CONFIDENTIAL

Report: Chilt/RF12101

A fire resistance test performed two single leaf single acting doorsets

Test conducted in accordance with
BS 476: Parts 20/22: 1987

Test date: 19th October 2012

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1 Summary of performance

The following performance was achieved from the specimens tested. Full details of the testing and specimen construction are described in the report.

Results:

Fire resistance test in accordance with BS476: Part 20/22: 1987

Times to failure:

	Doorset A	Doorset B
Integrity	**105 (one hundred and five) minutes**	**106 (one hundred and six) minutes**
Insulation	**105 (one hundred and five) minutes**	**106 (one hundred and six) minutes**

Summary of specimens:

Doorset A
Leaf size:- 2135mm high x 918mm wide x 66mm thick

Doorset B
Leaf size:- 2135mm high x 918mm wide x 68mm thick

2 Introduction

The doorsets were manufactured and supplied for test by the client and delivered on 3rd October 2012. Chiltern International Fire Ltd (CIFL) constructed a medium density concrete blockwork supporting construction and installed the doorsets into the wall.

3 Specification

Details of the specimens are shown in the Appendix.

3.1 Door leaf

The left doorset was designated doorset A and the leaf measured 2135mm high x 918mm wide x 66mm thick. The right doorset was designated doorset B and the leaf measured 2135mm high x 918mm wide x 68mm thick. Both doorsets were hung to open towards the furnace. The results of this test were obtained from doorsets fitted with engaged latches.

3.2 Door perimeter gaps

The gaps between the edge of the leaves and frames were measured prior to test. A total of 24 readings were taken. The measurements (in mm) are given in Figure 4 of the Appendix.

3.3 Closer forces

Measured in accordance with FTSG Resolution No 63.

	Opening force (Nm)	Closing force (Nm)
Doorset A	24	14
Doorset B	25	15

4 Description of construction (refers to Figures 1 to 4 of the appendix)

Leaf - doorset A

		Species/type	Dimensions (mm)	Density (kg/m³)	Moisture (% w/w)	Key to figures
Stiles and Rails		None fitted	-	-	-	-
Core		Particleboard	54 thick	550*	10.8	1
Facings		MDF	3 thick	800*		2
		Calcium Silicate board	3 thick	1050*	-	3
Adhesive	Lippings	Fire retardant glue**	-	-	-	-
	Facing	Fire retardant glue**	-	-	-	-
	Core	Fire retardant glue**	-	-	-	-
Lippings – all edges		Finger jointed –China Rosewood	8 thick	800*	10	4

**no specification provided by client

* Stated by client, not checked by laboratory

Leaf - doorset B

		Species/type	Dimensions (mm)	Density (kg/m³)	Moisture (% w/w)	Key to figures
Stile and Rails		None fitted	-	-	-	-
Core		Particleboard	44 thick	550*	-	5
Facings		MDF	3 thick	800*	10.8	6
		Calcium Silicate Board	9 thick	1050*		7
Adhesive	Lippings	Fire retardant glue**	-	-	-	-
	Facing	Fire retardant glue**	-	-	-	-
	Core	Fire retardant glue**	-	-	-	-
Lippings – all edges		Finger jointed – China Rosewood	6 thick	800*	10	8

**no specification provided by client

* Stated by client, not checked by laboratory

Door frame – both doorsets

	Material	Dimensions (mm)	Density (kg/m³)	Moisture (% w/w)	Key to figures
Head, jamb and threshold	Finger jointed hardwood lamels – random configuration	180 deep x 60 wide including a 22 high x 111 wide integral stop	800*	10.5	9
Head to jamb jointing detail	Mitred	-	-	-	-
Stops	Integral	-	-	-	-
Facings – fitted on exposed face of frame	MDF	3 thick x 38 wide	850*	-	10
	Calcium silicate	3 thick x 38 wide	1050*	-	11
Frame to supporting construction fixing detail	4 No. equally spaced steel masonry screws per jamb	100 long	-	-	-
Frame to supporting construction fire stopping detail	Tightly packed rock wool capped with intumescent mastic	Nominally 10 wide x full depth of frame	-	-	-
Architrave	MDF	18 thick x 50 wide	-	-	-

* Stated density, not checked by laboratory

Intumescent and sealing materials – both doorsets

	Make/type	Size (mm)	Location	Key to figures
Leaf edge	None fitted	-	-	-
Frame reveal	Sodium silicate type Foshan Nanhai Pingzhi Sealing Co. Ltd	20 x 4	Fitted in the frame reveal butting up to the upstand of the stop	12
Door edges – head, vertical edges and threshold	Rubber buffer seal Foshan Nanhai Pingzhi Sealing Co. Ltd	5 deep x 10 wide	Fitted centrally in all leaf edges	13

Intumescent interruptions and hardware protection – both doorsets

	Make/type	Size (mm)	Location
Around hinges	Continuous	-	Seal in frame reveal remains continuous past hinge blade in frame reveal
Under hinge blade	None fitted	-	-
Encasing latch body	None fitted	-	-
Under latch forend	None fitted	-	-
Around latch keep	Continuous	-	Seal in frame reveal remains continuous past latch keep in frame reveal
Under latch keep	None fitted	-	-

Hardware – both doorsets

	Make/type	Size (mm)	Location	Key to figures
Hinges	3 No Guangdong Topstrong Jichuang Household Co. Ltd stainless steel bearing butt type hinges	115 x 42 (blade size)	Fitted 150mm, 465mm and 1870mm from the head of the leaf	14
Closer	Nantong Emerging Special Metal Material Co. Ltd overhead type closer	140 x 40 (footprint)	Fitted on the exposed face as per manufactures instructions	15
Latch - engaged	Mortice latch with euro cylinder Wuxi Great Metal Product Co. Ltd	200 x 25 (forend size) 130 x 28 (keep size)	Fitted 1000mm from the threshold of the leaf	16
Furniture	Labore lever type handles	Ø60 (rose size)	Fitted appropriate to the lock/latch on both faces	17
	Lock esctcheon	Ø50 (rose size)	Fitted appropriated to the euro lock	18

5 Test conditions

5.1 Where areas of the test specification are ambiguous or open to interpretation the Fire Test Study Group Resolutions No's 51, 63, 70, 71, 72 and 78 have been followed (further specific details are available on request). These Resolutions provide basis of common agreements between the fire test laboratories which are members of this Group.

5.2 The ambient temperature of the test area at commencement of test was 15°C.

5.3 After the first 5 minutes of the test, the furnace pressure was maintained at -4.25 ± 3 Pa with respect to atmosphere, at a point 0.5m from the notional floor level, equating to 0Pa at a point 1m above the notional floor level.

5.4 The furnace was controlled to follow the temperature/time relationship specified in BS 476: Part 20: 1987 as closely as possible, using the average of nine thermocouples suitably distributed within the furnace. The temperatures recorded are shown graphically in Section 6.1.

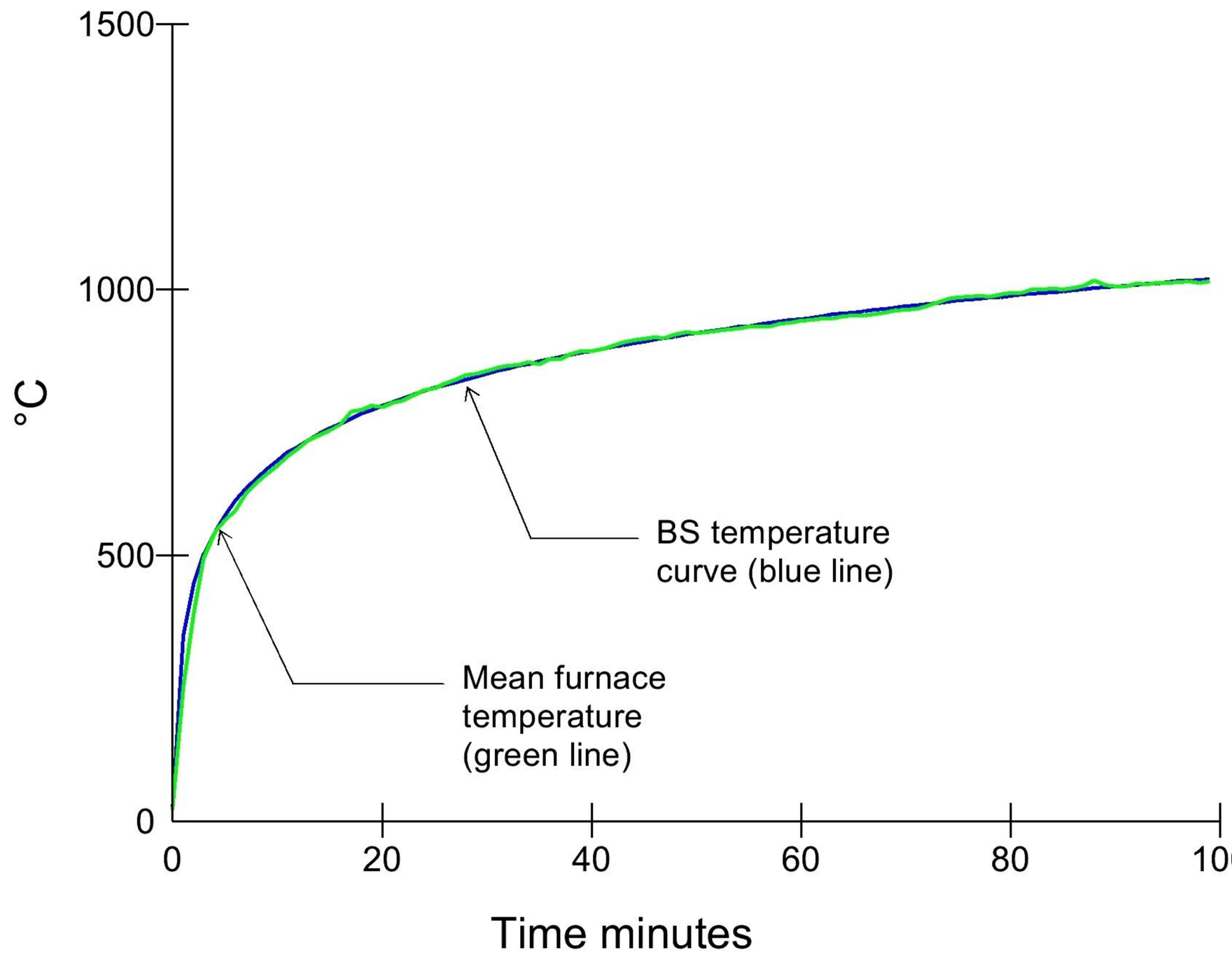
5.5 The temperature of the unexposed face of each doorset was monitored by means of 5 thermocouples fixed to the surface of the door leaf and 3 thermocouples attached to the door frame, one at midheight on each jamb and one centrally located above the leaf on the frame head.

The thermocouple positions are shown in Figure 4 of the appendix. The average temperature of the doorsets and maximum temperature of the doorsets are shown graphically in Section 6.2.

6 Test results

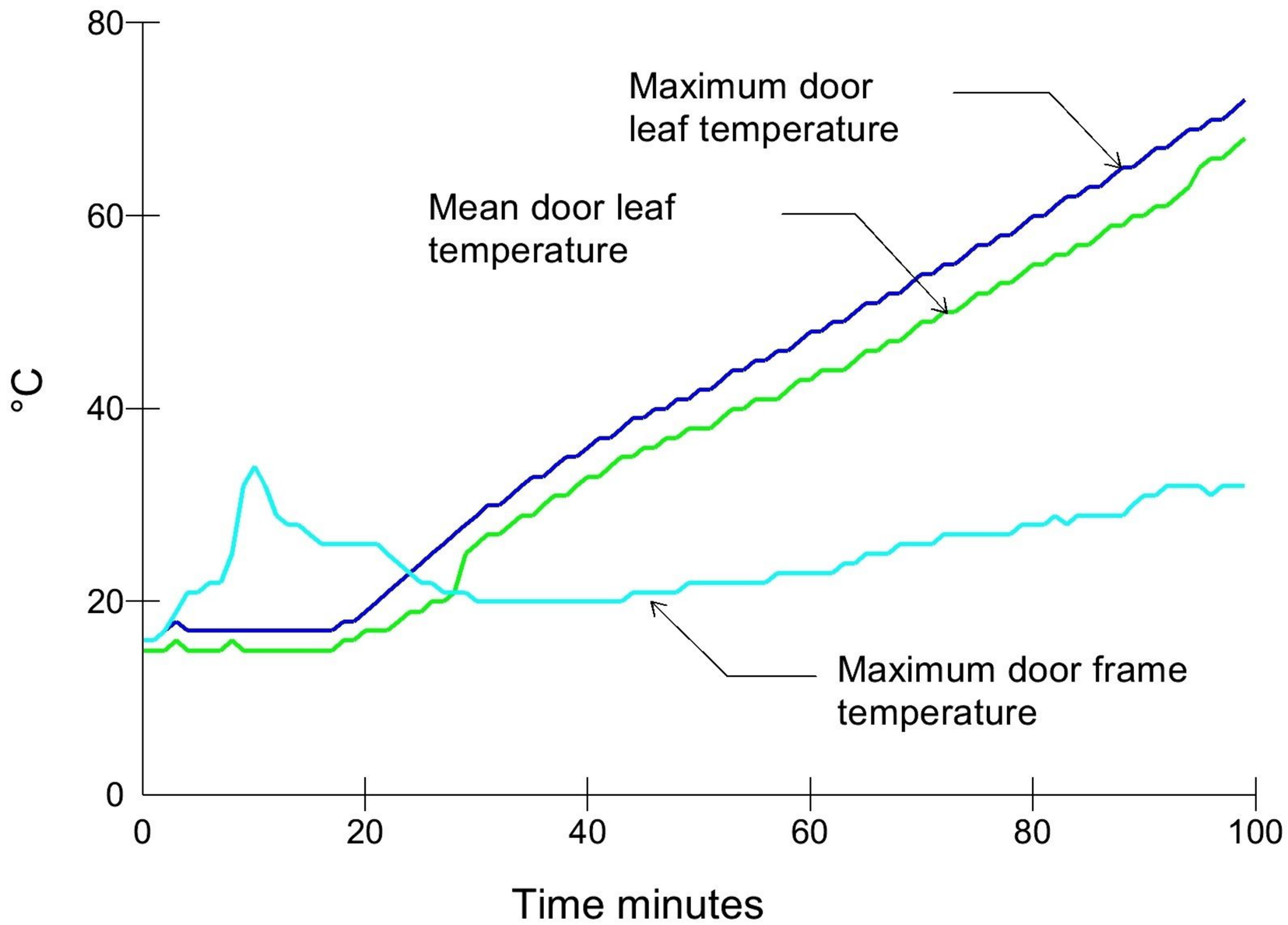
The following data and observations were recorded during the test.

6.1 Furnace temperature curve

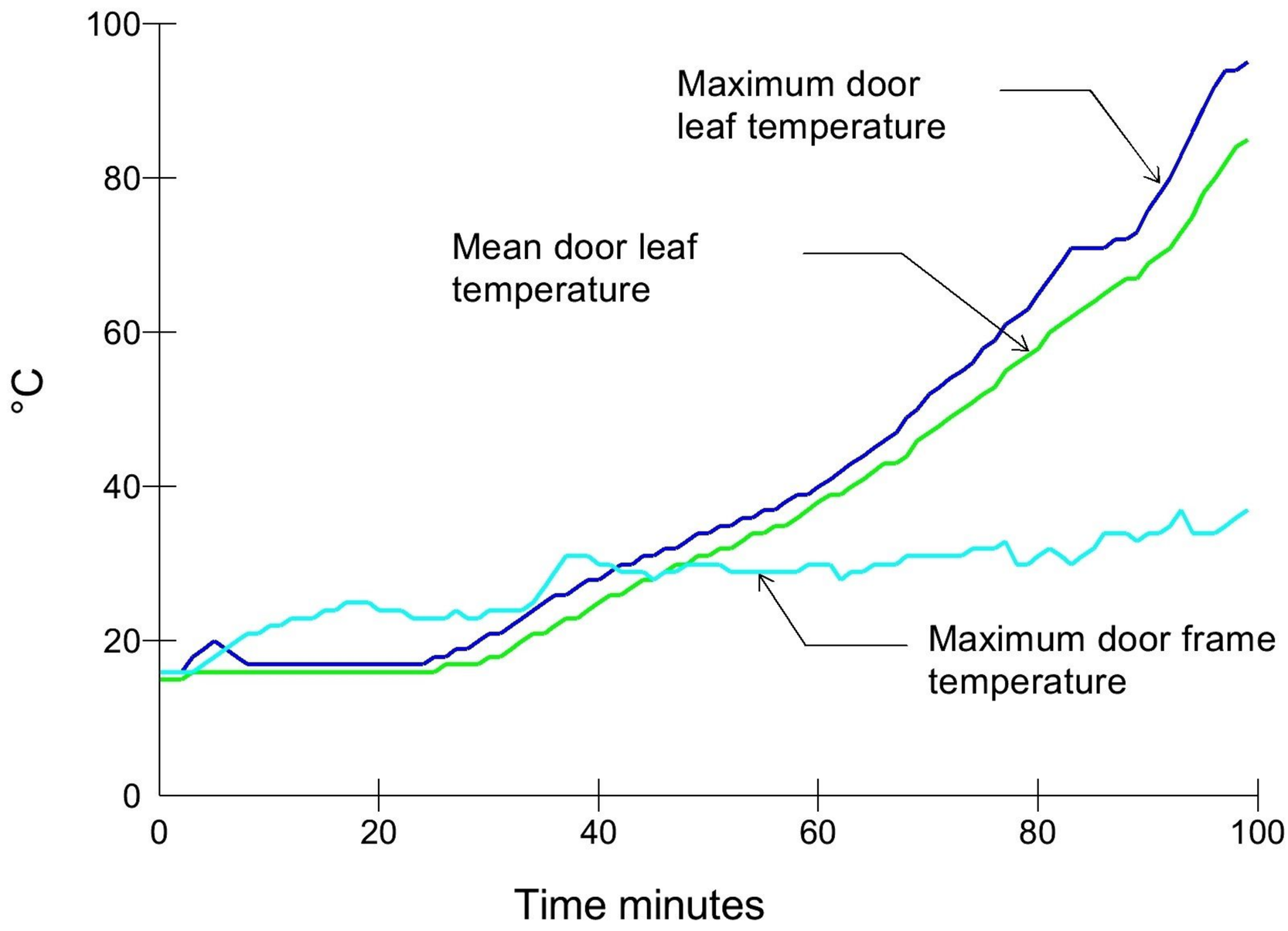


6.2 Unexposed face temperature curves

Doorset A

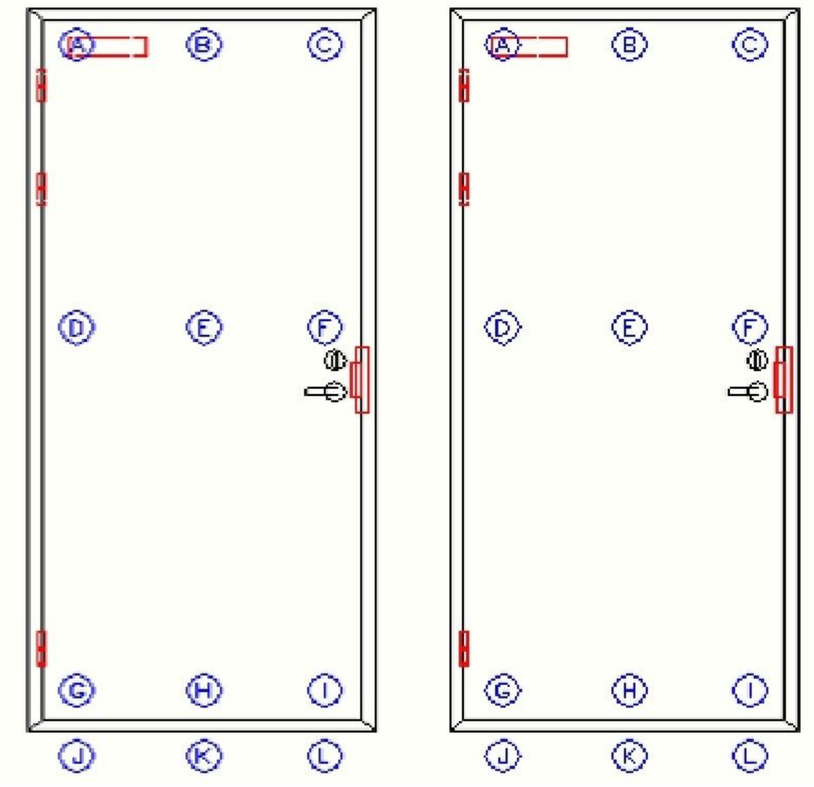


Doorset B



6.3 Door distortion data

The following tables show the distortion of the doors in mm with an accuracy of ±1mm.
A positive measurement indicates distortion towards the furnace.
A negative measurement indicates distortion away from the furnace.
J, K and L give vertical movement of the door, a negative reading indicates that the door has dropped.



Doorset A - leaf (hung on the left and opening towards the furnace)

Time	A	B	C	D	E	F	G	H	I	J	K	L
15	1	2	3	3	5	3	1	0	-1	0	4	0
30	1	3	5	1	2	2	2	0	0	0	4	-1
45	2	4	5	0	2	2	2	0	1	-2	4	0
60	2	3	4	-2	-1	1	3	-1	2	-2	4	0
75	4	2	5	-4	-9	1	3	-1	7	-3	2	-1
90	6	4	5	-2	-5	2	4	-2	9	-5	1	-3

Doorset B – leaf (hung on the left and opening towards the furnace)

Time	A	B	C	D	E	F	G	H	I	J	K	L
15	3	6	4	9	11	7	-1	2	-3	1	-1	1
30	5	8	5	9	13	8	1	3	-3	0	-1	-1
45	3	11	5	10	20	12	1	5	-2	0	-1	-1
60	7	12	4	10	19	10	1	8	-2	0	-1	-1
75	8	10	5	9	13	8	1	7	-1	-1	-2	-1
90	8	9	5	8	11	9	2	4	-1	-3	-5	-4

6.4 Observations

All comments relate to the unexposed face unless otherwise specified.

Time (minutes)	Comments
00.00	Test started.
01.19	Doorset A, there is smoke issuing from the top half of the closing edge of the leaf.
02.11	Doorset B, there is smoke issuing from the middle hinge position and the closing edge of the leaf.
02.50	Doorset A, there is smoke issuing from both top corners. There is an increase in the level of smoke issuing from the closing edges and middle hinge position. There is also smoke issuing from the handle position.
03.45	Both doorsets, there is a gap appearing at the closing edge and the white intumescent seal is visible.
04.44	Both doorsets, there is smoke issuing from across the head of the leaves.
07.14	Doorset A, there is a decrease in the level of smoke issuing from the middle hinge position and an increase in the level of smoke issuing from the head of the leaf.
11.26	Both doorsets, there is a decrease in the level of smoke issuing from the heads of the leaves.
11.51	Both doorsets, there is smoke issuing from the keyholes.
18.36	Doorset B, there is a gap approximately 10mm wide at the closing edge of the leaf.
19.45	Doorset A, there is smoke issuing from the top closing corner of the leaf. Doorset B, there is smoke issuing from the middle hinge position.
24.14	Exposed face of both leaves, the faces are peeling and flaking.
29.35	Doorset B, there is an increase in the level of smoke issuing from the closing edge of the leaf.
33.23	Doorset B, there is an increase in the level of smoke issuing from the top hinge position and the centre of the head of the leaf.
35.36	Exposed face of doorset B, the leaf is cracking.
36.00	Doorset B, there is a further increase in the level of smoke issuing from the centre of the head of the leaf.

40.14	Exposed face of doorset B, the facing of the leaf is beginning to break up and the top half has fallen away
41.43	Doorset B, there is smoke issuing from the top hinge position, the head and the top closing corner of the leaf.
42.36	Exposed face doorset A, the facing is starting to crack.
45.08	Doorset B, there is discolouration at the head of the leaf.
	Doorset A, there is discolouration at the lock position.
47.00	Doorset B, there is discolouration at the top half of the closing edge of the leaf.
50.02	Doorset A, there is charring around the key hole.
52.07	Doorset B, there is further charring on the leaf at the head of the leaf.
53.56	Doorset A, there is further charring around the keyhole position and an increase in the level of smoke issuing from the top closing corner of the leaf.
64.04	Doorset A, there is an increase in the level of smoke issuing from the top hanging corner of the leaf. There is discolouration at the top half of the closing edge of the leaf.
70.06	Doorset B, there is discolouration at the handle and keyhole positions.
74.00	Exposed face, doorset A the facing is falling away.
78.15	Doorset A, there is discolouration at the top hanging and top closing corner of the leaf. There is erosion at the threshold of the leaf.
82.50	Doorset A, there is a glow visible at the top hanging corner of the leaf.
90.55	Doorset A, a cotton pad integrity test was performed at the top hanging corner of the leaf, no failure.
93.02	Doorset A, a cotton pad integrity test was performed at the top hanging corner of the leaf, no failure.
93.45	Doorset A, there is further erosion at the threshold of the leaf and further increase in the discolouration at the top hanging and top closing corners of the leaf.
94.45	Doorset A, there is a glow visible at the top hanging corner moving across the head of the leaf.
96.17	Doorset A, a cotton pad integrity test was performed at the top hanging corner of the leaf, no failure.

97.46	Doorset B, there is an increase in the level of smoke issuing from the top hinge position, the top hanging corner and head of the leaf. There is also an increase in the discolouration and charring at these positions.
99.21	Doorset B, there is a glow visible at the top hanging corner and the head of the leaf.
99.30	Doorset A, a cotton pad integrity test was performed at the top hanging corner of the leaf.
100.28	Doorset B, there is a gap opening at the head of the leaf.
101.00	Doorset B, a cotton pad integrity test was performed at the head of the leaf, no failure.
102.38	Doorset B, there is a glow visible at the top hinge position.
103.10	Doorset A, a cotton pad integrity test was performed at the top hanging corner of the leaf, no failure.
103.40	Doorset B, there is a glow visible across the head of the leaf.
104.05	Doorset B, a cotton pad integrity test was performed at the top hanging corner of the leaf, no failure.
105.00	Doorset A, a cotton pad integrity test was performed at the top hanging corner of the leaf which resulted in ignition of the cotton pad thereby constituting **integrity failure.**
106.13	Doorset B, there is continuous flaming at the head of the leaf thereby constituting **integrity failure.**
	Test terminated.

6.5 Times to failure

When tested in accordance with BS 476: Part 22: 1987, Method 6, determination of fire resistance of fully insulated doorsets and shutter assemblies, the requirements of the standards were satisfied for the following periods:

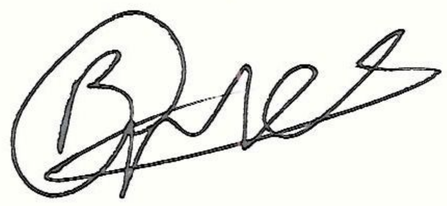
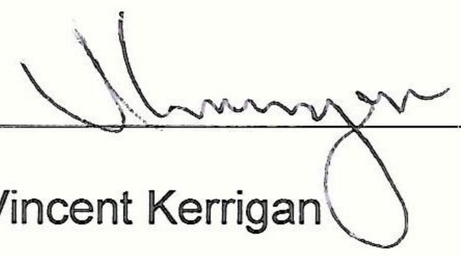
	Doorset A	Doorset B
Integrity	**105 (one hundred and five) minutes**	**106 (one hundred and six) minutes**
Insulation	**105 (one hundred and five) minutes**	**106 (one hundred and six) minutes**

7 Limitations

The results only relate to the behaviour 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.

The results of this test were obtained using the door to frame gaps recorded in Figure 4 of the appendix. The fire resistance performance of doors of this design may change if substantially different gaps are employed.

The specification and interpretation of fire test methods are the subject of ongoing development and refinement. Changes in associated legislation may also occur. For these reasons it is recommended that the relevance of test reports over 5 years old should be considered by the user. CIFL will be able to offer, on behalf of the legal owner, a review of the procedures adopted for a particular test to ensure that they are consistent with current practices, and if required may endorse the test report.

Signature:		
Name:	Robert Axe	Vincent Kerrigan
Title:	Deputy Head of Section – Fire Resistance	Technical Manager
Date of issue:	18-12-2012	18-12-2012

Photographs

Intumescent interruptions due to hardware

Hinges – both doorsets

Closer – both doorsets

Latch keep – both doorsets

Latch forend – both doorsets

At start of test

After 15 minutes

After 30 minutes

After 45 minutes

At 60 minutes

At 75 minutes

Appendix - figures 1 to 4