaf access panel	Towards the furnace
Doorset B	Single leaf access panel	Away from the furnace
Latching conditions	Engaged	

Table 2 Supporting construction

Item	Detail		
Supporting construction	150 mm thick low-density concrete wall with a low-density concrete lintel at the head as described in section 7.2 of EN 1363-1: 2020.		
Dimensions	Width	3050 mm	
	Height	3050 mm	
	Thickness	150 mm	
Aperture dimensions		Width	Height
	Doorset A	935 mm	2440 mm
	Doorset B	935 mm	2440 mm
Restraint conditions	Restrained on all edges		

Table 3 Summary of test results

Item	Criteria		Results
Doorset A	Integrity		31 minutes
	Insulation	I ₁	1 minute**
		I ₂	1 minute
	Radiation of 15 kW/m ²		101 minutes
Doorset B	Integrity		28 minutes
	Insulation	I ₁	2 minutes**
		I ₂	2 minutes
	Radiation of 15 kW/m ²		Radiation intensity of 15 kW/m ² was not reached after 132 minutes
Notes:			
The test results for the specimen only apply to the tested orientation. The test was discontinued after 132 minutes. ‘*’ indicates failure due to integrity failure. ‘***’ Indicates I2 – normal procedure has reached its maximum temperature rise prior to the I1 supplementary procedure.			

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1. Introduction

This report documents the findings of the fire resistance test of doorsets in accordance with BS EN 1634-1:2014+A1:2018.

Warringtonfire performed the test on 1 February 2025 at the request of the test sponsor listed in Table 4.

Table 4 Test sponsor(s) details

Test sponsor(s)	Address
Panel Technologies Limited	49-61 Jodrell Street Nuneaton, Warwickshire, CV11 5EG, United Kingdom

2. Test specimen and supporting construction

2.1 Drawings of test assembly

The description of the test specimen and supporting construction are detailed in Section 2.2 and illustrated in Figures 1-6. All measurements are in millimetres – unless indicated otherwise.

The drawings were supplied by the test sponsor and verified by Warringtonfire (unless stated otherwise in Section 2.2).

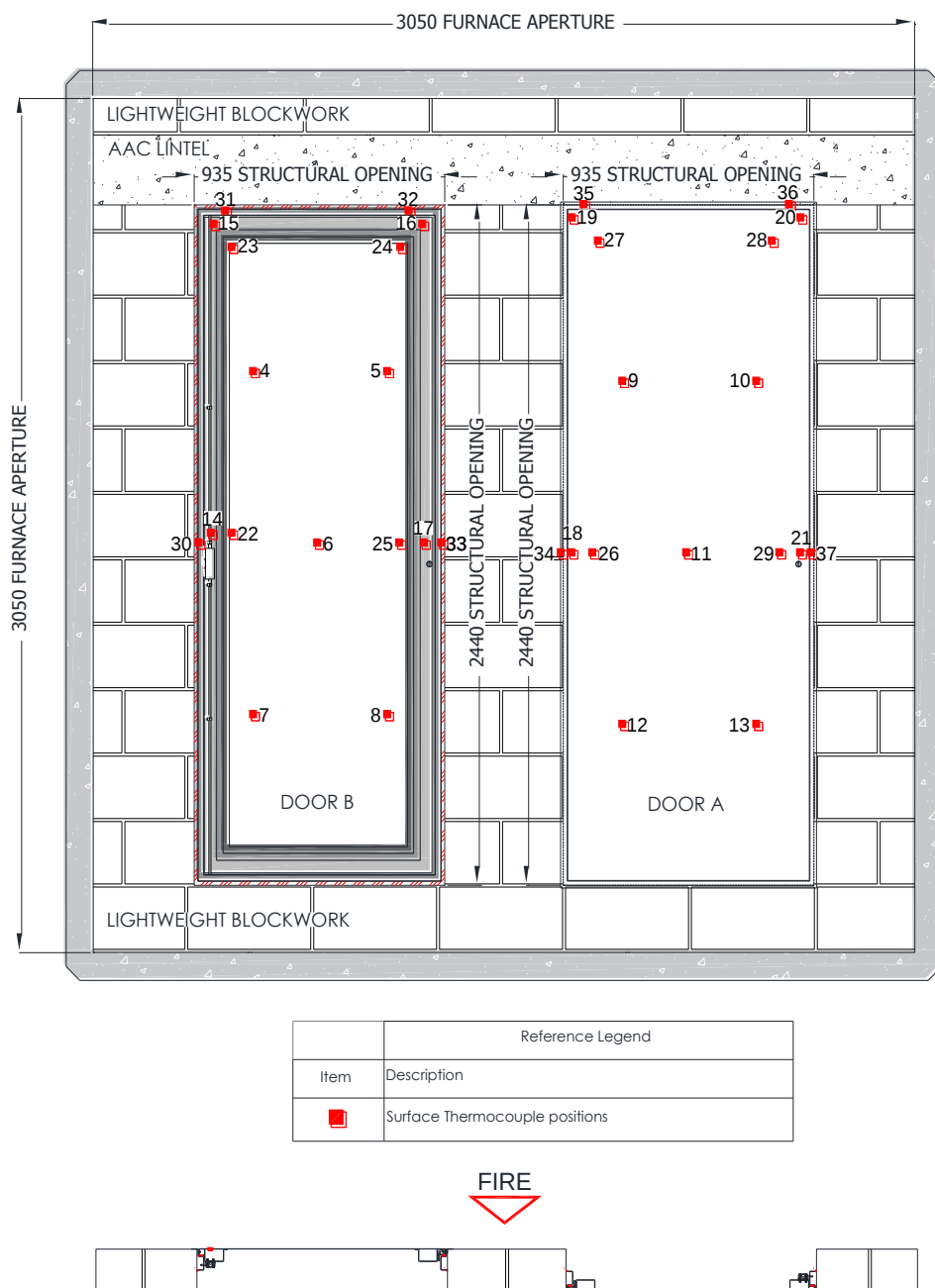


Figure 1 Elevation of Thermocouple positions - Unexposed face

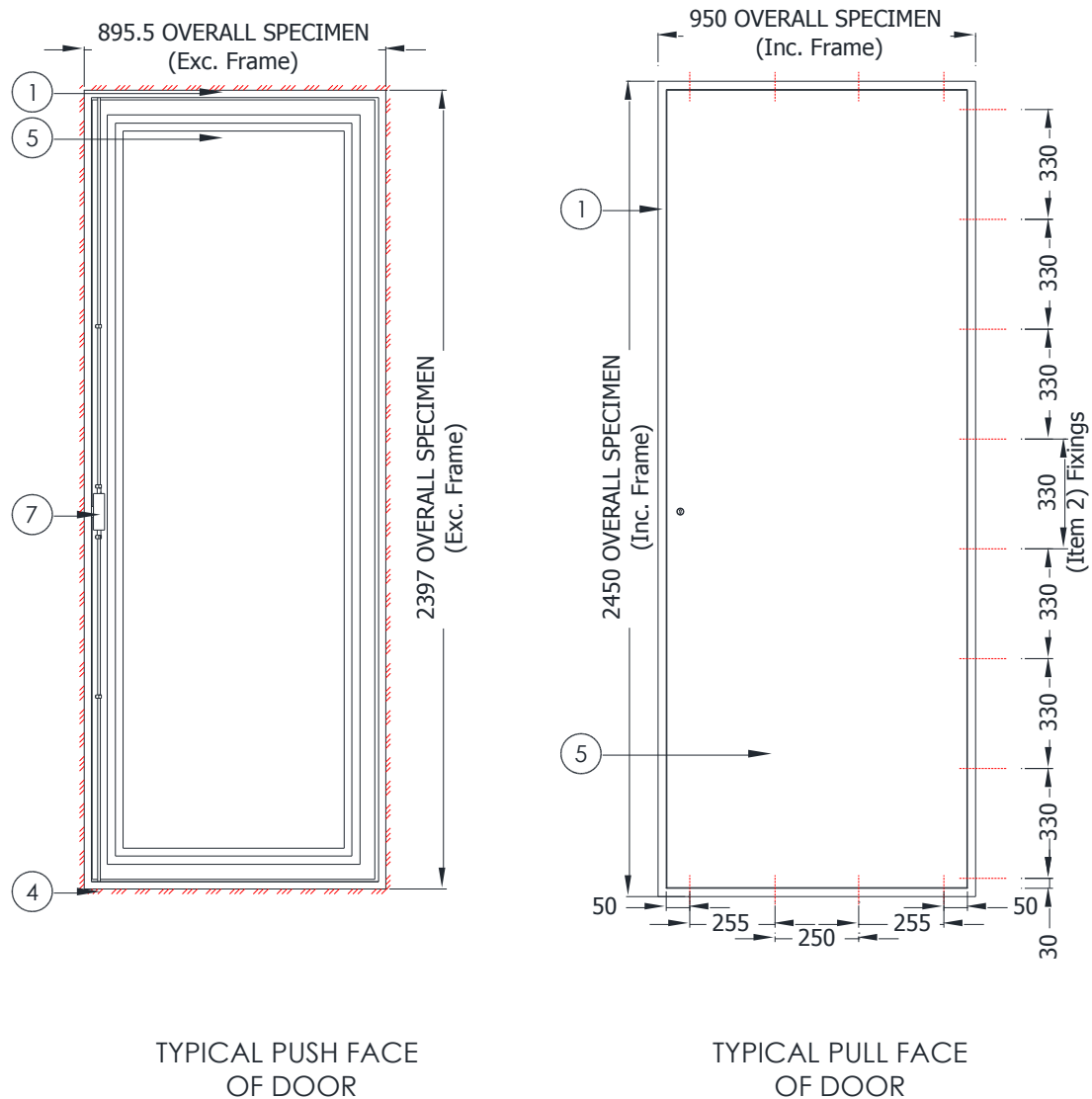


Figure 2 General Elevation of Doors A & B

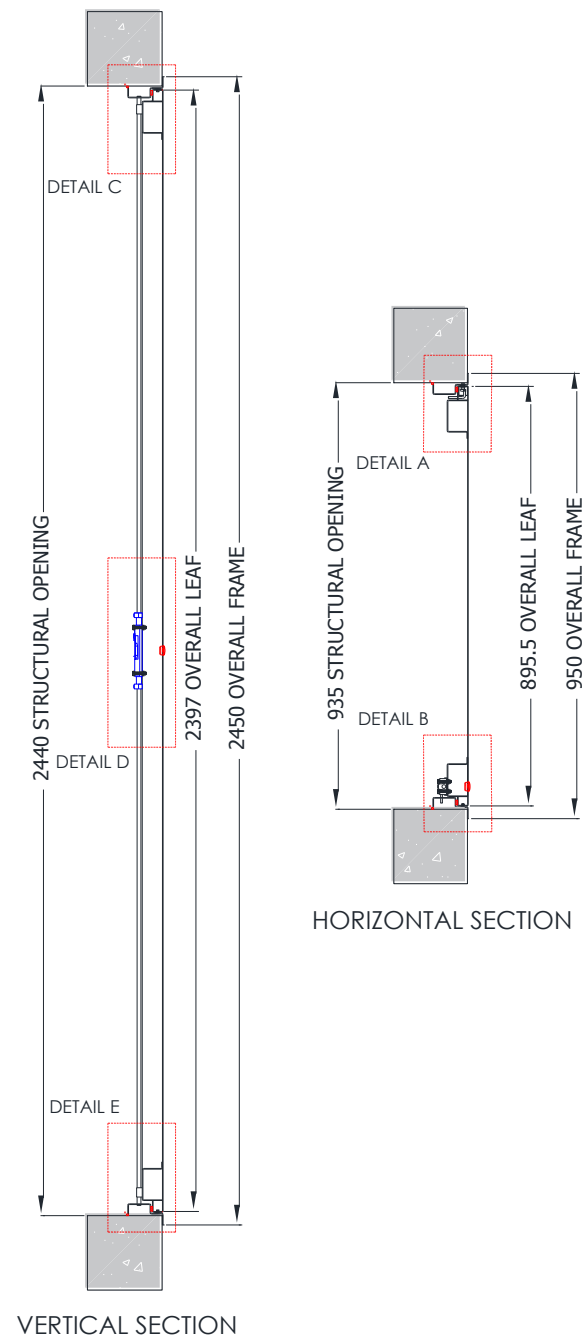


Figure 3 Typical Sections of Doors A & B

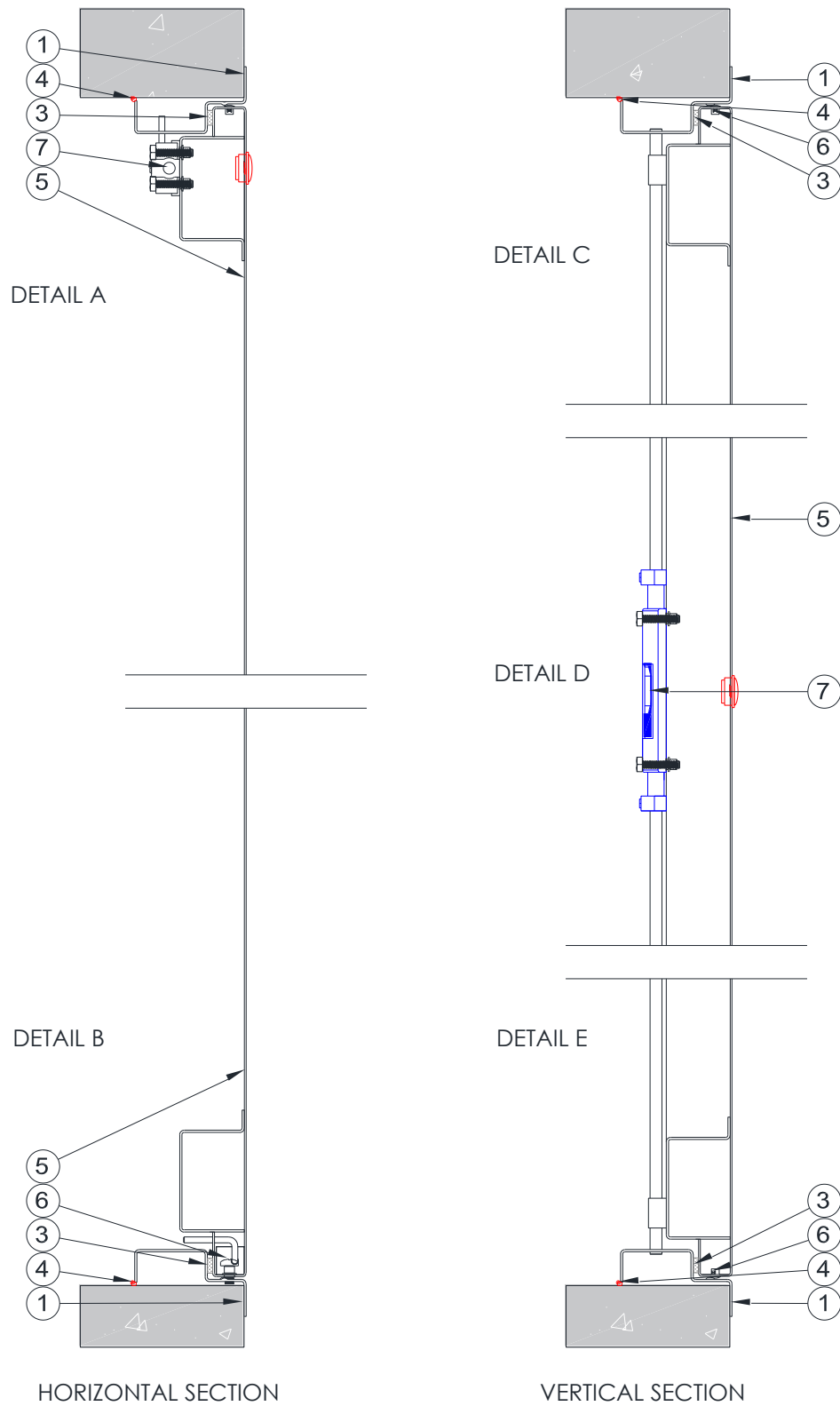


Figure 4 Typical Detailed Sections Through Both Doors

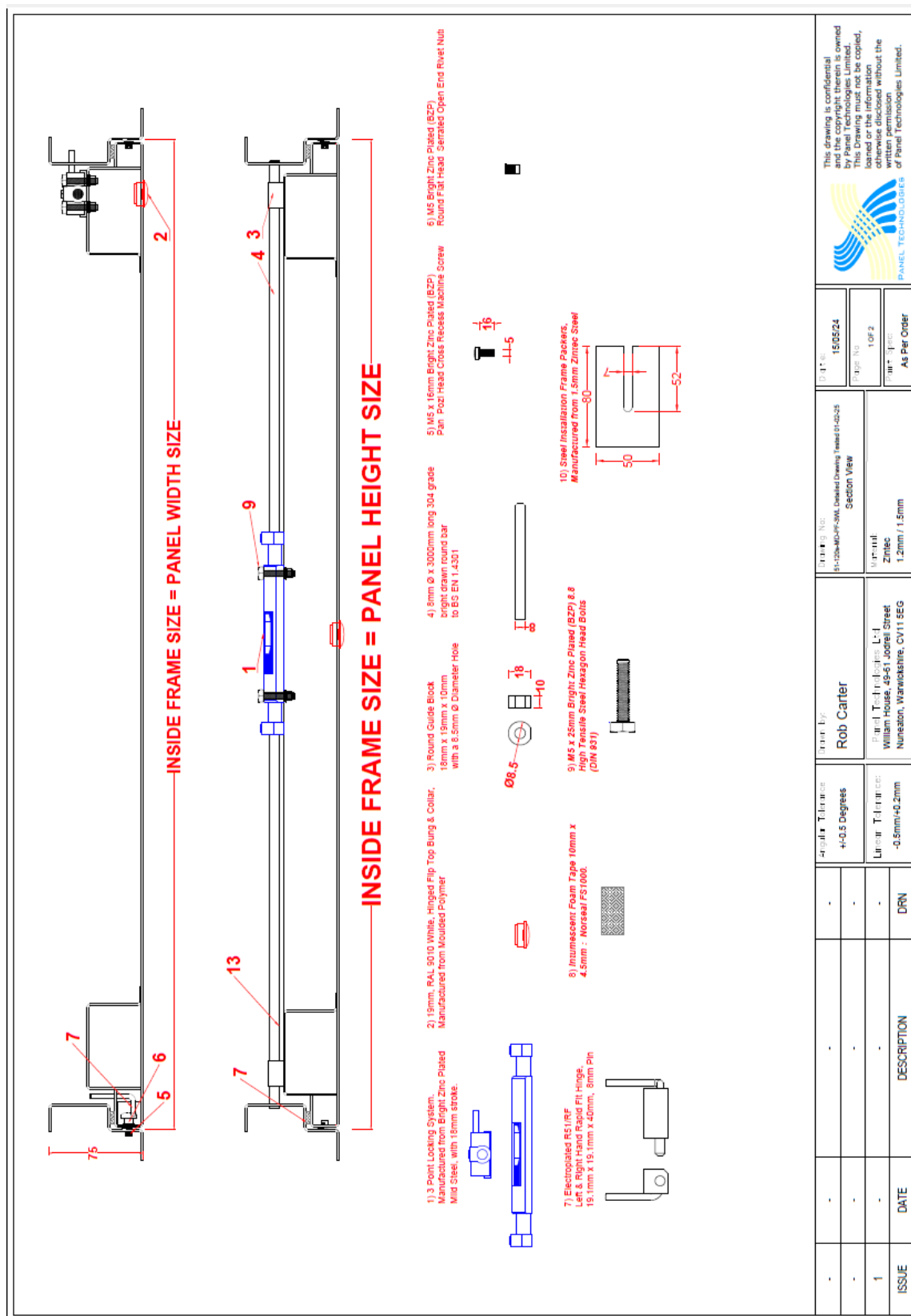


Figure 5 Client Drawings (1)

2.2 Schedule of components

Table 5 details the schedule of components which describes the test specimen and lists the components used in the construction of the test specimen. These were provided by the test sponsor and surveyed by Warringtonfire.

All measurements were verified by Warringtonfire unless stated otherwise in the schedule of components. All components marked with an “*” have not been verified by Warringtonfire.

Table 5 Schedule of components

1. Door Frame

1. Door frame	
Manufacturer	Rapid Access
Reference	Reference 2500x1250x1.5 Electric-Zinc BS EN 10152 : 2017 DC01
Material	Zintec Steel Head and Zintec Steel Jambs
Density	7901 kg/m ³
Overall size	
Frame (Head)	25 mm x 26 mm x 20 mm x 49 mm x 21.5 mm (Rebate 26mm)
Frame (Jambs)	25 mm x 26 mm x 20 mm x 49 mm x 21.5 mm (Rebate 26mm)
Jamb to Head jointing method, fixing detail and location	Welded Together
Stop to Frame jointing method, fixing detail and location	Welded Together
2. Frame Fixing Method to Supporting Construction	
Manufacturer	Easy Drive
Reference	Single Thread Zinc & Yellow Screw – 7.5 X 100mm
Type & material	Zinc & Yellow passivated
Overall size	7.5 mm diameter x 100 mm long
Spacing	50 mm from top corner of jamb, 50 mm from bottom corner of jamb and at no more than 330 mm centres
3. Intumescent to frame reveal (1)	
Quantity	1
Manufacturer	Norseal
Reference	FS1000
Material	Intumescent foam
Overall section size	10 mm wide x 4.5 mm thick
Application method	Self - Adhesive
Location (relative to the opening face of the door leaf)	Perimeter of the door leaf

2. Fire Stopping

4. Sealant to fire stopping detail

Manufacturer	Soundal
Reference	Fire Seal Firecyl FR
Material	Fire rated acrylic sealant
Application method	Caulking gun
Location	Inbetween specimen frame and test frame aperture

3. Door Leaf

5. Door Leaf

Manufacturer	Steelco
Reference	2500x1250x1.2 Electric-Zinc BS EN 10152 : 2017 DC01
Quantity of leaves on doorset	1
Overall leaf size supplied for testing	895.5mm wide x 2397mm high x 22.5mm thick

4. Hardware

6. Hinges *

Supplier	Bagshaw Engineering
Reference	HINGE-RF/LH-R51 & HINGE-RF/RH-R51
Quantity	1no of each
Primary material	Steel
Type	Pin Hinge
Size	19 mm long x 19 mm wide x 40 mm deep with 8 mm diameter pin
Position of each hinge	Top and bottom corner of the leaf

7. Lockset / Latch

Manufacturer	C.R.A International
Reference	18732 - 3 Point Locking System (bright zinc plated mild steel, with 18 mm stroke)
Material	Bright zinc plated mild steel
Overall sizes	110 mm long x 33 mm wide x 8 mm diameter bar
Fixing method *	Bolted with M5 x 25 mm BZP Hexagon Head Bolts. When engaged, the round bar overlapped the frame profile by 5 mm at each end. The central catch did not engage with any other component
Location of centre of the spindle relative to the bottom of the leaf	Centre of the spindle measures 1200mm from the bottom of the leaf

5. Supporting Construction

8. ACC Lintel	
Type	Steel reinforced concrete lintel
Material	Steel reinforced autoclaved aerated concrete
Overall size	3000 mm long x 250 mm deep x 200 mm wide
Density	550 - 650 kg/m ³
9. Lightweight Blockwork	
Manufacturer	THERMALITE
Reference	THERMALITE Shield
Material	Lightweight concrete blocks
Thickness	150 mm wide x 215 mm high x 440 mm long
Density	671 kg/m ³ (measured)
Fixing method	Ordinary sand/cement mortar, mix 3:1

2.3 Supporting construction

Table 6 details the supporting construction used for this fire resistance test.

Table 6 Supporting construction

Item	Detail		
Supporting construction	150 mm thick low-density concrete wall with a low-density concrete lintel at the head as described in section 7.2 of EN 1363-1: 2020.		
Dimensions	Width	3050 mm	
	Height	3050 mm	
	Thickness	150 mm	
Aperture dimensions		Width	Height
	Doorset A	935 mm	2440 mm
	Doorset B	935 mm	2440 mm
Restraint conditions	Restrained on all edges		

3. Test procedure

Table 7 details the test procedure for this fire resistance test.

Table 7 Test procedure

Item	Detail	
Test standard	The test was performed in accordance with BS EN 1634-1:2014+A1:2018.	
Product standard and/or EAD	EN 16034: 2014	
EGOLF agreements and/or recommendations	Certain aspects of some fire test specifications are open to different interpretations. EGOLF have identified a number of these areas and have agreed on resolutions which define a common agreement of interpretations between fire test laboratories that are members of the group. As a member of EGOLF, Warringtonfire has implemented several of these resolutions into its standard operating procedures. These Resolutions are as follows: - EGOLF Recommendation 017-2018: Position of thermocouples on door frames - EGOLF Recommendation 019-2018: Use of the average temperature thermocouples for determining maximum temperature criterion - EGOLF Recommendation 020-2018: Average temperature thermocouples moved away from stiffeners, joints, through components, features and hotspots - EGOLF Recommendation 021-2018: Positioning of thermocouples on hotspots in door leaves - EGOLF Recommendation 025-2018: Procedures for temperature measurement in fire resistance tests - EGOLF Recommendation 032-2018: Definition of gaps and measurement of size of gaps - EGOLF Recommendation 034-2018: Opening/closing of doors before test - EGOLF Recommendation 061-2021: Harmonization of pressure measurement, processing and reporting - EGOLF Recommendation 062-2021: Reporting test results	
Deviations from test method	None	
Instrumentation and equipment	The instrumentation was provided in accordance with BS EN 1634-1:2014+A1:2018, BS EN 1363-1:2020, and where appropriate BS EN 1363-2:1999.	
Pre-test conditioning	The specimen's storage, construction, and test preparation took place in the test laboratory over a total, combined time of 4 days. Throughout this period of time both the temperature and the humidity of the laboratory were measured and recorded as being within a range of from 11.5°C to 21.5°C and 39.5% to 68.0% respectively.	
Functionality test	Gap measurements	According to clause 10.1.2 of BS EN 1634-1:2014+A1:2018, these measurements were completed before the start of the fire test. They are shown in Figure 15 and Table 22 and Table 23 in Appendix C.
	Operability test	According to clause A.2.2 of EN 16034, the door(s) were subjected to a series of 25 opening and closing cycles of at least 90° for side-hung doorset(s).
	Final setting	According to clauses 10.1.4 of BS EN 1634-1: 2018 and A.2.2 of EN 16034, the door(s) were subjected to 1 cycle which was completed.

Item	Detail	
Installation details	Delivery date of the test specimen	30 January 2025
	Start date for construction of supporting construction	28 January 2025
	Completion date for construction of supporting construction	29 January 2025
	Start date for installation of test specimen	30 January 2025
	Completion date for installation of test specimen	30 January 2025
	Supporting construction constructed by	Representatives of Warringtonfire
	Doorset installed by	Representatives of the test sponsor
Symmetry	Asymmetrical: - Doorset A opened into the furnace. - Doorset B opened away from the furnace The direction of exposure was decided by the test sponsor.	
Ambient laboratory temperature	Start of the test	14.0 °C
	Minimum temperature	14.0 °C
	Maximum temperature	22.0 °C
Sampling / specimen selection	Warringtonfire was not involved in the sampling of the tested specimen or any of the components. The results obtained during the test only apply to the test samples as provided by the test sponsor.	

4. Test measurements and results

Table 8 summarises the results achieved by the test specimen against the performance criteria listed in BS EN 1634-1:2014+A1:2018 for the following parameters:

- Integrity – The specimen must retain its separating function, without causing either ignition of a cotton pad when applied, or permitting the penetration of a gap gauge as specified in BS EN 1634-1: 2014 + A1:2018, or resulting in sustained flaming on the unexposed surface.
- Insulation (I_1) – The test specimen must be evaluated against the maximum temperature rise criteria specified in EN 1363-1: 2020 (180°C).
- Insulation (I_2) – The mean temperature rise (ΔT_m) of the unexposed surface must not be greater than 140°C and the maximum temperature rise (ΔT_M) must not be greater than 180°C, with the exception that the limit for temperature rise for any frame member or transom member adjacent to the leaf/leaves of the doorset or openable window must be 360°C. Insulation failure also occurs simultaneously with integrity failure as specified in BS EN 1634-1: 2014 + A1:2018.
- Radiation – Elements for which the radiation criteria is evaluated must be given by the time for the measured radiation to exceed the value of 5, 10, 15, 20, 25 kW/m² as specified in BS EN 1363-2: 1999.

Appendix A includes observations of any significant behaviour of the specimen and details of the occurrence of the relevant performance criteria.

Appendix B details the location of the instrumentation used during the test.

Appendix C includes details of the measurements taken during the test, including the radiation measurements.

Appendix D includes photographs of the test specimen before, during and after the test.

Table 8 Detailed test results

Criteria		Doorset A	Doorset B
Thermal insulation			
Supplementary procedure – I ₁		1 minute**	1 minute**
$\Delta T_M = 180^\circ\text{C}$		1 minute**	1 minute**
$\Delta T_M = 180^\circ\text{C}$ on the frame		9 minutes	9 minutes
Normal procedure – I ₂		1 minute (Average, TC4, TC5, TC6, TC7, TC8, TC22, TC23, TC54, TC25)	1 minute (Average, TC9, TC10, TC11, TC12, TC13)
$\Delta T_m = 140^\circ\text{C}$		1 minute	1 minute
$\Delta T_M = 180^\circ\text{C}$		1 minute	2 minutes
$\Delta T_M = 360^\circ\text{C}$ on the frame		45 minutes	34 minutes
Integrity		31 minutes	28 minutes
Sustained flaming		No integrity failure for this criteria at the termination of the test	No integrity failure for this criteria at the termination of the test
Failure with gap gauge		No integrity failure for this criteria at the termination of the test	No integrity failure for this criteria at the termination of the test
Cotton pad failure		31 minutes	28 minutes
Radiation			
Radiation intensity	15 kW/m ²	101 minutes	Radiation intensity of 15 kW/m ² was not reached after 132 minutes
Notes:			
The test results for the specimen only apply to the tested orientation. The test was discontinued after 132 minutes. '*' indicates failure due to integrity failure. '***' Indicates I₂ – normal procedure has reached its maximum temperature rise prior to the I₁ supplementary procedure.			

5. Application of test results

5.1 Field of direct application

EN 1634-1:2014+A1:2018 states that “The field of direct application may only be defined following the identification of classification(s)” and that “The field of (direct and, where applicable, extended) application should be included in the classification report”. For these reasons, the field of direct application in is not covered by this test report.

5.2 Validity

This document is the original version of this test report and is written in English. In case of doubt, the original version prevails over a translation. This document is issued subject to Warringtonfire's standard terms and conditions, which are available at: [Terms and Conditions | Element](#).

The test results relate to the behaviour of the test specimens of a product under the particular conditions of the test; they are not intended to be the sole criteria for assessing the potential fire hazard of the product in use, nor can the results be extrapolated and applied to other products.

Reports are statements of fact(s) prepared in accordance with the referenced version of the standard(s) stated in Section 3 of this report. Reports are based upon the information provided to Warringtonfire. Warringtonfire takes no responsibility for the accuracy or completeness of such information.

The results stated in this report apply to the test specimens as received.

This report details the method of construction, the test conditions and the results obtained when the specific element of construction described herein was tested following the procedure outlined in BS EN 1634-1:2014+A1:2018, BS EN 1363-1:2020, and where appropriate BS EN 1363-2:1999.

Any significant deviation 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.

Any differences in relation to the aforementioned characteristics may significantly affect the performance and will therefore invalidate the application of the test results to the variant product. It is recommended that any proposed variation to the tested configuration or product should be referred to the test sponsor. The test sponsor should then obtain appropriate documentary evidence of compliance from Warringtonfire or another accredited testing authority. The supplier of the product is responsible for ensuring that the product which is supplied for use is identical to the test specimens that were tested.

The specification and the interpretation of fire test methods are both the subject of ongoing development and refinement. Changes in the applicability of the results of tests in relation to associated legislation may also occur. For these reasons the currency and the relevance of test reports should be considered by the user.

The test report also relates only to the sample(s) of the product submitted to the test. The laboratory accepts no responsibility for the representativeness of the test specimens unless so stated in the test report.

Confidence that the product that is supplied to the market will have the performance indicated in the test report can be supported by use of third-party certification schemes.

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5.3 Uncertainty of measurement

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.

Appendix A Test observations

Table 9 shows the observations of any significant behaviour of the specimen during the test.

Table 9 Test observations

Min	Sec	System	Observation
00	00	Doorset A & B	Commencement of test
00	40	Doorset A & B	Audible bangs coming from inside the furnace.
01	20	Doorset A & B	Crumple-like effect on the unexposed face of both doorsets.
02	00	Doorset A & B	Steam/Smoke release from both doorsets.
02	30	Doorset A & B	Discolouration on the face of both doorsets. The original white colour has turned grey.
05	50	Doorset A & B	Grey discolouration has turned darker.
17	00	Doorset B	Cotton pad applied next to TC12 on doorset B. Cotton pad did not ignite or show embers therefore failure did not occur.
21	30	Doorset A	Cotton pad applied next to TC22 on doorset B. Cotton pad did not ignite or show embers therefore failure did not occur.
28	55	Doorset B	Cotton pad applied next to TC12 on doorset B. Cotton pad ignited therefore integrity failure is deemed to have occurred.
31	40	Doorset A	Cotton pad applied next to TC8 on doorset B. Cotton pad ignited therefore integrity failure is deemed to have occurred.
36	40	Doorset A & B	Grey-like discolouration has now turned yellow on the unexposed surface of the specimen.
64	00	Doorset B	Visual bowing on doorset B. Corners of the frame coming away from the blockwork.
89	00	Doorset B	Coating on doorset B starting to bubble/come away from the surface of the leaf.
132	00	Doorset A & B	Test discontinued at request of the test sponsor

Appendix B Instrumentation locations

Figure 1 shows the instrumentation locations for this fire resistance test.

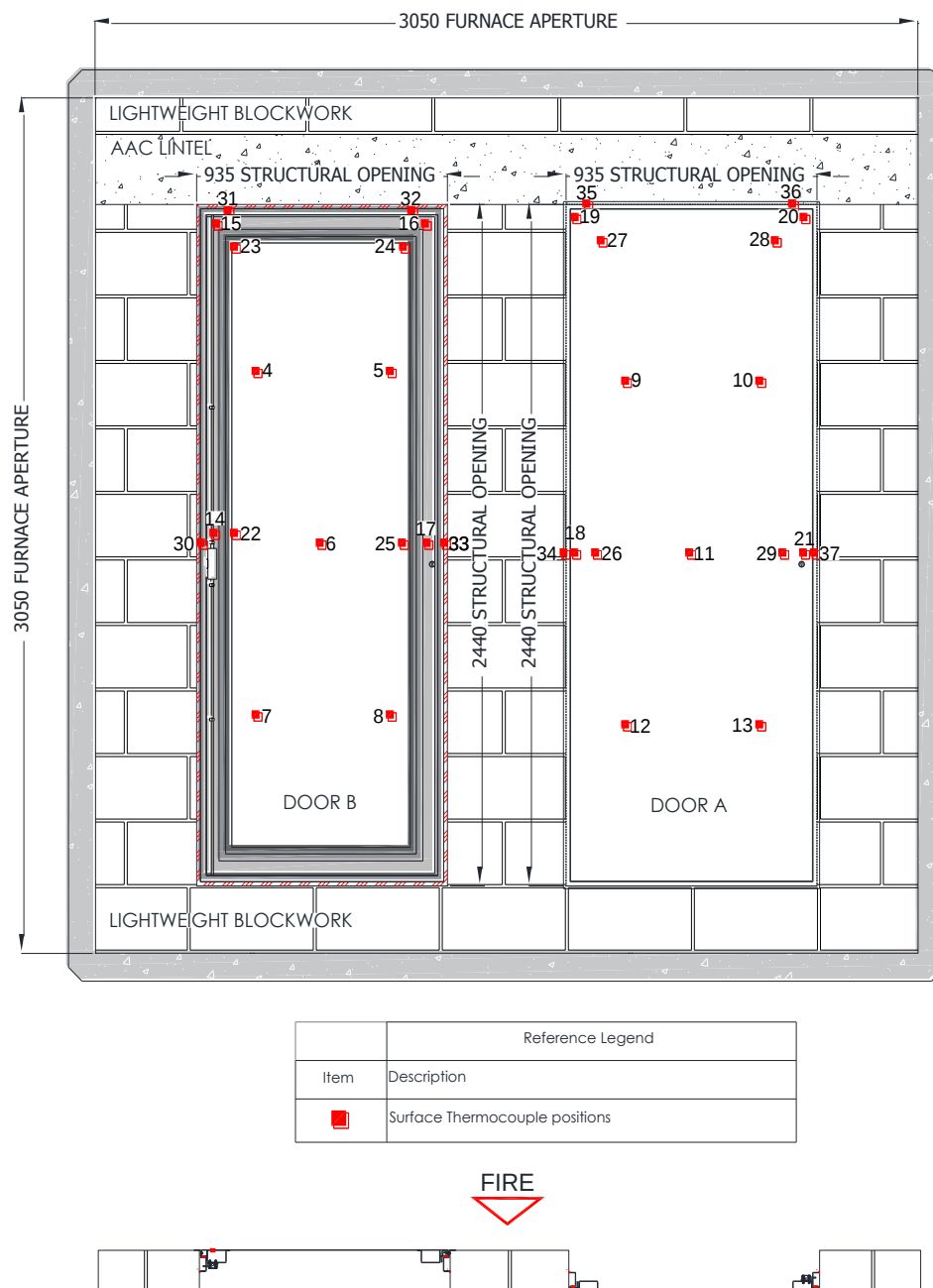


Figure 1 Instrumentation locations

Appendix C Test data

C.1 Furnace temperature and deviation

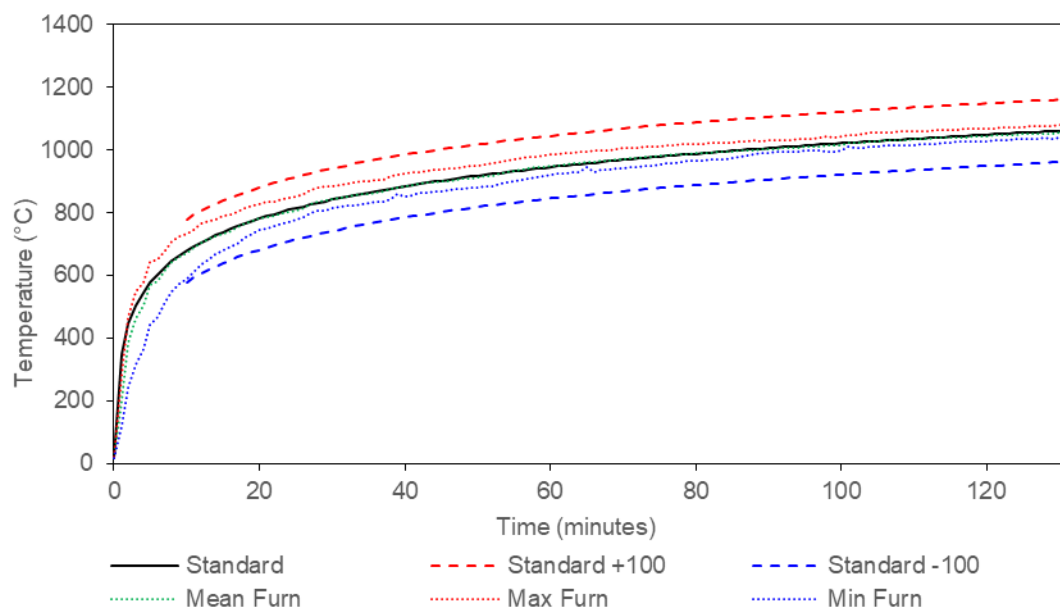


Figure 2 Furnace thermocouple temperature vs time

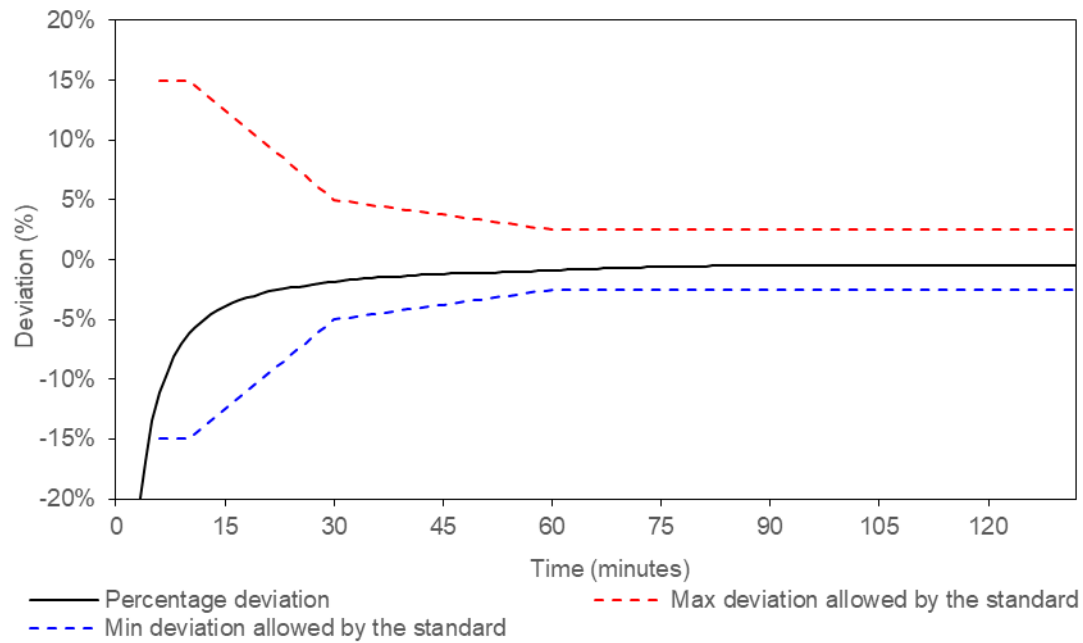


Figure 3 Percentage deviation of exposure severity vs time

C.2 Furnace pressure

The furnace pressure was taken at 2700 mm above the sill of the test specimen.

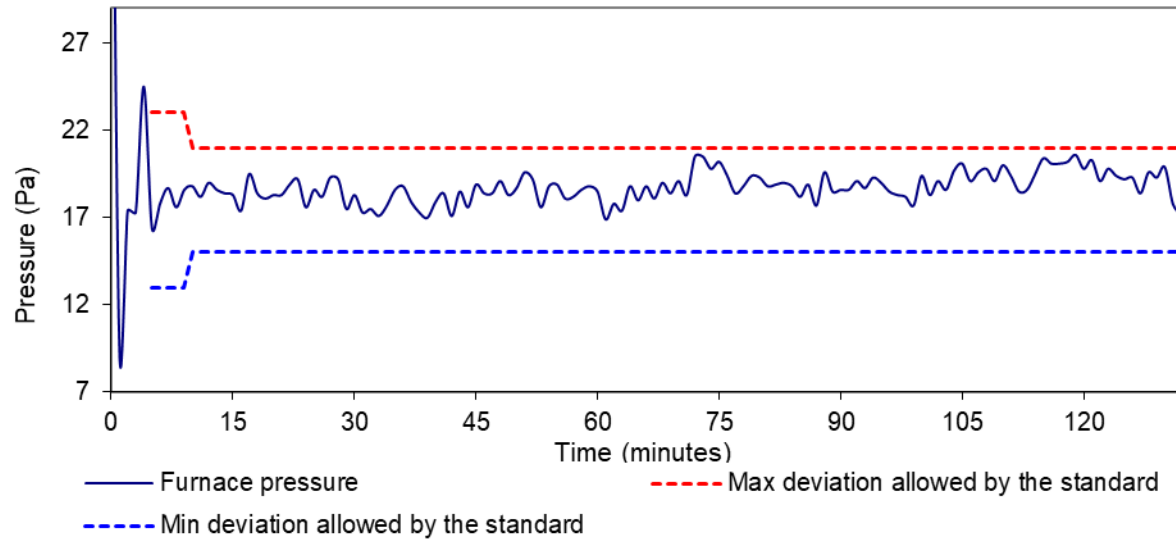


Figure 4 Furnace pressure

C.3 Specimen temperatures

Table 10 Individual And Mean Temperatures Recorded On The Unexposed Surface Of Doorset A

Time (mins)	Tc 004 (°C)	Tc 005 (°C)	Tc 006 (°C)	Tc 007 (°C)	Tc 008 (°C)	Average (°C)
0	21.0	21.0	20.0	21.0	23.0	21.2
1	141.0	138.0	153.0	145.0	152.0	146.0
2	262.0	263.0	293.0	277.0	299.0	279.0
4	358.0	362.0	388.0	383.0	411.0	380.4
8	488.0	500.0	502.0	494.0	513.0	499.4
12	528.0	543.0	538.0	534.0	554.0	539.4
16	558.0	572.0	567.0	563.0	586.0	569.2
20	594.0	610.0	604.0	599.0	623.0	606.0
24	616.0	631.0	627.0	619.0	645.0	627.6
28	654.0	667.0	662.0	650.0	677.0	662.0
32	671.0	684.0	681.0	666.0	692.0	678.8
36	684.0	697.0	693.0	679.0	705.0	691.6
40	705.0	719.0	715.0	696.0	726.0	712.2
48	707.0	716.0	708.0	700.0	711.0	708.4
52	703.0	717.0	709.0	700.0	713.0	708.4
56	713.0	724.0	714.0	708.0	725.0	716.8
60	724.0	746.0	734.0	720.0	744.0	733.6
64	749.0	761.0	745.0	734.0	757.0	749.2
68	769.0	776.0	753.0	748.0	768.0	762.8
72	780.0	786.0	760.0	761.0	778.0	773.0
76	788.0	793.0	767.0	768.0	787.0	780.6
80	794.0	800.0	774.0	773.0	795.0	787.2
84	804.0	808.0	780.0	780.0	801.0	794.6
88	811.0	815.0	786.0	786.0	806.0	800.8
92	814.0	819.0	793.0	794.0	817.0	807.4
96	824.0	825.0	801.0	802.0	824.0	815.2
100	831.0	832.0	808.0	808.0	829.0	821.6
104	841.0	842.0	820.0	824.0	841.0	833.6
108	848.0	847.0	828.0	829.0	847.0	839.8
112	851.0	852.0	836.0	839.0	852.0	846.0
116	855.0	855.0	839.0	844.0	855.0	849.6
120	859.0	858.0	844.0	847.0	860.0	853.6
124	861.0	860.0	846.0	852.0	864.0	856.6
128	865.0	862.0	848.0	856.0	867.0	859.6
132	870.0	868.0	858.0	860.0	873.0	865.8

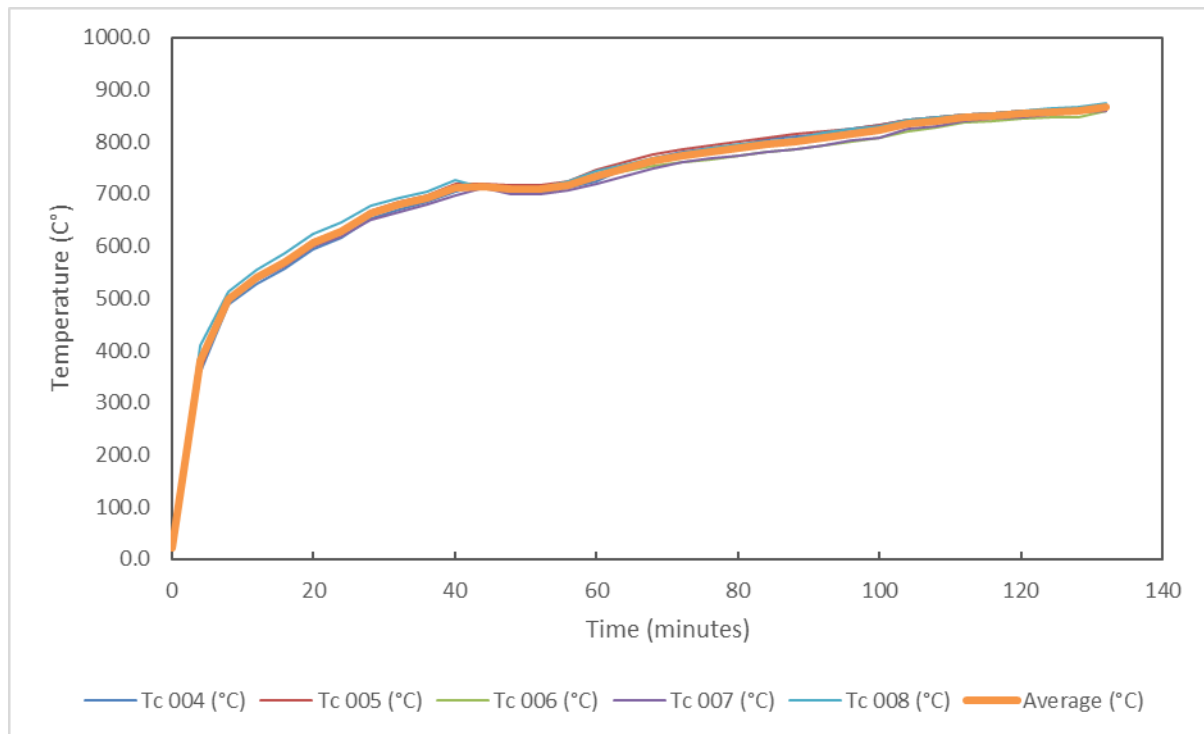


Figure 5 Individual And Mean Temperatures Recorded On The Unexposed Surface Of Doorset A

Table 11 Individual Temperatures Recorded On The Door Leaf 25 mm Away From The Edges On Doorset A

Time (mins)	Tc 014 (°C)	Tc 015 (°C)	Tc 016 (°C)	Tc 017 (°C)
0	24.0	22.0	23.0	22.0
4	149.0	102.0	121.0	104.0
5	185.0	120.0	155.0	131.0
6	221.0	160.0	189.0	161.0
8	263.0	217.0	246.0	213.0
12	341.0	295.0	337.0	285.0
16	402.0	370.0	407.0	352.0
20	439.0	414.0	443.0	407.0
24	462.0	440.0	473.0	439.0
28	491.0	469.0	502.0	471.0
32	512.0	491.0	524.0	498.0
36	522.0	507.0	530.0	509.0
40	527.0	523.0	541.0	522.0
44	536.0	532.0	549.0	531.0
48	541.0	529.0	556.0	532.0
52	547.0	532.0	563.0	537.0
56	555.0	542.0	573.0	548.0
60	563.0	553.0	584.0	560.0
64	570.0	562.0	591.0	565.0
68	579.0	574.0	597.0	572.0
72	586.0	583.0	603.0	577.0
76	592.0	591.0	610.0	582.0
80	597.0	598.0	617.0	586.0
84	601.0	604.0	621.0	591.0
88	605.0	609.0	624.0	593.0
92	608.0	614.0	626.0	595.0
96	612.0	622.0	613.0	601.0
100	615.0	625.0	611.0	605.0
104	624.0	636.0	616.0	613.0
108	629.0	644.0	618.0	619.0
112	632.0	648.0	621.0	621.0
116	635.0	652.0	625.0	624.0
120	637.0	656.0	629.0	626.0
124	633.0	659.0	631.0	628.0
128	632.0	664.0	634.0	629.0
132	633.0	669.0	639.0	628.0

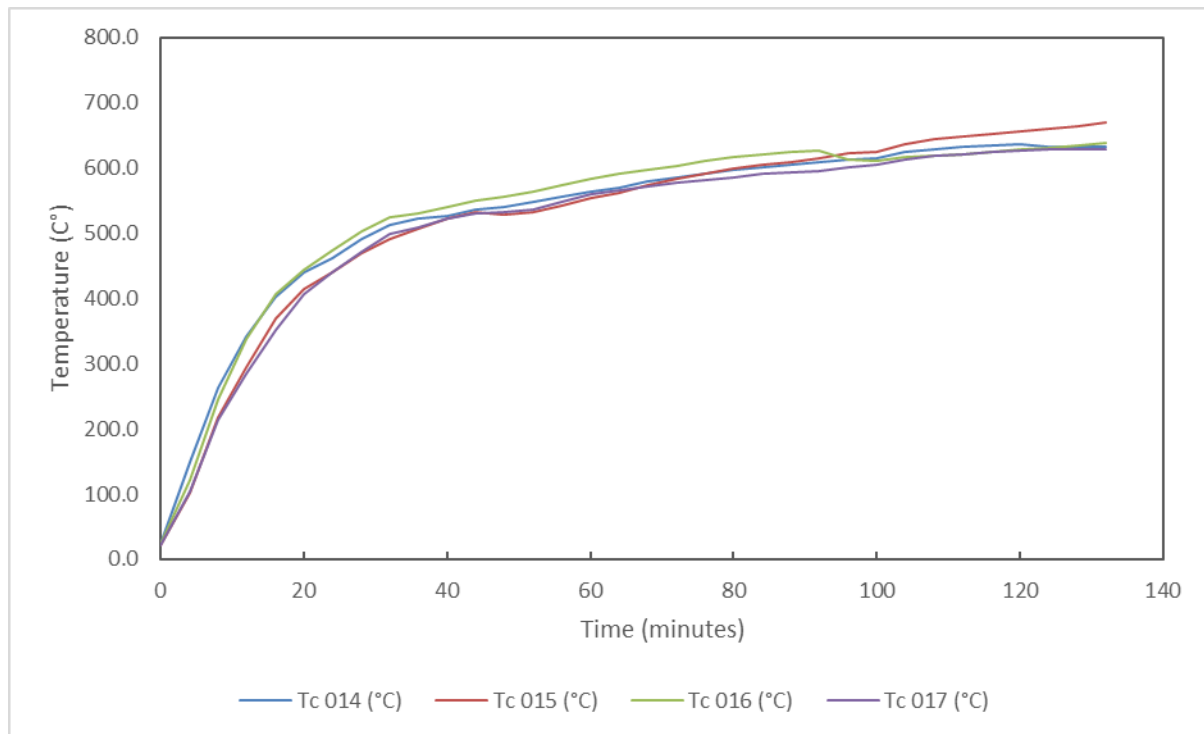


Figure 6 Individual Temperatures Recorded On The Door Leaf 25 mm Away From The Edges On Doorset A

Table 12 Individual Temperatures Recorded On The Door Leaf 100 mm Away From The Edges On Doorset A

Time (mins)	Tc 022 (°C)	Tc 023 (°C)	Tc 024 (°C)	Tc 025 (°C)
0	18.0	20.0	20.0	20.0
1	141.0	132.0	148.0	138.0
2	271.0	132.0	148.0	251.0
4	365.0	360.0	382.0	350.0
8	507.0	499.0	516.0	487.0
12	551.0	537.0	556.0	528.0
16	585.0	568.0	592.0	563.0
20	625.0	602.0	629.0	603.0
24	646.0	625.0	651.0	629.0
28	681.0	659.0	683.0	665.0
32	698.0	679.0	701.0	684.0
36	711.0	693.0	715.0	695.0
40	714.0	714.0	727.0	717.0
44	723.0	717.0	739.0	728.0
48	731.0	730.0	749.0	734.0
52	747.0	745.0	762.0	744.0
56	767.0	763.0	778.0	764.0
60	786.0	776.0	790.0	780.0
64	798.0	786.0	797.0	790.0
68	808.0	795.0	806.0	799.0
72	814.0	801.0	814.0	807.0
76	819.0	808.0	822.0	817.0
80	824.0	814.0	829.0	825.0
84	829.0	818.0	836.0	832.0
88	834.0	822.0	841.0	838.0
92	840.0	827.0	845.0	843.0
96	849.0	832.0	851.0	851.0
100	854.0	837.0	857.0	858.0
104	869.0	846.0	867.0	868.0
108	874.0	853.0	873.0	877.0
112	878.0	857.0	877.0	883.0
116	882.0	860.0	881.0	888.0
120	884.0	862.0	886.0	892.0
124	882.0	861.0	889.0	894.0
128	871.0	860.0	893.0	899.0
132	867.0	861.0	898.0	910.0

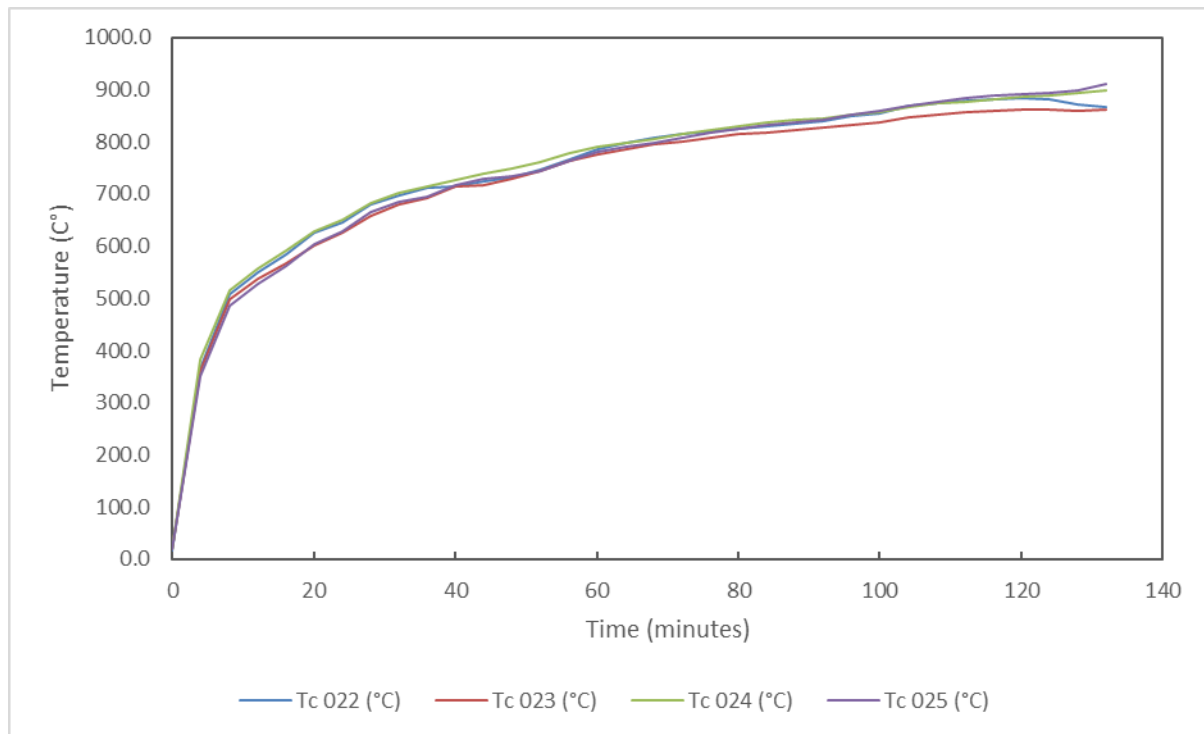


Figure 7 Individual Temperatures Recorded On The Door Leaf 100 mm Away From The Edges On Doorset A

Table 13 Individual Temperatures Recorded On The Unexposed Surface Of The Door Frame On Doorset A

Time (mins)	Tc 030 (°C)	Tc 031 (°C)	Tc 032 (°C)	Tc 033 (°C)
0	20.0	21.0	21.0	21.0
4	113.0	77.0	74.0	71.0
8	188.0	127.0	136.0	126.0
9	200.0	145.0	152.0	143.0
10	208.0	161.0	167.0	160.0
12	221.0	186.0	192.0	188.0
16	248.0	222.0	226.0	228.0
20	269.0	253.0	252.0	260.0
24	289.0	279.0	271.0	287.0
28	310.0	299.0	290.0	310.0
32	324.0	309.0	308.0	332.0
36	338.0	323.0	319.0	350.0
40	350.0	336.0	330.0	365.0
44	362.0	349.0	341.0	377.0
48	377.0	358.0	350.0	386.0
52	389.0	366.0	359.0	397.0
56	399.0	375.0	368.0	407.0
60	408.0	384.0	378.0	418.0
64	418.0	393.0	387.0	430.0
68	429.0	404.0	394.0	441.0
72	440.0	413.0	401.0	450.0
76	449.0	421.0	408.0	458.0
80	458.0	429.0	416.0	465.0
84	465.0	436.0	421.0	471.0
88	469.0	442.0	426.0	476.0
92	474.0	449.0	431.0	480.0
96	480.0	455.0	435.0	485.0
100	483.0	458.0	439.0	489.0
104	489.0	465.0	443.0	496.0
108	494.0	471.0	447.0	502.0
112	498.0	477.0	453.0	507.0
116	503.0	481.0	457.0	510.0
120	506.0	486.0	461.0	515.0
124	508.0	490.0	466.0	519.0
128	511.0	494.0	470.0	522.0
132	513.0	500.0	478.0	526.0

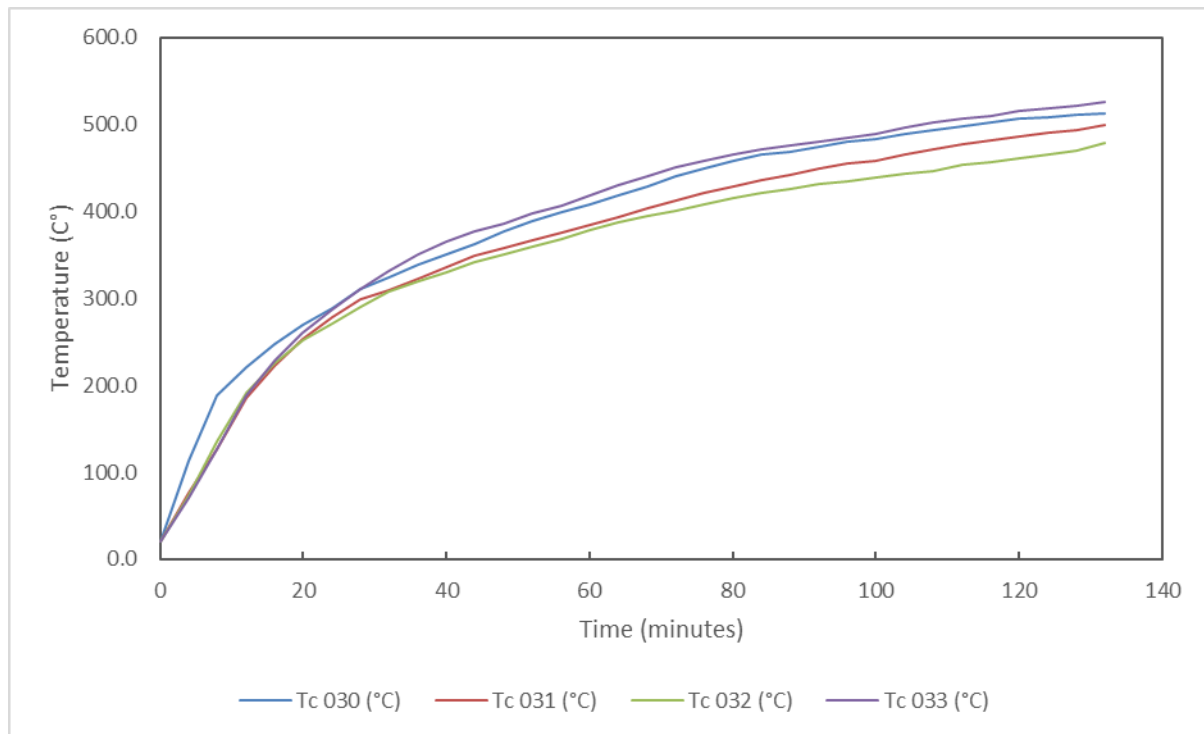


Figure 8 Individual Temperatures Recorded On The Unexposed Surface Of The Door Frame On Doorset A

Table 14 Individual And Mean Temperatures Recorded On The Unexposed Surface Of Doorset B

Time (mins)	Tc 009 (°C)	Tc 010 (°C)	Tc 011 (°C)	Tc 012 (°C)	Tc 013 (°C)	Average (°C)
0	24.0	24.0	24.0	23.0	23.0	23.6
1	156.0	127.0	127.0	141.0	115.0	133.0
2	276.0	224.0	221.0	262.0	207.0	238.0
4	361.0	328.0	314.0	347.0	296.0	329.2
8	507.0	484.0	505.0	508.0	491.0	499.0
12	559.0	533.0	554.0	563.0	538.0	549.4
16	592.0	567.0	587.0	596.0	574.0	583.2
20	628.0	603.0	624.0	635.0	614.0	620.8
24	651.0	625.0	643.0	656.0	634.0	641.8
28	683.0	656.0	674.0	688.0	667.0	673.6
32	697.0	675.0	690.0	704.0	685.0	690.2
36	709.0	689.0	704.0	718.0	698.0	703.6
40	730.0	708.0	723.0	738.0	718.0	723.4
44	743.0	723.0	737.0	756.0	738.0	739.4
48	740.0	735.0	747.0	769.0	730.0	744.2
52	740.0	745.0	734.0	723.0	723.0	733.0
56	726.0	709.0	719.0	756.0	727.0	727.4
60	744.0	708.0	727.0	784.0	751.0	742.8
64	773.0	732.0	759.0	798.0	772.0	766.8
68	786.0	754.0	774.0	805.0	789.0	781.6
72	801.0	770.0	788.0	812.0	798.0	793.8
76	811.0	783.0	800.0	819.0	806.0	803.8
80	818.0	792.0	808.0	824.0	812.0	810.8
84	825.0	800.0	816.0	828.0	816.0	817.0
88	828.0	805.0	822.0	833.0	821.0	821.8
92	832.0	810.0	826.0	838.0	825.0	826.2
96	838.0	815.0	833.0	843.0	832.0	832.2
100	845.0	820.0	840.0	850.0	837.0	838.4
104	853.0	829.0	849.0	860.0	847.0	847.6
108	860.0	835.0	854.0	866.0	852.0	853.4
112	861.0	837.0	858.0	869.0	856.0	856.2
116	864.0	840.0	863.0	873.0	861.0	860.2
120	868.0	843.0	866.0	877.0	864.0	863.6
124	871.0	845.0	869.0	880.0	868.0	866.6
128	876.0	848.0	873.0	883.0	870.0	870.0
132	882.0	854.0	878.0	890.0	878.0	876.4

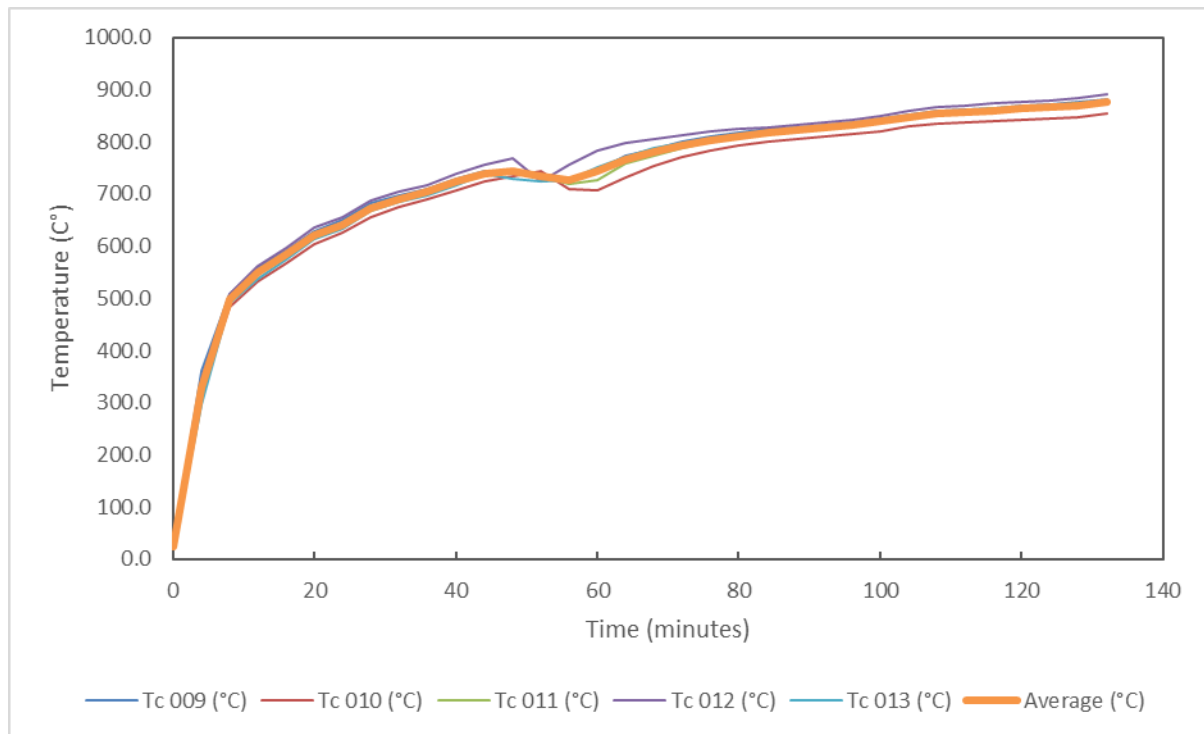


Figure 9 Individual And Mean Temperatures Recorded On The Unexposed Surface Of Doorset B

Table 15 Individual Temperatures Recorded On The Door Leaf 25 mm Away From The Edges On Doorset B

Time (mins)	Tc 018 (°C)	Tc 019 (°C)	Tc 020 (°C)	Tc 021 (°C)
0	22.0	23.0	23.0	22.0
4	131.0	161.0	137.0	133.0
5	163.0	188.0	159.0	164.0
6	198.0	211.0	182.0	195.0
8	243.0	249.0	219.0	242.0
12	320.0	305.0	274.0	312.0
16	377.0	351.0	310.0	372.0
20	411.0	383.0	341.0	404.0
24	436.0	403.0	370.0	426.0
28	459.0	421.0	388.0	447.0
32	482.0	440.0	402.0	466.0
36	495.0	451.0	416.0	476.0
40	505.0	461.0	429.0	487.0
44	519.0	473.0	442.0	497.0
48	528.0	481.0	450.0	506.0
52	538.0	488.0	459.0	517.0
56	550.0	497.0	469.0	531.0
60	564.0	506.0	479.0	549.0
64	574.0	513.0	488.0	565.0
68	582.0	519.0	495.0	576.0
72	589.0	524.0	501.0	586.0
76	597.0	529.0	508.0	595.0
80	606.0	535.0	513.0	601.0
84	612.0	541.0	518.0	605.0
88	618.0	545.0	524.0	608.0
92	623.0	552.0	528.0	610.0
96	628.0	557.0	531.0	612.0
100	632.0	563.0	535.0	616.0
104	638.0	571.0	541.0	623.0
108	643.0	579.0	547.0	630.0
112	648.0	585.0	550.0	634.0
116	652.0	591.0	555.0	637.0
120	655.0	595.0	560.0	642.0
124	657.0	599.0	563.0	645.0
128	661.0	603.0	567.0	648.0
132	667.0	606.0	571.0	652.0

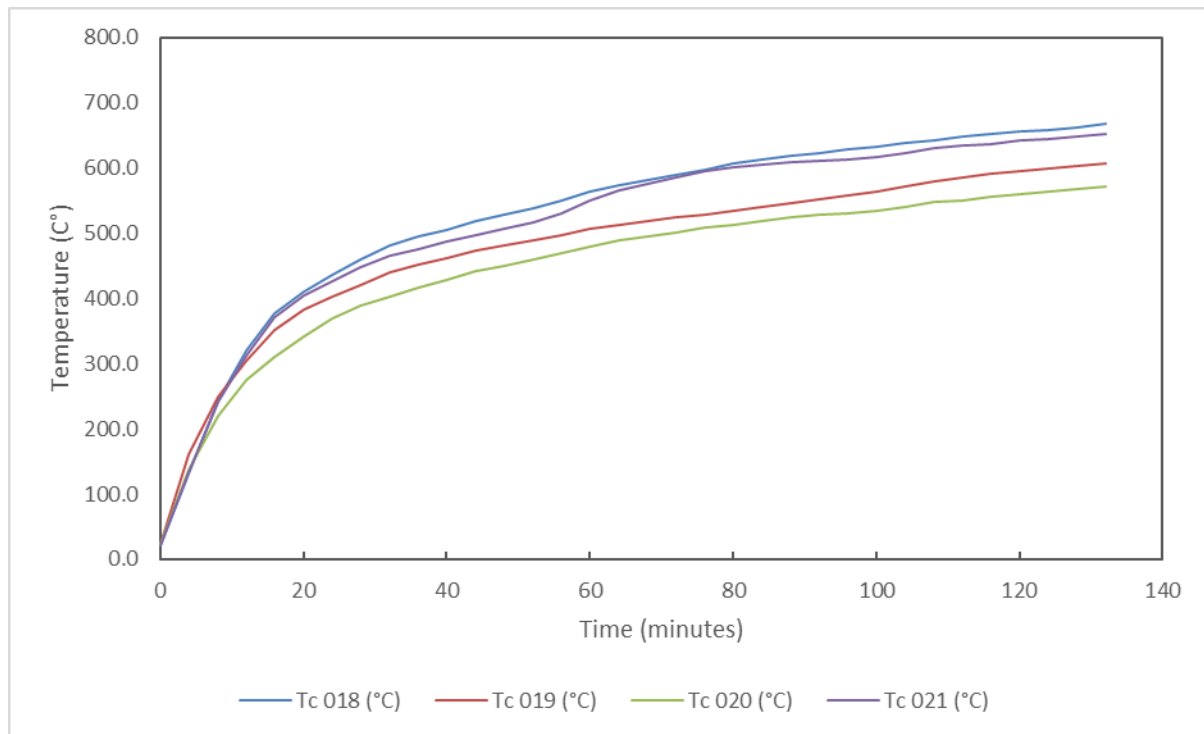


Figure 10 Individual Temperatures Recorded On The Door Leaf 25 mm Away From The Edges On Doorset B

Table 16 Individual Temperatures Recorded On The Door Leaf 100 mm Away From The Edges On Doorset B

Time (mins)	Tc 026 (°C)	Tc 027 (°C)	Tc 028 (°C)	Tc 029 (°C)
0	20.0	21.0	21.0	20.0
2	140.0	166.0	152.0	176.0
3	198.0	225.0	202.0	230.0
4	241.0	262.0	238.0	266.0
8	377.0	412.0	354.0	414.0
12	458.0	474.0	433.0	481.0
16	493.0	505.0	477.0	518.0
20	524.0	531.0	510.0	547.0
24	544.0	550.0	529.0	563.0
28	570.0	567.0	552.0	591.0
32	586.0	582.0	571.0	605.0
36	596.0	587.0	581.0	612.0
40	608.0	599.0	596.0	623.0
44	615.0	613.0	602.0	632.0
48	621.0	620.0	609.0	639.0
52	631.0	630.0	617.0	652.0
56	646.0	640.0	630.0	666.0
60	658.0	651.0	648.0	689.0
64	663.0	658.0	654.0	698.0
68	668.0	664.0	660.0	702.0
72	677.0	668.0	668.0	708.0
76	685.0	671.0	673.0	718.0
80	691.0	679.0	680.0	724.0
84	694.0	683.0	686.0	721.0
88	695.0	687.0	689.0	723.0
92	697.0	693.0	692.0	726.0
96	701.0	699.0	697.0	732.0
100	704.0	703.0	704.0	740.0
104	714.0	713.0	708.0	751.0
108	721.0	718.0	714.0	757.0
112	723.0	723.0	716.0	762.0
116	727.0	726.0	720.0	767.0
120	731.0	732.0	722.0	771.0
124	733.0	734.0	724.0	773.0
128	737.0	737.0	727.0	776.0
132	743.0	740.0	735.0	783.0

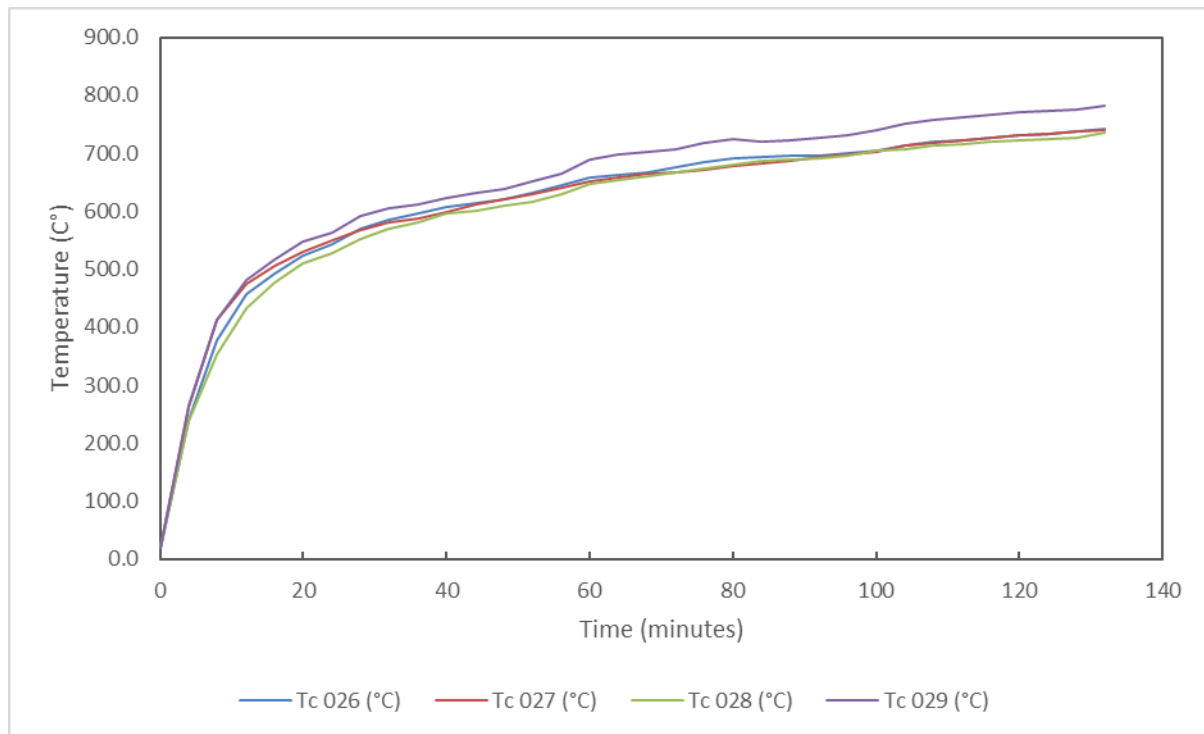


Figure 11 Individual Temperatures Recorded On The Door Leaf 100 mm Away From The Edges On Doorset B

Table 17 Individual Temperatures Recorded On The Unexposed Surface Of The Door Frame On Doorset B

Time (mins)	Tc 034 (°C)	Tc 035 (°C)	Tc 036 (°C)	Tc 037 (°C)
0	22.0	21.0	20.0	19.0
4	71.0	90.0	102.0	106.0
8	145.0	169.0	159.0	169.0
9	165.0	189.0	177.0	184.0
10	183.0	206.0	193.0	200.0
12	213.0	234.0	215.0	227.0
16	265.0	276.0	243.0	268.0
20	299.0	309.0	265.0	297.0
24	324.0	336.0	285.0	319.0
28	345.0	357.0	299.0	338.0
32	372.0	374.0	311.0	356.0
36	389.0	385.0	323.0	372.0
40	400.0	393.0	333.0	387.0
44	414.0	400.0	345.0	400.0
48	423.0	405.0	353.0	411.0
52	430.0	410.0	360.0	422.0
56	439.0	417.0	368.0	435.0
60	448.0	424.0	376.0	449.0
64	458.0	430.0	383.0	466.0
68	465.0	434.0	389.0	478.0
72	472.0	438.0	394.0	488.0
76	477.0	442.0	400.0	497.0
80	484.0	446.0	404.0	502.0
84	489.0	450.0	407.0	507.0
88	493.0	454.0	412.0	508.0
92	497.0	458.0	415.0	507.0
96	500.0	462.0	417.0	508.0
100	501.0	465.0	420.0	509.0
104	504.0	469.0	423.0	511.0
108	506.0	473.0	427.0	515.0
112	508.0	479.0	430.0	517.0
116	510.0	481.0	433.0	518.0
120	513.0	484.0	435.0	520.0
124	513.0	487.0	438.0	522.0
128	515.0	488.0	440.0	523.0
132	518.0	491.0	442.0	526.0

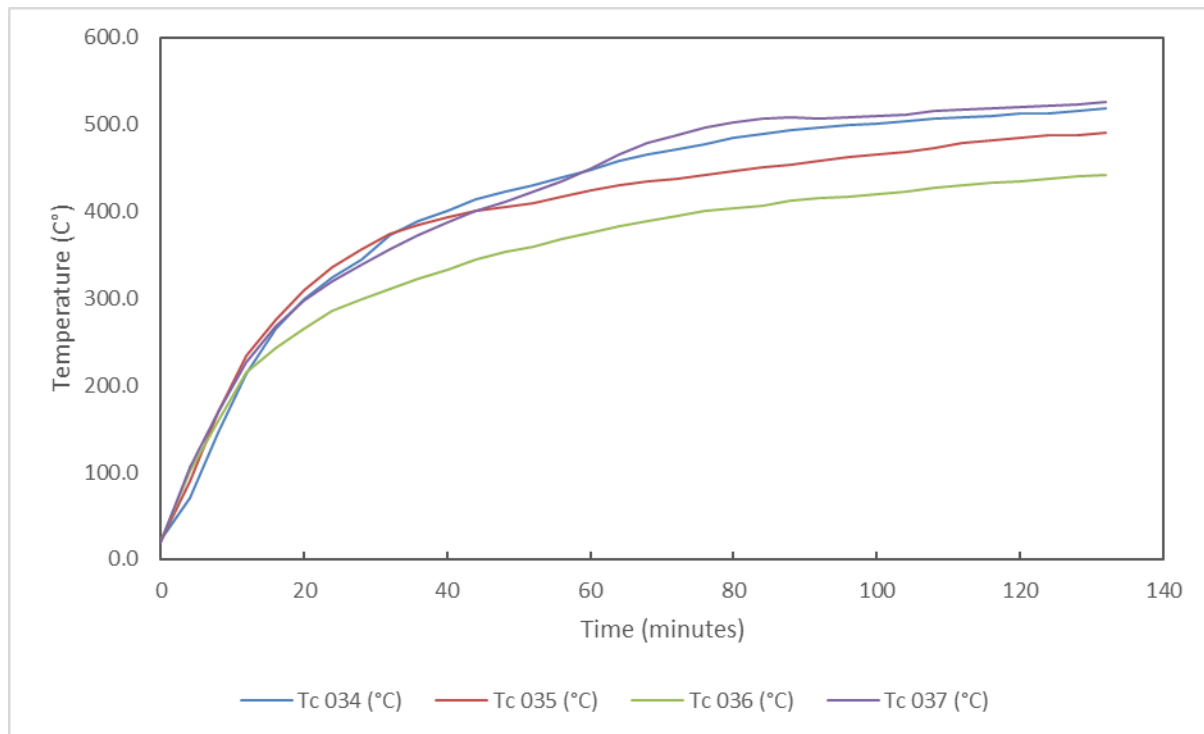


Figure 12 Individual Temperatures Recorded On The Unexposed Surface Of The Door Frame On Doorset B

C.4 Specimen deflections

Table 18 and Table 19 detail the deflection measurements of the test specimen at locations given in Figure 16.

Negative measurements show movement of the test specimen away from the furnace. Positive measurements show movement of the test specimen towards the furnace.

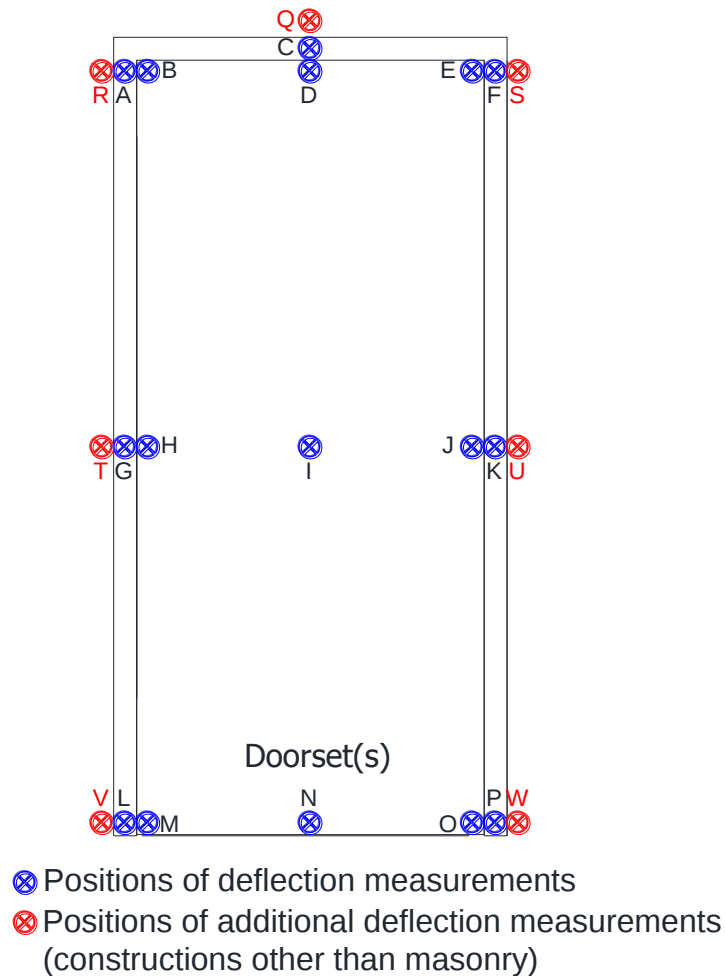


Figure 13 Position of deflection measurements

Table 18 Deflections – Doorset A

Time (mins)	Deflections (mm)											
	A	B	C	D	E	F	G	H	I	J	K	L
0	0	0	0	0	0	0	0	0	0	0	0	0
10	-45	-4	-13	6	-8	-26	60	-11	8	-23	11	-3
20	-34	-14	-13	5	-16	-10	9	15	16	20	20	-5
30	-14	-17	-15	-6	-11	-36	19	15	14	16	24	-4
40	3	15	-22	7	17	10	21	16	30	18	22	22
50	2	14	14	2	13	-11	8	16	38	-24	21	29
60	-4	1	8	-5	0	-5	61	18	23	14	11	-2
70	-13	4	-15	12	9	-9	7	18	28	10	32	-3
80	-9	2	-32	11	17	2	22	11	36	11	21	36
90	-12	3	8	-4	-5	19	21	22	30	4	-5	3
100	-3	-5	10	-4	19	2	52	41	48	21	47	55
110	-4	-12	13	23	0	7	58	15	34	11	79	34
120	-1	10	-5	3	-9	11	72	6	38	16	20	31
130	-6	6	4	5	-16	4	84	-17	19	-8	40	79
Max	-45	-17	-32	23	19	-36	84	41	48	-24	79	79

Time (mins)	Deflections (mm)										
	M	N	O	P	Q	R	S	T	U	V	W
0	0	0	0	0	0	0	0	0	0	0	0
10	2	5	40	-53	-30	5	-2	18	15	1	1
20	0	6	42	-54	5	-20	-4	-115	14	107	-7
30	0	5	46	-18	5	-35	-33	-115	13	75	-67
40	-1	-2	37	-3	0	-35	-33	-112	-8	73	-67
50	-7	-1	36	-55	0	-35	-37	-117	-23	63	-67
60	-4	2	37	-10	-7	-31	-42	-107	8	91	-62
70	1	3	37	-36	-7	-26	-34	-97	33	101	-42
80	3	3	45	-5	3	-1	-32	-92	52	111	-27
90	0	-5	37	-25	1	4	-27	-72	56	130	-17
100	-1	0	25	-4	1	-16	-18	-63	72	136	-4
110	6	4	16	-26	23	14	-18	-42	79	163	23
120	4	17	26	-25	28	14	-18	-37	99	163	43
130	81	11	26	-28	34	44	-7	-37	106	166	56
Max	81	17	46	-55	34	44	-42	-115	106	166	-67

Table 19 Deflections – Doorset B

Time (mins)	Deflections (mm)											
	A	B	C	D	E	F	G	H	I	J	K	L
0	0	0	0	0	0	0	0	0	0	0	0	0
10	-24	-5	9	-42	18	-8	21	29	13	-27	6	-7
20	-23	0	6	-16	13	-27	29	27	6	-56	-5	-5
30	-17	9	35	27	20	-6	32	37	16	-31	0	-2
40	-19	-60	20	14	48	-9	16	26	2	-62	6	-6
50	-50	-2	34	-24	19	-5	32	25	17	-41	-16	-8
60	-29	2	27	-24	12	-2	23	29	13	-14	14	-6
70	-24	-22	-4	-16	23	-44	29	17	12	-38	23	3
80	-23	-21	-7	-18	0	-28	27	35	16	-30	15	-8
90	-20	-11	6	-23	19	-24	26	103	-11	-21	-29	3
100	-13	-8	-13	-16	13	-14	-6	49	-3	-34	4	5
110	-21	12	-18	-44	13	-8	-3	30	63	-27	1	6
120	-16	35	4	-38	18	-22	36	26	-1	-38	0	-8
130	-12	40	8	-26	18	-22	40	44	-1	-34	3	0
Max	-50	-60	35	-44	48	-27	40	103	63	-62	-29	-8

Time (mins)	Deflections (mm)										
	M	N	O	P	Q	R	S	T	U	V	W
0	0	0	0	0	0	0	0	0	0	0	0
10	-7	-2	-17	-7	5	-136	-20	26	-2	65	-12
20	-6	-2	-10	-9	-26	-105	-132	30	-2	74	8
30	-4	-2	-14	-24	-26	-111	-128	40	-8	69	8
40	-11	20	-16	-20	-32	-119	-133	40	-6	64	13
50	73	5	-10	-21	-47	-119	-133	45	2	59	13
60	-1	24	-20	-25	-47	-108	-120	54	17	69	13
70	-1	3	-10	-24	-45	-98	-120	79	32	74	27
80	-8	-2	-13	-21	-45	-96	-115	84	32	74	27
90	5	4	-8	-21	-38	-96	-113	69	32	77	23
100	28	-1	-6	-15	-34	-76	-115	90	52	83	38
110	132	0	-11	-4	-24	-67	-88	109	67	96	49
120	50	-7	-15	0	-18	-56	-83	125	67	96	49
130	0	-1	-11	16	3	-36	-82	128	67	96	60
Max	73	25	-20	-25	-47	-119	-133	128	67	96	60

C.5 Heat flux measurements

The heat flux was measured 1000 mm away from the specimen and is based on the maximum levels.

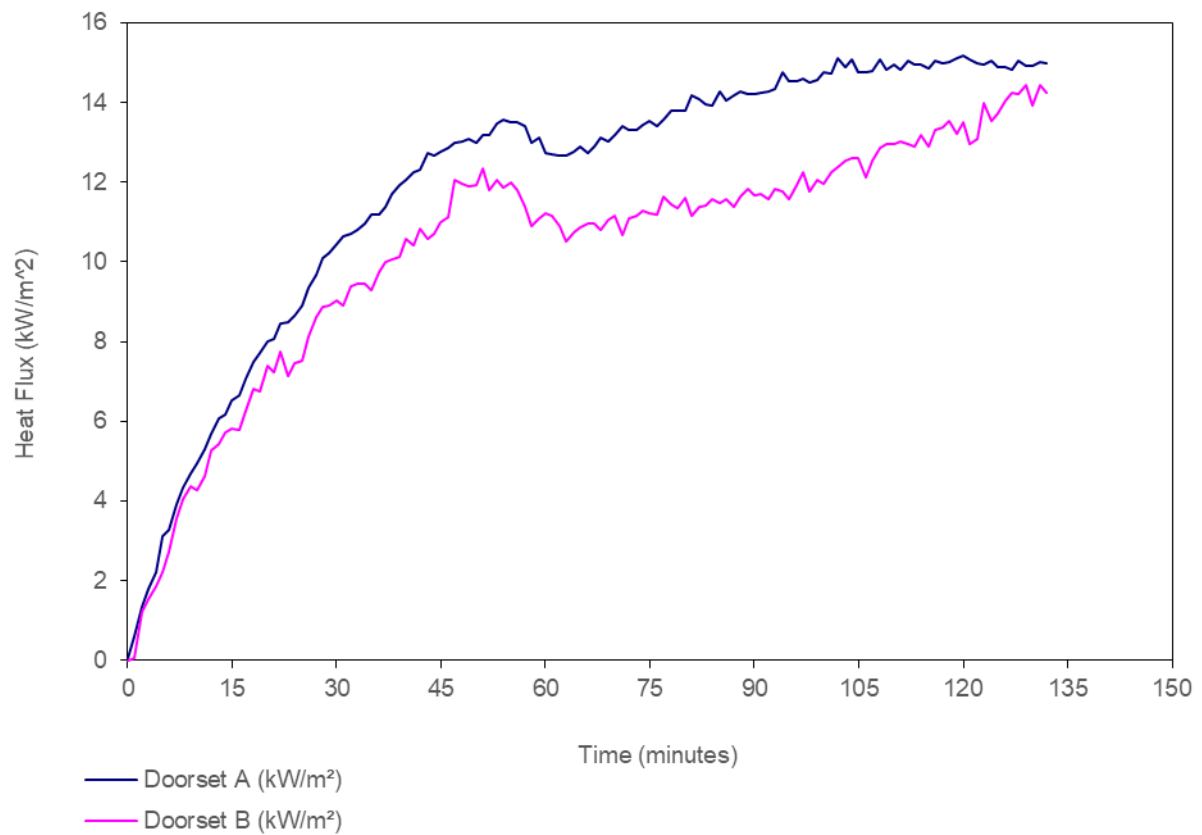


Figure 14 Heat flux measurements of the test specimen vs time

Table 20 Heat flux measurements of the test specimen vs time

Time (mins)	Doorset A (kW/m ²)	Doorset B (kW/m ²)
0	0.061	0.000
4	2.212	1.850
8	4.331	4.044
12	5.683	5.266
16	6.666	5.768
20	8.017	7.397
24	8.662	7.460
28	10.106	8.870
32	10.720	9.372
36	11.181	9.748
40	12.072	10.563
44	12.656	10.720
48	13.024	11.973
52	13.178	11.785
56	13.516	11.785
60	12.717	11.221
64	12.778	10.751
68	13.116	10.814
72	13.301	11.096
76	13.423	11.19
80	13.792	11.597
84	13.915	11.566
88	14.284	11.629
92	14.284	11.566
96	14.529	11.942
100	14.775	11.973
104	15.082	12.600
108	15.082	12.851
112	15.052	12.945
116	15.052	13.321
120	15.174	13.509
124	15.052	13.541
128	15.052	14.199
132	14.99	14.230

Table 21 Heat flux thresholds vs time

Radiation intensity	Doorset A	Doorset B
5 kW/m ²	10 minute(s)	11 minute(s)
10 kW/m ²	27 minute(s)	37 minute(s)
15 kW/m ²	101 minute(s)	Radiation intensity not reached
20 kW/m ²	Radiation intensity not reached	Radiation intensity not reached
25 kW/m ²	Radiation intensity not reached	Radiation intensity not reached

C.6 Gap measurements

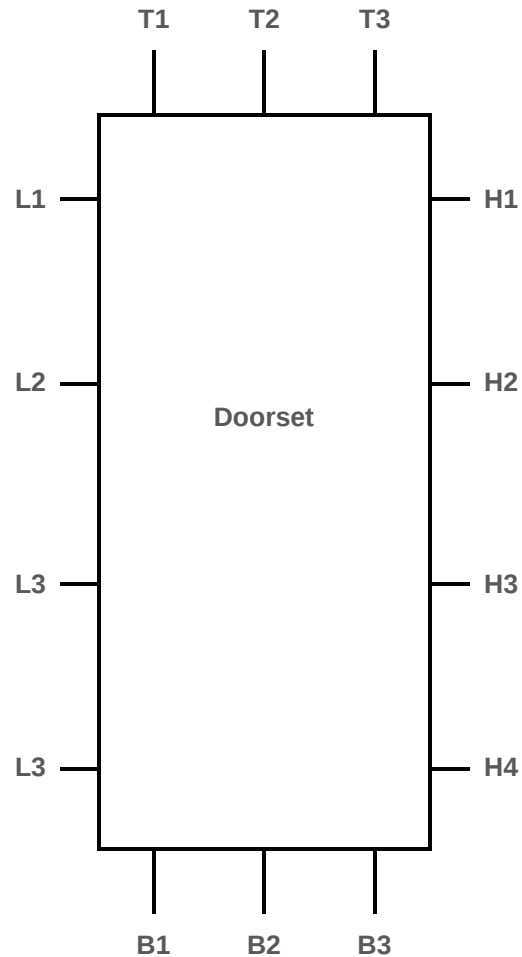


Figure 15 Gap measurements, Doorset A and B (unexposed side shown)

Table 22 Measured and calculated gap sizes for Doorset A

Doorset A (mm)					
Hinge side	Primary	Leaf to stop	Leading edge	Primary	Leaf to stop
H1	2.38	4.43	L1	3.26	4.16
H2	2.51	3.75	L2	3.63	4.01
H3	2.43	3.59	L3	3.05	3.95
H4	2.46	3.61	L4	3.01	3.91
Mean	2.45		Mean	3.24	
Max	2.51		Max	3.63	
Min	2.38		Min	3.01	
Max permitted	4.48		Max permitted	5.43	
Top edge	Primary	Leaf to stop	Threshold	Primary	
T1	2.15	4.29	B1	1.48	
T2	2.36	4.35	B2	1.54	
T3	2.89	4.42	B3	2.40	
Mean	2.47		Mean	1.81	
Max	2.89		Max	2.40	
Min	2.15		Min	1.48	
Max permitted	4.68		Max permitted	4.10	

Table 23 Measured and calculated gap sizes for Doorset B

Doorset B (mm)					
Hinge side	Primary	Leaf to stop	Leading edge	Primary	Leaf to stop
H1	3.63	4.01	L1	3.28	4.18
H2	3.99	4.02	L2	3.35	4.09
H3	4.39	3.98	L3	2.89	3.75
H4	4.44	4.41	L4	2.58	3.92
Mean	4.11		Mean	3.03	
Max	4.44		Max	3.35	
Min	3.63		Min	2.58	
Max permitted	6.28		Max permitted	5.19	
Top edge	Primary	Leaf to stop	Threshold	Primary	
T1	2.81	4.20	B1	2.75	
T2	2.90	4.31	B2	2.51	
T3	3.01	4.46	B3	2.41	
Mean	2.91		Mean	2.56	
Max	3.01		Max	2.75	
Min	2.81		Min	2.41	
Max permitted	4.96		Max permitted	4.65	

Appendix D Photographs



Figure 16 Unexposed face of the specimens before the start of the test



Figure 17 Exposed face of the specimens before the start of the test



Figure 18 Unexposed face of the specimens at 10 minutes of testing



Figure 19 Unexposed face of the specimens at 30 minutes of testing



Figure 20 Unexposed face of the specimens at 60 minutes of testing



Figure 21 Unexposed face of the specimens at 90 minutes of testing



Figure 22 Unexposed face of the specimens at 120 minutes of testing



Figure 23 Unexposed face of the specimens at the termination of the test



Figure 24 Exposed face of the specimens at the end of the test



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