



**Fire Protection  
Association ®**

# BS EN 1634-1

**Fire resistance test for door and shutter assemblies and  
openable windows**

# TEST REPORT

# BS EN 1634-1 – Fire resistance test for door and shutter assemblies and openable windows- TEST REPORT

Report number:	FPA 104947 r0
Test date:	9/10/2023
Test report on:	2 no. timber based door-sets, both single-leaf, double-acting, one 30 minute construction and one 60 minute construction. Each door-set was installed with two BQT Solutions YD30D auxiliary locks in the leading edge and header of the frame.
In accordance with:	BS EN 1634-1:2014+A1:2018
Test sponsor:	<p>BQT Solutions Unit 4, 101 Diana Drive, Wairau Valley, Auckland, 0627, New Zealand</p> <p>This test was conducted by the FPA as service provider to UK Approved Body No. 0843 - UL International(UK) Ltd, 220, Cygnet Court, Centre Park, Warrington, WA1 1PP, United Kingdom, under UL Project No 4790973179.</p>

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## CONTENTS

1. TEST LOCATION .....	4
2. TEST SPECIMEN DESCRIPTION .....	4
3. SAMPLING OF TEST SPECIMEN(S) .....	4
4. CONSTRUCTION / INSTALLATION .....	4
5. TEST PROCEDURE .....	5
6. SUMMARY AND EVALUATION OF TEST RESULTS: .....	6
7. LIMITATIONS.....	7
8. TEST REPORT SIGNATORIES.....	8
9. REVISION HISTORY .....	8
Annex A – Supporting Construction .....	9
Annex B – Construction / Installation Details.....	10
Annex B.1 – Door-Set A .....	10
Annex B.2 – Door-Set A.....	15
Annex C – Test Data .....	20
Annex D- Photographs.....	30

### 1. TEST LOCATION

The Fire Protection Association, Unit 1-2, Northcot Business Park, Station Road, Blockley, Gloucestershire GL56 9LH

### 2. TEST SPECIMEN DESCRIPTION

2no. timber based door-sets, both single-leaf, double-acting, one 30-minute construction and one 60 minute construction. These door-sets were fitted with 2 Cobalt Double YD30D auxiliary locks in the leading edge and header of the frame and were tested to evaluate its Fire Resistance performance.

A full description of the tested specimen is given in Annex B.

### 3. SAMPLING OF TEST SPECIMEN(S)

The specimen(s) for test were supplied to the FPA by UL International (UK) Ltd on behalf of BQT Solutions on 4/10/2023.

The FPA was not involved in the selection of the test specimen(s).

### 4. CONSTRUCTION / INSTALLATION

The door-sets were mounted into a standard EN1363-1, rigid supporting construction. Details of the construction are contained in ANNEX A.

The supporting construction was arranged by the FPA and constructed between 2/10/2023 and 3/10/2023.

The specimen was installed by a subcontractor arranged by the FPA between 5/10/2023 and 6/10/2023.

Throughout this period, the laboratory temperature and humidity were measured and recorded as being within the range of 16.70 °C and 24.60 °C and 56.00% RH and 74.80% RH respectively.

**5. TEST PROCEDURE**

The results of this investigation, including construction review and testing were in compliance with the applicable requirements in the standards noted below.

Standard	Title	Edition	Revision Date
BS EN 1634-1	Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware – Part 1: Fire resistance test for door and shutter assemblies and openable windows	2014+A1	2018

**EGOLF**

Aspects of some fire test requirements are open to interpretation. EGOLF has identified a number of such areas and have agreed Recommendations and Agreements which define common agreement of interpretations between member fire test laboratories. Such Recommendations and Agreements have been followed for this test, where applicable:

EGOLF Recommendations:

025-2018, 032-2018, 034-2018, 050-2018, 028-2018, 037-2018, 013-2017, 016-2018, 017-2018, 018-2018, 019-2018, 202-2018, 021-2018, 022-2018, 023-2018, 059-2020, 060-2021, 061-2021, 062-2022

EGOLF Agreements:

034-2018, 036-2018

**INSTRUMENTATION**

Furnace - The test was conducted in a nominal 4m wide x 3m high furnace.

Furnace Temperature - The furnace temperature was measured by twelve EN furnace plate thermometers and controlled to follow the standard heating curve as specified in EN 1363-1.

Furnace Pressure - The furnace was set to control to 17 Pa at a height of 2500 mm above the door threshold.

Insulation Criteria - Unexposed surface thermocouples - Thermocouples were provided to monitor the unexposed surface of the test specimen. The location of the thermocouples is shown in ANNEX B. A roving thermocouple was available for use during the test.

Integrity Criteria - Gap gauges (6mm and 25mm) and cotton pads were available for use during the test.

Laboratory Temperature - The ambient laboratory temperature at the start of the test was 22.6 °C.

Deflection - A laser array was used to measure the deflection of the specimen at the locations shown in ANNEX B.

Mechanical Conditioning - Prior to the fire test the doors were subjected to 25 open and close cycles.

The doors were mechanically held in the closed position at the start of the test.

**6. SUMMARY AND EVALUATION OF TEST RESULTS:**

Based on the test(s) reported herein, the door-sets were found to satisfy the following criteria:

<b>Doorset A – Prima 30 minutes Performance Criteria</b>	<b>Performance (Minutes)</b>
<b>INSULATION</b>	
Average temperature, increase of $\Delta 140^{\circ}\text{C}$	36 (test termination)*
Maximum temperature on leaf/leaves, increase of $\Delta 180^{\circ}\text{C}$	36 (test termination)*
Maximum temperature on the frame adjacent to leaf/leaves, increase of $\Delta 360^{\circ}\text{C}$	36 (test termination)*
Maximum temperature on frame(s) not adjacent to leaf/leaves, increase of $\Delta 180^{\circ}\text{C}$	36 (test termination)*
Supplementary Procedure - Average temperature, increase of $\Delta 140^{\circ}\text{C}$	Not evaluated
Supplementary Procedure - Maximum temperature on the leaf, increase of $\Delta 180^{\circ}\text{C}$	Not evaluated
<b>INTEGRITY</b>	
Integrity – Sustained Flaming	36 (test termination)*
Integrity – Ignition of the cotton pad	36 (test termination)*
Integrity – Cracks / openings in excess of given dimensions	36 (test termination)*

<b>Doorset B – Prima 60 minutes Performance Criteria</b>	<b>Performance (Minutes)</b>
<b>INSULATION</b>	
Average temperature, increase of $\Delta 140^{\circ}\text{C}$	54 (test termination)*
Maximum temperature on leaf/leaves, increase of $\Delta 180^{\circ}\text{C}$	54 (test termination)*
Maximum temperature on the frame adjacent to leaf/leaves, increase of $\Delta 360^{\circ}\text{C}$	54 (test termination)*
Maximum temperature on frame(s) not adjacent to leaf/leaves, increase of $\Delta 180^{\circ}\text{C}$	54 (test termination)*
Supplementary Procedure - Average temperature, increase of $\Delta 140^{\circ}\text{C}$	Not Evaluated
Supplementary Procedure - Maximum temperature on the leaf, increase of $\Delta 180^{\circ}\text{C}$	Not Evaluated
<b>INTEGRITY</b>	
Integrity – Sustained Flaming	54 (test termination)*
Integrity – Ignition of the cotton pad	54 (test termination)*
Integrity – Cracks / openings in excess of given dimensions	54 (test termination)*

**\*The test contained two door sets, one 30 minute (Door set A) and one 60 minute (Door set B) specification. After 36 minutes door set A was boarded over to enable continuation of the test to evaluate door set B. The boarding fell away after 54 minutes.**

**Up to 54 minutes, the test was in accordance with the standard requirements.**

**From 54 minutes test duration onwards (60 minutes), the required furnace pressure could not be maintained (pressure below the limits specified in EN 1634-1). This is a less onerous condition of test. Performance after this time cannot be determined and information is included for reference only.**

The door set constructions were essentially symmetrical in design. The results apply to fire exposure in either direction. A full description of the tested specimen is given in Annex B.

The maximum size of the primary gaps is shown in Annex A, Illustration A1 – Door Gaps.



## 7. LIMITATIONS

The result(s) described in this report are only applicable to the sample(s) as received and tested as described in this test report and Annex(es).

The results only relate 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.

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 EN 1363-1, and where appropriate EN 1363-2. 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.

The field of direct application may only be defined following the identification of classification(s). The field of (direct and, where applicable, extended) application should be included in a classification 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.

8. TEST REPORT SIGNATORIES	
Ben Sawyer Laboratory Technician	
Responsible Engineer	Signature
Steve Harms Technical Consultant	
Reviewed by	Signature
Richard Glover Head of Fire Testing & Experimental Unit	
Authorised by	Signature
Date of Issue	31/10/2023

9. REVISION HISTORY		
Revision No.	Date of Issue	Details of Revision



**Annex A – Supporting Construction**

Supporting Construction		Verified by FPA
EN 1363-1 Specification	Low Density Rigid AAC blocks	Yes
Wall thickness	140mm	Yes
Opening Preparation	A – 2183mmx1070mm B – 2183mmx1075mm	Yes
Masonry walls:		
Brick / block dimensions	445mm x 210mm x 140mm	Yes
Brick / block density	600kg/m <sup>3</sup> (nominal)	
Lintel	Pre-stressed concrete lintel 100mm x 40mm x 1500mm R15	Yes

**Table A.1** – Supporting Construction – Construction Details

## Annex B – Construction / Installation Details

Annex B.1 – Door-set A	
Description	Illustration reference
Door Frame – Swinging Doors	B.1.1
Door Leaves – Swing/Slide/Fold Doors	B.1.2
Door Hardware	B.1.3
Opening Forces	B.1.4
Gap Measurements	B.1.5

Door Frame – Swinging Doors		Verified by FPA
Manufacturer / Reference	S.A Joinery Ltd.	
Construction Type	Redwood. Density not specified.	
Profile / rebate	Scalloped back edge and plain leading edge.	Yes
Intumescent type and locations	1x 15mm Pyroplex Certifire Certificate No. CF355 centered in perimeter of door frame. 1 No. Pyroplex 8700, 15mm x 4mm strip centrally positioned..	Yes
Smoke seals / gaskets	None	Yes
Fixing to supporting construction type	M4 x 125mm steel screws at 500mm centres.	Yes

**Table B.1.1** – Door Frame

Door Leaves – Swing/Slide/Fold Doors		Verified by FPA
Manufacturer / Reference	Halspan Prima FD30 44mm	Yes
Construction Type	Tri-layer particle board	Yes
Door opening direction	Double Swing	Yes
Dimensions	W: 938mm H:2040mmT:45mm	Yes
Leaf weight (kg)	27.7kg/m <sup>2</sup>	
Frame Profile / rebate	N/A	
Lipping T	6mm sapele lippings (leading edge), 20mm maximum sapele lippings (back edge) on vertical edges only glued on with Ureka aro-bond 947 mcpu.	Yes
Facing T	None	Yes
Intumescent type and locations	None	Yes
Smoke seals / gaskets	None	Yes
Evidence of conformity / sampling markings	None	Yes
Meeting edge rebate	None	Yes

**Table B.1.2**– Door Leaves / Leaf

Door Hardware		Verified by FPA
<b>CLOSING DEVICE</b>		
Manufacturer / Reference	Dorma Kaba BTS80 F EN4	Yes
Evidence of conformity / sampling markings	CERTIFIRE approved for fire doors; Cert. no. CF127	no
Surface mount / concealed, Leaf / Frame	Floor mounted with associated bottom strap and top centre.	Yes
Intumescent type, location, thickness	Unknown	
Fixing method (number, type and dimensions of screws, type and dimensions of welding)	4 No.M4 x 6mm grubnut screws.	Yes
<b>LOCKS &amp; LATCHES</b>		
Type	Auxiliary	Yes
Lock Manufacturer / model	BQT Solutions / Cobalt Double YD30D	Yes
Evidence of conformity / sampling markings	None.	Yes
Mounting location	Frame leading edge	Yes
Lock Intumescent type, location, thickness	1mm MAP Intumescent kit around body of the lock, behind the foreend and behind the strike plate.	Yes
Lock fixing method (number, type and dimensions of screws, type and dimensions of welding)	2x M4 32mm steel screw.	Yes
Latch projections mm	Disengaged	Yes
Latch Engagement mm	Disengaged	yes
Latch locations	400mm down from top of frame centralized leading edge of frame.	Yes
Strike plate fixing method (number, type and dimensions of screws, type and dimensions of welding)	2 No. M4x32mm pz2 steel screw.	Yes
Status at commencement of test	Un-latched	Yes
<b>LOCKS &amp; LATCHES</b>		
Type	Auxiliary	Yes
Lock Manufacturer / model	BQT Solutions / Cobalt Double YD30D	Yes
Evidence of conformity / sampling markings	None.	Yes
Mounting location	Head of frame	Yes
Lock Intumescent type, location, thickness	1mm MAP Intumescent kit around body of the lock, behind the foreend and behind the strike plate.	Yes
Lock fixing method (number, type and dimensions of screws, type and dimensions of welding)	2 No.M4 32mm steel screw.	Yes
Latch projections mm	Disengaged	Yes

Door Hardware		Verified by FPA
Latch Engagement mm	Disengaged	Yes
Latch locations	103mm in from leading edge of frame in header centralized in frame.	Yes
Strike plate fixing method (number, type and dimensions of screws, type and dimensions of welding)	2 No. M4 32mm steel screw.	Yes
Status at commencement of test	Un-latched	Yes

**Table B.1.3** – Door Hardware

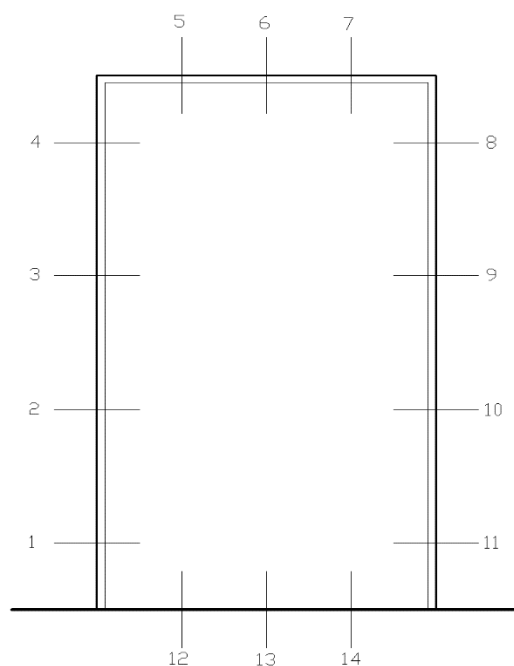
## Door Closing Forces

	Measurement 1	Measurement 2	Measurement 3	Highest Value
Closing Force (N)	0.5	0.49	0.5	0.5

**Figure B.1.4** – Opening forces

## Door Gaps

\*Dimension not included in calculations



Gap Dimension in mm at primary (P) position											
1	2	3	4	5	6	7	8	9	10	11	12*
3.4	6.0	5	3.1	4.3	4.3	4.8	4.8	5.7	5.7	5	4
13*	14*										
4.4	3.5										
Mean		4.7		Maximum		6.0		Minimum		3.1	

\*Dimension not included in calculations

**Figure B.1.5** – Gap Measurements

Annex B.2 – Doorset B	
Description	Illustration reference
Door Frame – Swinging Doors	B.2.1
Door Leaves – Swing/Slide/Fold Doors	B.2.2
Door Hardware	B.2.3
Opening Forces	B.2.4
Gap Measurements	B.2.5



Door Frame – Swinging Doors		Verified by FPA
Manufacturer / Reference	S.A Joinery Ltd.	
Construction Type	Redwood. Density not specified.	
Profile / rebate	Scalloped back edge and plain leading edge.	Yes
Intumescent type and locations	2 No. Pyroplex 8700, 15mm x 4mm strips equidistant inside perimeter of frame rebate profile, spaced 10mm apart.	Yes
Smoke seals / gaskets	None	Yes
Fixing to supporting construction type	M4 x 125mm steel screws at 500mm centres.	Yes

**Table B.2.1** – Door Frame

Door Leaves – Swing/Slide/Fold Doors		Verified by FPA
Manufacturer / Reference	Halspan Prima FD60 54mm.	Yes
Construction Type	Tri-layer particle board	Yes
Door opening direction	Double Swing	Yes
Dimensions	W: 937mm H:2040mm T:55mm	Yes
Leaf weight (kg)	34 kg/m <sup>2</sup>	
Frame Profile / rebate	N/A	
Lipping T	6mm sapele lippings (leading edge), 20mm maximum sapele lippings (back edge) on vertical edges only glued on with Ureka aro-bond 947 mcpu.	Yes
Facing T	None	Yes
Intumescent type and locations	None	Yes
Smoke seals / gaskets	None	Yes
Evidence of conformity / sampling markings	None	Yes
Meeting edge rebate	None	Yes

**Table B.2.2** – Door Leaves / Leaf

Door Hardware		Verified by FPA
<b>CLOSING DEVICE</b>		
Manufacturer / Reference	Dorma Kaba BTS80 F EN4	Yes
Evidence of conformity / sampling markings	CERTIFIRE approved for fire doors; Cert. no. CF127	
Surface mount / concealed, Leaf / Frame	Floor mounted with associated bottom strap and top centre.	Yes
Intumescent type, location, thickness	Unknown	
Fixing method (number, type and dimensions of screws, type and dimensions of welding)	4 No.M4 x 6mm grubnut screws.	Yes
<b>LOCKS &amp; LATCHES</b>		
Type	Auxiliary	Yes
Lock Manufacturer / model	BQT Solutions / Cobalt Double YD30D	Yes
Evidence of conformity / sampling markings	None.	Yes
Mounting location	Frame leading edge	Yes
Lock Intumescent type, location, thickness	2mm MAP Intumescent kit around body of the lock, behind the foreend and behind the strike plate.	Yes
Lock fixing method (number, type and dimensions of screws, type and dimensions of welding)	2x M4 32mm steel screw.	Yes
Latch projections mm	Disengaged	Yes
Latch Engagement mm	Disengaged	yes
Latch locations	400mm down from top of frame centralized leading edge of frame.	Yes
Strike plate fixing method (number, type and dimensions of screws, type and dimensions of welding)	2 No. M4x32mm pz2 steel screw.	Yes
Strike plate Intumescent type, location, thickness	Un-latched	Yes
Status at commencement of test	Auxiliary	Yes
<b>LOCKS &amp; LATCHES</b>		
Type	Auxiliary	Yes
Lock Manufacturer / model	BQT Solutions / Cobalt Double YD30D	Yes
Evidence of conformity / sampling markings	None.	Yes
Mounting location	Head of frame	Yes
Lock Intumescent type, location, thickness	2mm MAP Intumescent kit around body of the lock, behind the foreend and behind the strike plate.	Yes

Door Hardware		Verified by FPA
Lock fixing method (number, type and dimensions of screws, type and dimensions of welding)	2 No.M4 32mm steel screw.	Yes
Latch projections mm	Disengaged	Yes
Latch Engagement mm	Disengaged	Yes
Latch locations	105mm in from leading edge of frame in header centralized in frame.	Yes
Strike plate fixing method (number, type and dimensions of screws, type and dimensions of welding)	2 No. M4 32mm steel screw.	Yes
Strike plate Intumescent type, location, thickness	Un-latched	Yes
Status at commencement of test	Auxiliary	Yes

**Table B.2.3** – Door Hardware

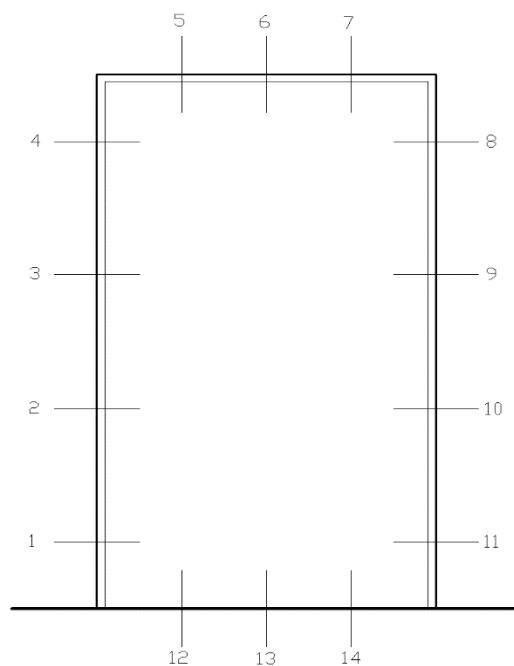
### Door Closing Forces

	Measurement 1	Measurement 2	Measurement 3	Highest Value
Closing Force (N)	0.5	0.48	0.49	0.5

Door-set

**Figure B.2.4** – Opening forces

## Door Gaps

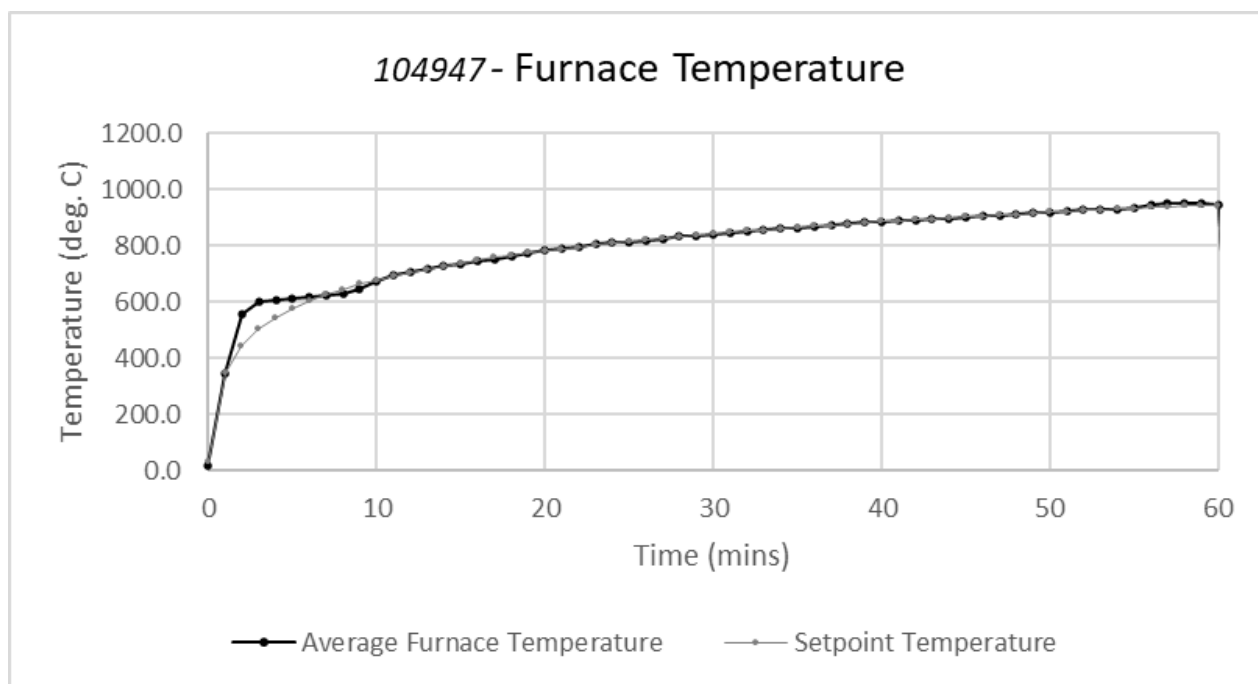


Gap Dimension in mm at primary (P) position											
1	2	3	4	5	6	7	8	9	10	11	12*
4.8	5.7	5.8	5.9	3.8	3.8	4.5	4.4	3.5	4	5.7	3.9
13*	14*										
3.9	2.4										
Mean		4.7mm		Maximum		5.9mm		Minimum		3.5mm	

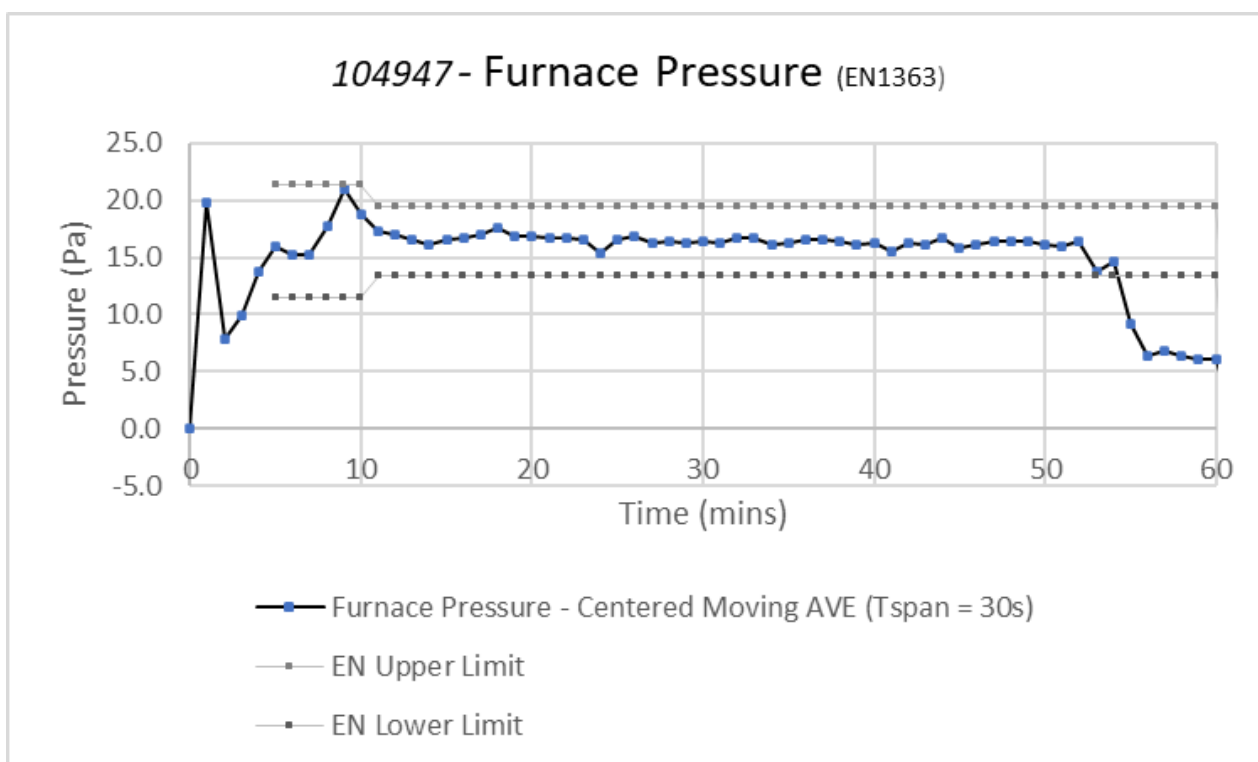
\*Dimension not included in calculations

**Figure B.2.5** – Gap Measurements

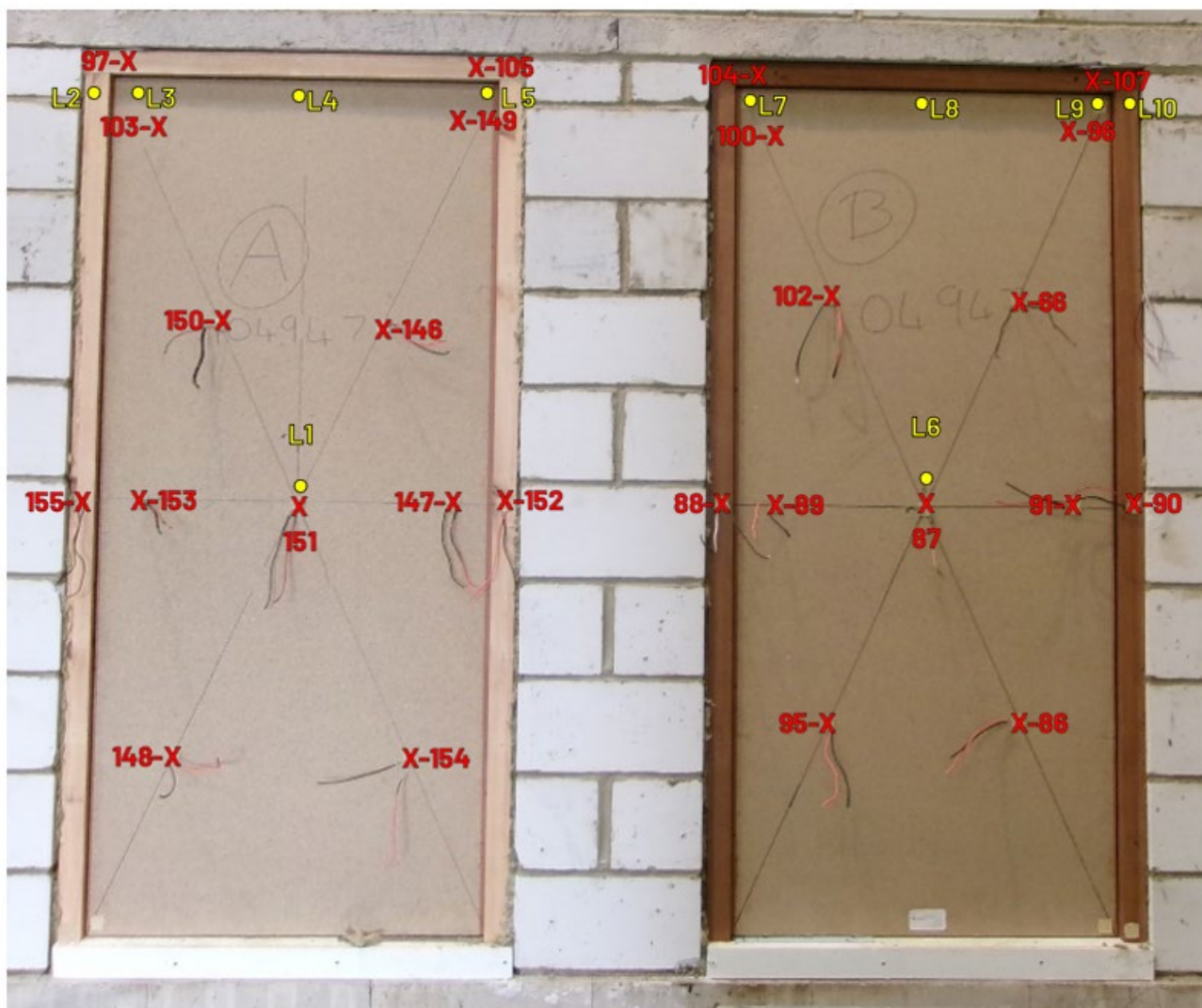
Annex C – Test Data	
Description	Illustration reference
Furnace Temperature	C.1
Furnace Pressure	C.2
Door-Set A + B – Unexposed surface thermocouple deflection locations	C.3
Door-Set A – Unexposed surface temperature rise – mean graph (leaf)	C.4
Door-Set A – Unexposed surface temperature rise – max graph (Leaf)	C.5
Door-Set A – Unexposed surface temperature rise – max graph (frame)	C.6
Door-Set B – Unexposed surface temperature rise – mean graph (leaf)	C.7
Door-Set B – Unexposed surface temperature rise – max graph (Leaf)	C.8
Door-Set B – Unexposed surface temperature rise – max graph (frame)	C.9
Door-Set A – Unexposed thermocouple tabular data	C.10
Door-Set B – Unexposed thermocouple tabular data	C.11
Door-Set A+B – Deflection data	C.12
Door-Set A -Test Observations	C.13
Door-Set B -Test Observations	C.14



**Figure C.1** – Furnace Temperature



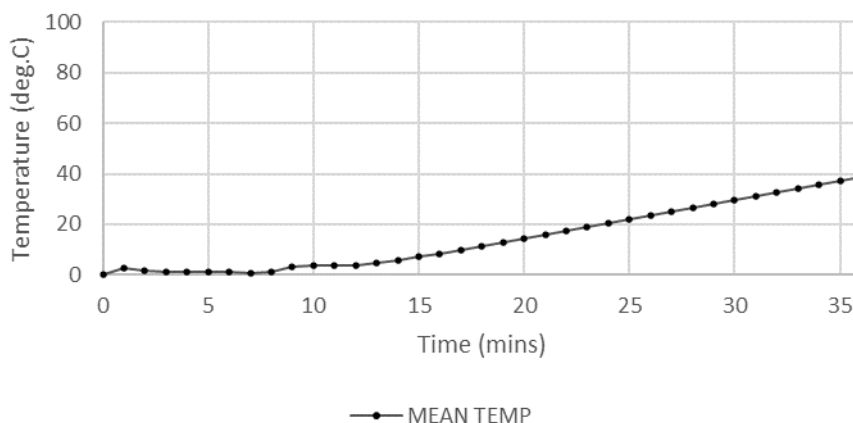
**Figure C.2**– Furnace Pressure



**Figure C.3** – Unexposed surface thermocouple / deflection locations

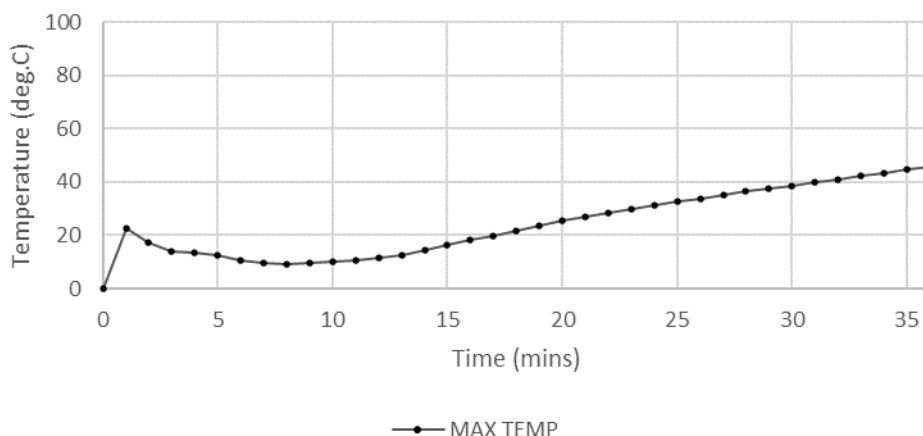


### 104947- Unexposed Surface Mean Temperature Rise - Leaf A



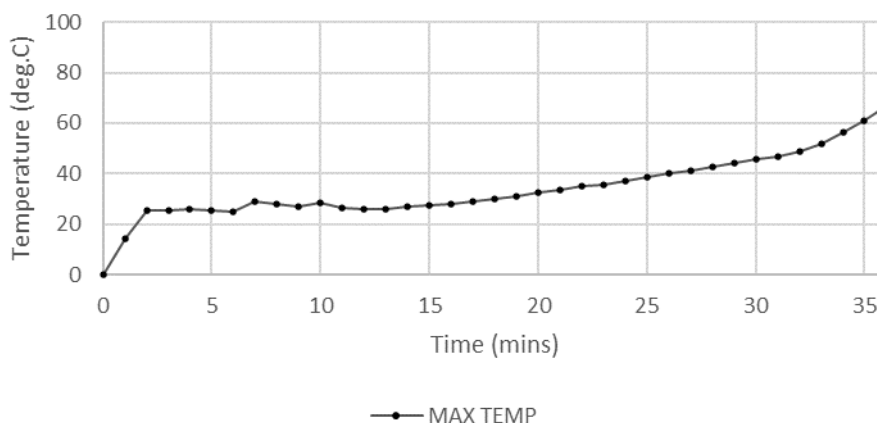
**Figure C.4** – Door-Set A – Unexposed surface temperature rise – Mean – Leaf

### 104947- Unexposed Surface Max Temperature Rise - Leaf (A)

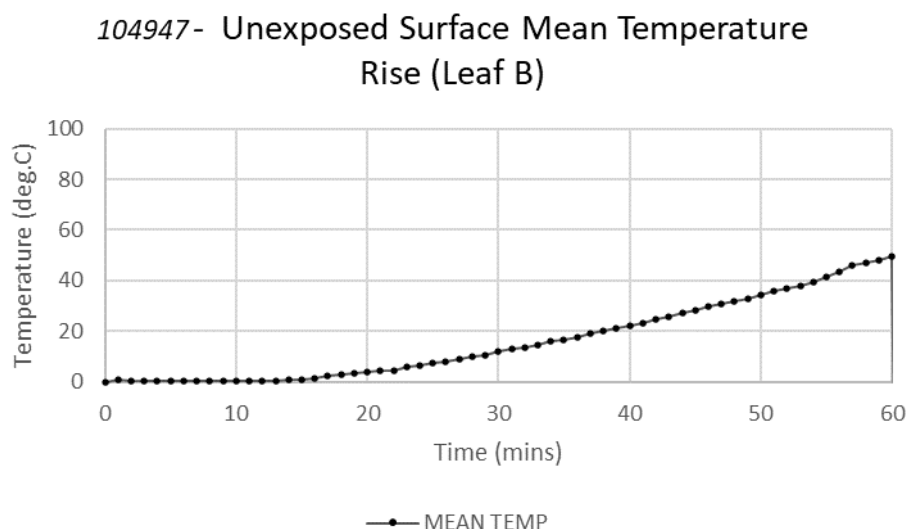


**Figure C.5** – Door-Set A – Unexposed surface temperature rise -Max – Leaf

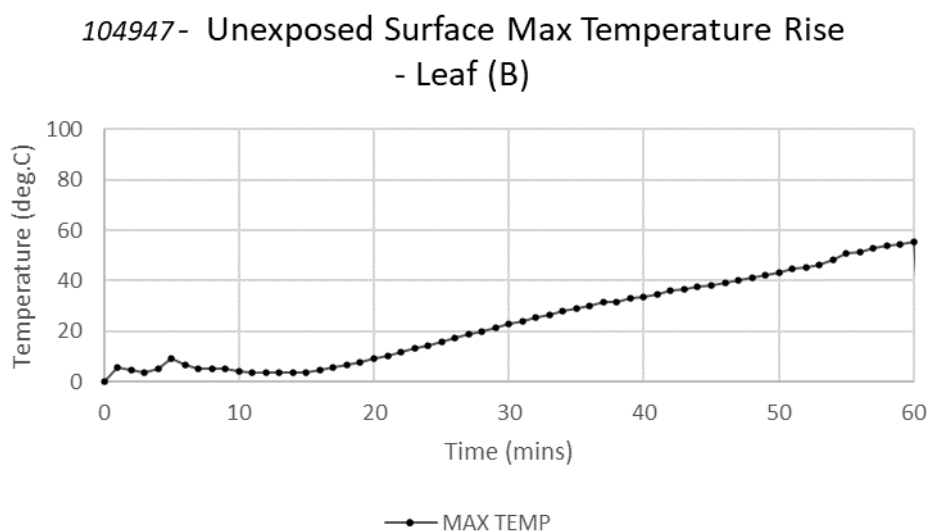
### 104947- Unexposed Surface Max Temperature Rise - Frame (A)



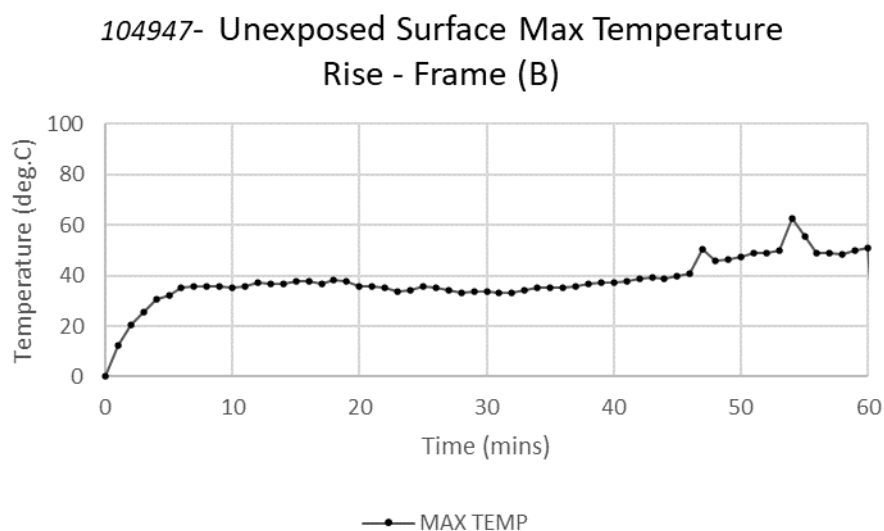
**Figure C.6** – Door-Set A – Unexposed surface temperature rise – Max – Frame



**Figure C.7** – Door-Set B – Unexposed surface temperature rise – Mean – Leaf



**Figure C.8** – Door-Set B – Unexposed surface temperature rise – Max – Leaf



**Figure C.9** – Door-Set B – Unexposed surface temperature rise – Max – Frame

Unexposed Surface Temperature Rise (°C) - Door-set A													
TIME (mins)	Leaf Thermocouples									Frame Thermocouples			
	TC 103	TC 146	TC 147	TC 148	TC 149	TC 150	TC 151	TC 153	TC 154	TC 97	TC 105	TC 152	TC 155
0	0	0	0	0	0	0	0	0	0	0	-	-	0
1	2	8	8	2	23	1	1	1	2	14	-	-	12
2	3	3	5	1	18	1	1	1	2	25	-	-	7
3	3	2	4	1	14	1	0	1	1	25	-	-	4
4	3	3	7	0	13	1	0	1	1	26	-	-	9
5	4	3	8	0	12	1	0	3	1	25	-	-	12
6	4	2	6	1	11	1	0	3	1	25	-	-	10
7	3	2	5	1	10	1	0	2	1	29	-	-	9
8	3	2	4	1	9	1	1	2	1	28	-	-	8
9	4	3	5	5	9	2	2	3	4	27	-	-	8
10	5	2	5	7	10	2	2	4	4	28	-	-	8
11	5	3	5	6	10	3	2	4	4	27	-	-	7
12	7	3	5	6	11	3	3	4	5	26	-	-	6
13	8	4	5	7	13	4	4	5	6	26	-	-	5
14	9	4	5	8	14	5	5	6	6	27	-	-	6
15	11	5	6	9	16	7	6	7	8	27	-	-	5
16	12	6	7	11	18	8	8	9	9	28	-	-	6
17	14	7	8	12	20	9	9	10	11	29	-	-	6
18	16	9	9	14	22	11	11	12	13	30	-	-	6
19	17	10	10	15	24	12	12	13	14	31	-	-	7
20	19	11	11	17	25	14	14	15	16	33	-	-	7
21	20	13	12	18	27	15	16	17	17	34	-	-	7
22	22	14	14	19	29	17	18	18	19	35	-	-	8
23	24	16	15	20	30	19	19	19	20	36	-	-	11
24	25	17	17	22	31	20	21	21	22	37	-	-	12
25	27	19	18	23	33	22	23	22	23	39	-	-	13
26	28	21	20	24	34	23	24	24	25	40	-	-	15
27	30	23	21	26	35	25	26	26	26	41	-	-	16
28	31	24	23	27	36	26	28	27	27	43	-	-	17
29	33	26	25	28	37	28	29	28	29	44	-	-	17
30	34	27	26	29	39	30	31	30	30	46	-	-	22
31	36	29	28	31	40	31	33	31	31	47	-	-	22
32	38	31	30	32	41	33	35	33	33	49	-	-	25
33	39	33	31	34	42	34	36	35	34	52	-	-	29
34	41	34	33	35	43	36	38	36	36	56	-	-	32
35	43	36	35	36	45	37	40	38	37	61	-	-	42
36	45	38	36	37	46	39	41	39	38	67	-	-	47

**Figure C.10** – Door-Set A – Unexposed thermocouple data.

*Thermocouples 105 and 152 have been omitted due to anomalous data.*

Unexposed Surface Temperature Rise (°C) - Door-set B													
TIME (mins)	Leaf Thermocouples									Frame Thermocouples			
	TC 66	TC 86	TC 87	TC 89	TC 91	TC 95	TC 96	TC 100	TC 102	TC 88	TC 90	TC 104	TC 107
0	-	0	0	0	0	0	0	0	0	0	0	0	-
1	-	-1	1	2	6	1	4	6	2	13	2	12	-
2	-	-1	1	2	4	1	3	5	1	9	2	21	-
3	-	0	0	1	3	0	3	4	1	7	1	25	-
4	-	-1	0	2	5	0	2	3	1	12	2	31	-
5	-	-1	1	4	9	0	2	4	1	15	5	32	-
6	-	0	0	3	7	0	1	3	1	15	7	35	-
7	-	0	0	2	5	0	1	2	1	14	6	36	-
8	-	0	0	2	5	0	1	2	1	14	7	36	-
9	-	-1	1	3	5	1	2	2	1	15	9	36	-
10	-	0	1	3	4	1	1	2	1	15	9	35	-
11	-	-1	1	3	4	1	0	2	1	13	9	36	-
12	-	0	1	3	4	1	-1	2	1	13	9	37	-
13	-	0	1	2	4	1	-1	3	1	12	9	37	-
14	-	0	1	2	4	1	0	3	1	12	9	37	-
15	-	-2	2	2	4	1	2	4	1	12	9	38	-
16	-	-1	2	2	4	2	4	5	2	12	9	38	-
17	-	2	2	3	4	2	5	6	2	12	10	37	-
18	-	2	3	3	5	3	6	7	3	13	10	38	-
19	-	3	3	3	5	3	8	8	3	13	10	38	-
20	-	4	4	4	6	4	9	9	4	13	10	36	-
21	-	4	4	5	7	5	10	10	4	14	10	36	-
22	-	1	6	5	7	5	11	12	5	14	11	35	-
23	-	5	6	6	8	6	13	13	6	14	11	34	-
24	-	5	7	7	9	7	14	15	6	15	11	34	-
25	-	7	8	9	10	8	15	16	7	15	12	36	-
26	-	6	9	10	10	8	16	17	8	15	13	35	-
27	-	8	9	11	11	9	17	19	9	15	13	34	-
28	-	9	10	12	12	10	19	20	10	16	13	33	-
29	-	10	11	13	13	11	19	22	11	16	14	34	-
30	-	11	12	15	14	12	21	23	12	16	14	34	-
31	-	12	13	16	15	12	22	24	13	16	15	33	-
32	-	12	15	17	16	13	23	26	14	17	15	33	-
33	-	13	16	18	18	14	25	27	16	17	16	34	-
34	-	15	17	19	19	15	26	28	17	17	16	35	-
35	-	15	17	20	20	16	27	29	18	18	17	35	-
36	-	15	19	21	21	17	28	30	19	18	17	35	-
37	-	17	20	23	22	18	29	31	21	19	17	36	-
38	-	18	21	24	24	19	30	32	22	19	17	37	-
39	-	19	23	25	25	20	32	33	23	19	18	37	-
40	-	20	23	26	26	21	32	34	25	20	18	37	-
41	-	20	25	27	27	22	33	35	26	20	19	38	-
42	-	22	26	28	28	24	34	36	27	21	19	39	-
43	-	23	27	30	29	25	35	37	29	21	20	39	-
44	-	24	28	31	30	26	36	38	30	22	20	39	-
45	-	25	30	32	32	27	37	38	31	21	20	40	-
46	-	26	31	33	33	28	38	39	33	22	21	41	-
47	-	27	32	34	34	29	38	40	34	23	22	50	-
48	-	27	34	35	35	31	39	41	35	23	22	46	-
49	-	28	35	37	36	32	40	42	37	23	22	46	-
50	-	30	36	38	37	33	41	43	38	24	23	47	-
51	-	31	37	39	38	34	42	45	40	24	23	49	-
52	-	32	38	41	39	35	43	45	41	25	24	49	-
53	-	33	40	42	40	37	44	46	42	25	24	50	-
54	-	35	41	43	42	38	45	48	44	26	26	63	-
55	-	37	43	45	43	40	46	51	46	28	27	55	-
56	-	39	45	47	45	42	47	51	48	30	27	49	-
57	-	41	48	49	47	44	48	53	51	32	28	49	-
58	-	41	49	51	48	46	49	54	52	33	28	49	-
59	-	41	51	52	49	47	50	55	53	34	29	50	-
60	-	43	52	54	50	49	51	56	54	35	29	51	-

Figure C.11 – Doorset B – Unexposed thermocouple data

Thermocouples 66 and 152 have been omitted due to anomalous data

Deflection (mm) - Door-sets A and B										
TIME (mins)	Specimen A					Specimen B				
	Laser_1	Laser_2	Laser_3	Laser_4	Laser_5	Laser_6	Laser_7	Laser_8	Laser_9	Laser_10
0	0	0	0	0	0	0	0	0	0	0
1	-2	-43	-21	-3	-	3		-5		
2	-1	-39	-44	-2	-13	0	-7	-4		-3
3	-2	-18	-30	0	-20	-2	-8	-3		-1
4	-4	-26	-15	0	-26	-4		-3		
5	-7	-30	-23	-2	-67	-18		-14		
6		-36	-5			-11		-14		
7										
8	-19			-27						
9										
10										
11		-45	-7							
12			-10							
13			-16							
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27								-13		
28			1					-12		
29										
30					-17			-8		
31			1					-10		
32			-1		-11			-9		
33			-3		-16			-9		
34			-33		-18			-9		
35								-9		
36					-12			-9		
37								-6		
38			-58					-13		
39			-54					-10		
40			-54					-14		
41								-11		
42								-9		
43										
44										
45										
46								-13		
47										
48										
49										
50										
51										
52										
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**Figure C.12** – Deflection data

- Anomalous data due to smoke interference removed.

<b>TIME (Mins)</b>	<b>Observations Door Set A</b>
00:50	Smoke/steam emission from top half of door-set.
02:46	Discolouration at edges of leaf and frame at header.
03:42	Flames flickering at bottom right corner of leaf.
04:11	Smoke/steam emission from continues from perimeter of leaf
05:30	Mechanical restraints removed from door-set
06:50	Discolouration around perimeter of leaf edges.
07:50	Threshold of leaf emitting smoke/steam.
09:22	Discolouration at bottom of leaf increasing.
11:25	Discolouration of frame and lintel about top corners of leaf.
12:54	Smoke / steam from right hand side mid height of leaf discolouring frame.
13:33	Flash flaming from threshold, left hand side of leaf.
17:05	Discolouration around leaf edges increases.
18:50	Flames flickering underneath leaf threshold intermittently.
21:44	Flames flickering underneath leaf now more consistent
23:37	Flash flame from bottom left corner of leaf threshold.
30:07	Discolouration around leaf and frame increase again.
31:51	Deflections at bottom and top of leaf towards the furnace.
35:20	Glowing present at top of leaf.
36:10	Specimen A blocked off with plasterboard. Evaluation of Door set A ended.

**Figure C.13** – Door Set A Test Observations

<b>TIME (Mins)</b>	<b>Observations Door Set B</b>
00:52	Smoke/steam emission from all edges of door set.
01:52	Flame can be seen flickering in the gap between the leaf and the frame trailing edge of leaf.
02:31	Smoke/steam emission now contain to top half of door-set.
04:16	Smoke/steam emission now continues at a constant rate.
05:00	Mechanical restraints removed from door-set
07:14	Discolouration around vertical edges of leaf and header of specimen.
08:41	Smoke/ steam emission now coming from all areas.
11:20	Smoke/steam slow now only emitting upwards from neutral pressure plane. Discolouration around edges of leaf increases especially at bottom of leaf.
16:40	Discolouration continues to increase.
17:16	Condensation dripping down vertical elements of frame and leaf.
20:00	No significant change.
21:00	Flames flickering/visible at leaf threshold.
25:00	No significant change.
39:07	Flames continues to flicker under the leaf threshold.
43:16	Smoke/steam now emitting from top corners of leaf.
48:00	Flicking/glowing under the leaf threshold Increases.
52:00	Header + threshold of leaf deflecting towards the furnace.
54:31	Plasterboard applied to block off door set A fall away. From the supporting construction. From this time of the test onwards, the required furnace pressure could not be maintained. Evaluation of Door set B ended.
58:51	No change.
60:00	End of Test.

**Figure C.14** – Door Set B Test Observations



Annex D- Photographs	
Description	Photograph reference
Exposed Surface of the Test Assembly, Pre-Test	D1
Unexposed Surface of the Test Assembly, Pre-Test	D2
Exposed Surface of the Test Assembly, Pre-Test	D3
Unexposed Surface of the Test Assembly, Post-Test	D4
Door Set A Leading Edge YD30D Pre-Test	D5
Door Set A Header YD30D Pre-Test	D6
Door Set B Leading Edge YD30D Pre-Test	D7
Door Set B Header YD30D Pre-Test	D8
Door Set A+B YD30D Post Test 1	D9
Door Set A+B YD30D Post Test 2	D10
Door Set A+B YD30D Post Test 3	D11
Door Set A+B YD30D Post Test 4	D12



**Figure D.1** – Door-Set A+B – Exposed face Pre-test



**Figure D.2** – Door-Set A+B – Unexposed Face Pre-test



**Figure D.3** – Door-Set A – YD30D Leading edge of Frame Pre-Test.





**Figure D.4** – Door-Set A – YD30D Frame Header Pre-Test.



**Figure D.5** – Door-Set B – YD30D Leading edge of Frame Pre-Test.



**Figure D.6** – Door-Set B – YD30D Head of Frame Pre-Test.





**Figure D.7–** Door-Set Door Set A+B YD30D Post Test 1





**Figure D.8** – Door-Set Door Set A+B YD30D Post Test 2





**Figure D.9** – Door-Set Door Set A+B YD30D Post Test 3



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