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Title:

The fire resistance performance of two, single-leaf, single-acting doorsets, when tested in accordance with BS 476: Part 20/22: 1987

WF Report No:

414533

Prepared for:

Falcon Panel Products Ltd

Clock House
Station Approach
Shepperton
Middlesex
TW17 8AN

Test date:

13th June 2019

1762

Registered Office: Warringtonfire Testing and Certification Limited, 10 Lower Grosvenor Place, London, United Kingdom, SW1W 0EN. Reg No. 11371436

Contents

Summary of Performance

The following performance was achieved from the specimen 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	67 (sixty seven) minutes	80 (eighty) minutes*
Insulation	67 (sixty seven) minutes **	80 (eighty) minutes*

* No failure at test termination
** Failure by virtue of integrity failure

Summary of specimens:

Two latched single-leaf, single-acting doorsets.

Doorset A hung opening in towards the furnace, and doorset B hung opening out away from the furnace

Leaf size – both doorsets:
2510mm high x 1045mm wide x 54mm thick

1 Introduction

The doorsets were manufactured and supplied for test by the client and delivered during June 2019. At the request of the client, Warringtonfire constructed a plasterboard clad timber stud supporting construction and installed the specimens into the wall.

2 Specification

Details of the specimens are shown in the Appendix.

2.1 Door leaf

The left doorset was designated doorset A and the right doorset was designated doorset B. The leaf of both doorsets measured 2510mm high x 1045mm wide x 54mm thick. Doorset A was hung to open in towards the furnace, and doorset B was hung to open out away from the furnace. The results of this test were obtained from doorsets fitted with a latch which was engaged for the duration of the test.

2.2 Door perimeter gaps

The gaps between the edge of the door and frame were measured prior to test. A total of 24 readings were taken. The measurements (in mm) are given in Section 5.5 of the report.

2.3 Closer forces

Measured in accordance with FTSG Resolution No 63.

	Opening force (Nm)	Closing force (Nm)
Doorset A	50	51
Doorset B	25	24

3 Description of Construction (Refers to Figures 1 to 4 of the Appendix)

Leaf – stated as being produced from Falcon Panel Products Strebord 54 door blanks

		Species/type	Dimensions (mm)	Density (kg/m³)	Moisture (% w/w)	Key to figures
Stiles and rails		None fitted	-	-	-	-
Core		Falcon Panel Products Strebord particleboard*	54 thick	520-630*	10.6-10.7	1
Facing		American White Oak veneer	0.5 thick	-	-	2
Adhesive	Lippings	Urea Formaldehyde	-	-	-	-
	Facing	Urea Formaldehyde	-	-	-	-
Lippings	Top edge	American White Oak*	20 thick	770**	-	3
	Vertical and bottom edges		10 thick			4

* Stated by client, not verified by laboratory

** Nominal density – TRADA Timber database

Door frame

	Species/type	Dimensions (mm)	Density (kg/m³)	Moisture (% w/w)	Key to figures
Head and jambs	American White Oak*	40 wide x 102 deep	770**	8.9	5
Head to jamb jointing detail	Mortice and tenon – screwed and glued with Urea Formaldehyde	-	-	-	-
Stop – planted (screwed)	American White Oak*	18 high x 45 wide	770**	8.9	6
Frame to supporting construction fire stopping detail	Rockwool mineral fibre for full depth of frame capped with intumescent mastic on both faces	Nominally 5 – 18 wide x 10 deep (mastic depth only, mineral fibre remains full depth of frame)	-	-	-
Frame to supporting construction fixing detail	4No. steel screws per jamb	6Ø x 100 long	-	-	-
Architrave	None fitted	-	-	-	-
Threshold	Non combustible	-	-	-	-

* Stated by client, not verified by laboratory

** Nominal density – TRADA Timber database

Intumescent and sealing materials

	Make/type	Size (mm)	Location	Key to figures
Leaf – bottom edge	Norseal NOR810 drop seal	22 wide x 60 high	Fitted centrally along the bottom edge of the leaf	7
Frame reveal – head and jambs	Lorient Polyproducts Ltd LP1504DS Type 617	15 x 4	Fitted 7mm from the opening face	8
	Lorient Polyproducts Ltd LP1504 Type 617	15 x 4	Fitted 32mm from the opening face	9
Smoke seal	Lorient Polyproducts Ltd LAS1007	10 x 7	Fitted to the upstand of the stop in the frame reveal	10

Intumescent interruptions and additional hardware protection

	Make/type	Size (mm)	Location
Around hinge blade	Partially interrupted	-	Hinge blade fully interrupts 1st seal leaving 2nd seal continuous in frame reveal
Under hinge blade	Hinge manufacturer supplied kit Ref. 8820 (graphite)	1 thick	Fitted under hinge blade on frame and leaf
Around closer slide channel	Partially interrupted	-	Closer slide channel partially interrupts both seals in frame head with 8mm of each remaining continuous
Concealed closer protection	Manufacturers supplied intumescent kit	-	Fitted as per the manufacturer's instructions
Under latch forend	Sealed Tight Solutions Ltd graphite	1 thick	Fitted under the latch forend
Around latch keep	Partially interrupted	-	Latch keep partially interrupts both seals with 4mm of 1st seal and 3mm of 2nd seal remaining continuous
Under latch keep	Sealed Tight Solutions Ltd graphite	1 thick	Fitted under the latch keep

* Stated by client, not verified by laboratory

Hardware

	Make/type	Size (mm)	Location	Key to figures
Hinge	3No. Simonswerk Tectus TE527FR	155 x 33 x 26 (blade size)	Fitted 200mm, 655mm and 2160mm from the head of the leaf	11
Closer	Geze Boxer 2-4 concealed overhead type closer	286 x 53 x 34 (body size in leaf head) 440 wide arm channel in frame head	Closer body rebated into leaf head and slide channel rebated into frame head as per the manufacturer's instructions	12
Latch - engaged	AGB mortice latch 60mm Polaris Maglock 2XT	195 x 18 (forend size) 82 x 22 (keep size)	Fitted 945mm from the bottom edge of the leaf	13
Furniture	Olivari Conca lever type handle	Ø53 x 121 x 51 (handle size)	Fitted appropriate to the latch	14
	Securefast Slimline deedlock electromagnetic lock	250 x 47 x 26 (body size)	Body fitted on frame head on the exposed face of doorset A and the unexposed face of doorset B. Corresponding plate through bolted on leaf head.	15

* Stated by client, not verified by laboratory

4 Test Conditions

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.

The ambient temperature of the test area at commencement of test was 17°C.

After the first 5 minutes of the test, the furnace pressure was maintained such that it complied with the requirements of BS 476-20:1987 clause 3.2.2 (including allowance for transient occurrences in line with clause 12 (L)) at -4.25 ± 2 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.

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 5.1.

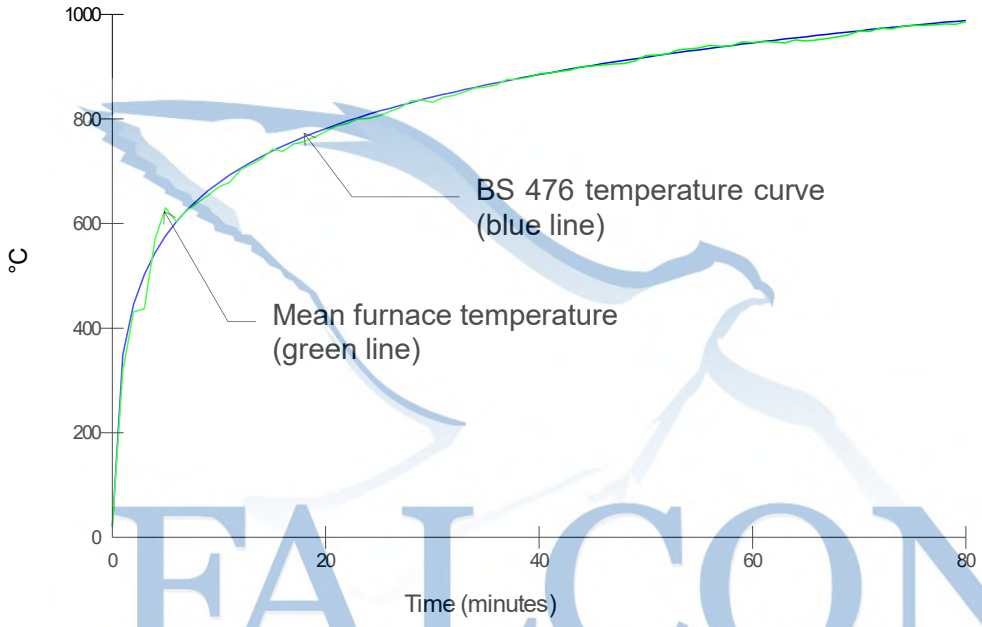
The temperature of the unexposed face of both doorsets was monitored by means of five thermocouples fixed to the surface of the door leaf, and three thermocouples attached to the frame, one at mid-height on each jamb and one centrally located above the leaf on the frame head.

The thermocouple positions are shown in Figure 4 of the appendix. The average temperature of the door leaves and maximum temperature of the doorsets are shown graphically in Section 5.2.

5 Test results

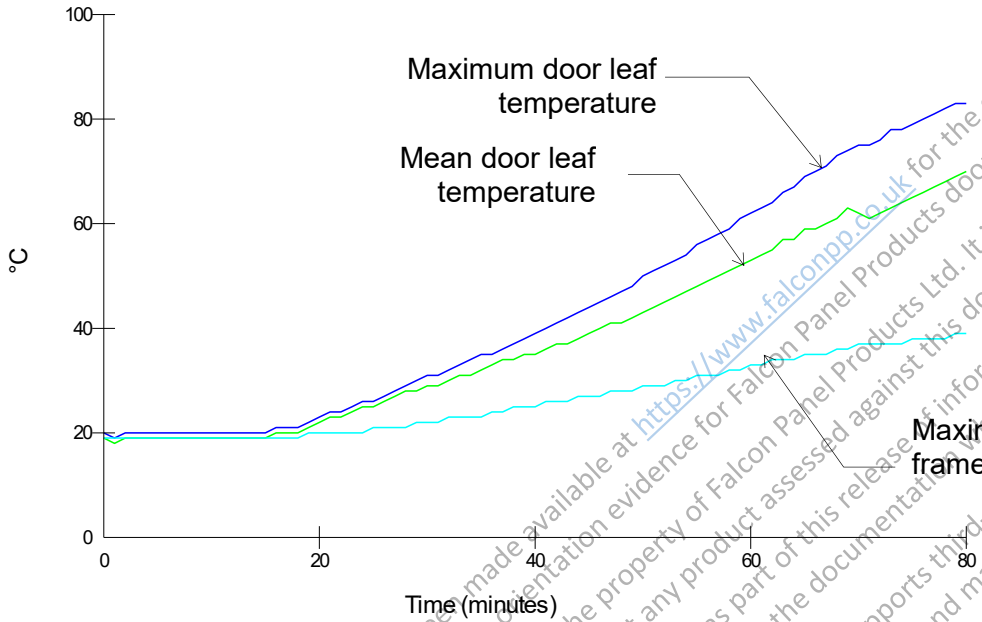
The following data and observations were recorded during the test.

5.1 Furnace Temperature Curve

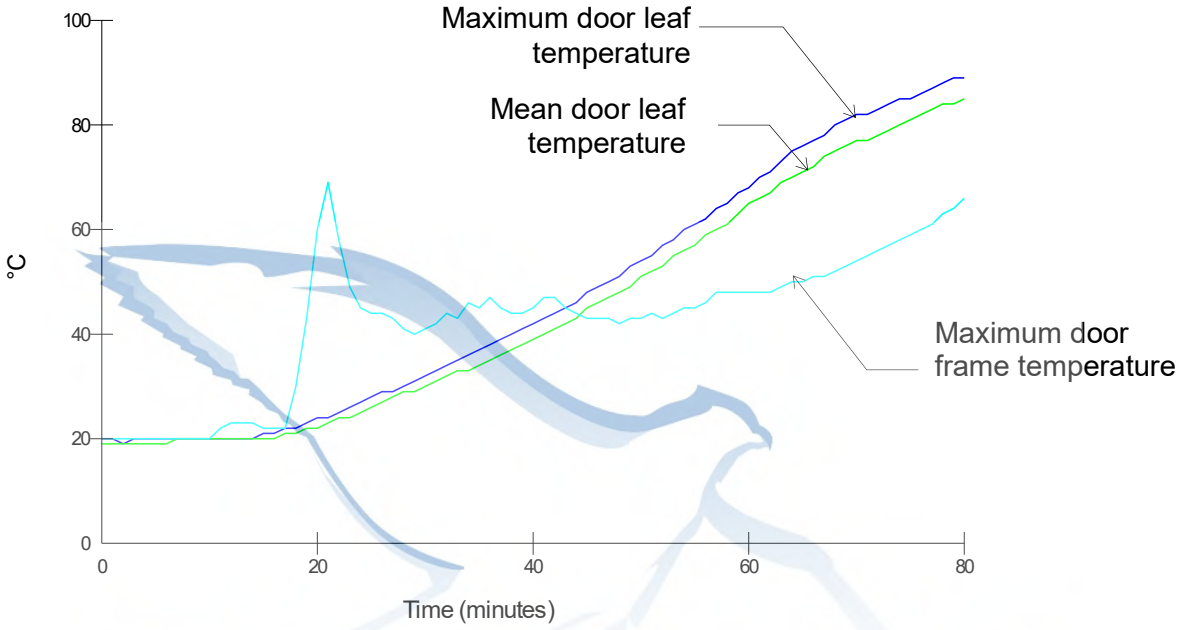


5.2 Unexposed Face Temperature Curves

Doorset A

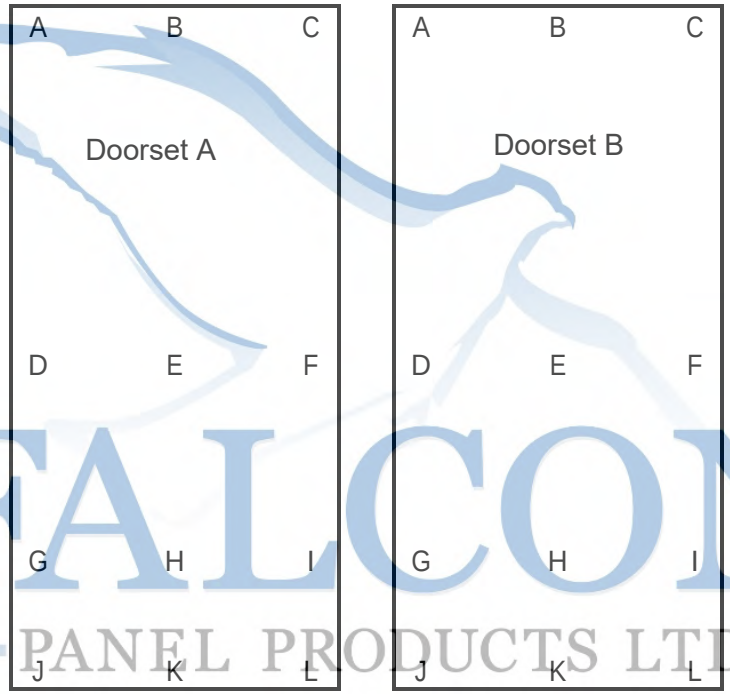


Doorset B



5.3 Door Distortion Data

The following tables show the distortion of the door leaves 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 in towards the furnace

TIME mins	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
15	-4	-6	-5	-3	-5	-2	2	-1	0	-2	-2	-1
30	-8	-9	-3	-1	-6	0	2	-2	2	-3	-2	-1
45	-11	-14	-7	-2	-12	-7	1	-2	5	-3	-3	-1
60	-14	-24	-14	-8	-38	-12	-2	-19	3	-3	-3	-1
75	-9	-33	-20	-11	-61	-20	-7	-46	-6	-4	-3	-2

Doorset B – leaf hung on the right and opening out away from the furnace

TIME mins	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
15	-5	-6	-7	-3	-5	-6	0	-3	-2	-1	-1	0
30	-7	-8	-9	-6	-12	-8	0	-4	-2	-1	-1	0
45	-9	-15	-12	-11	-25	-12	-2	-11	-1	-2	-1	0
60	-13	-25	-51	-13	-40	-9	-3	-25	-1	-2	-1	0
75	-19	-37	-21	-19	-59	-21	-5	-36	-1	-3	-	-1

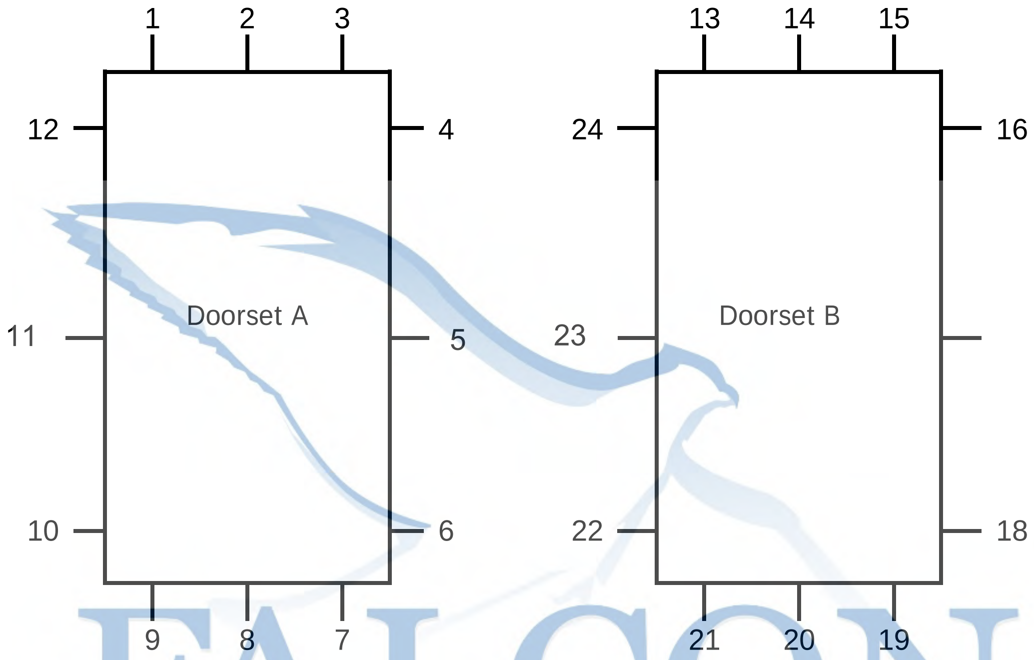
5.4 Observations

All comments relate to the unexposed face unless otherwise specified.

Time (minutes)	Comments
00:00	Test Started
04:10	Doorset B, There is smoke issuing at the top closing corner and the threshold.
04:28	Doorset A, There is smoke issuing at the top closing corner.
04:50	Both doorsets, There is an increase in smoke issuing at the threshold.
06:00	Doorset B, There is an increase in smoke issuing at the top closing corner and 200mm across the head.
08:00	Doorset A, There is smoke issuing at the top hanging corner.
09:05	Doorset A, There is smoke issuing at the hanging edge (100mm down from the top hanging corner).
14:10	Doorset A, There is smoke issuing at the closing edge 500mm down from the top closing corner.
14:40	Doorset A, There is an increase in smoke issuing around the closer.
15:15	Doorset B, There is an increase in smoke issuing across the left half of the head and discolouration on the frame head.
16:40	Doorset B, There is an increase in smoke issuing at the centre of the head.
17:50	Doorset B, There is an increase in smoke issuing at the right half of the head.
19:00	Doorset A, There is an increase in smoke issuing at the top closing corner and the closer.
31:00	Doorset B, There is an increase in smoke issuing across the head.
33:00	Doorset A, There is smoke issuing at the hanging edge 700mm down.
36:00	Doorset A, There is an increase in smoke issuing at the top hanging corner.
37:00	Doorset B, There is an increase in smoke issuing at the top hanging corner.
39:00	Doorset B, There is an increase in smoke issuing at the top hinge position.
42:00	Doorset B, There is an increase in smoke issuing at the centre of the head only.
46:00	Doorset B, There is smoke issuing at the latch position.
47:00	Doorset B, There is an increase in smoke issuing at the hanging edge 700mm down.
47:40	Doorset A, There is an increase in smoke issuing at the top hanging corner.
50:00	Doorset B, There is smoke issuing at the left half of the head only.
50:50	Doorset A, There is an increase in smoke issuing at the top hanging corner.

53:00	Doorset B, There is an increase in smoke issuing at the hanging edge 800mm down.
53:40	Doorset A, The door handle is sagging.
54:00	Doorset B, The door handle is sagging.
60:30	Doorset A, There is a glow visible at the top hanging corner.
61:55	Doorset A, a cotton pad integrity test was performed at the top hanging corner which did not result in the ignition of the cotton pad. No failure.
62:30	Doorset B, There is a glow visible at the bottom hanging corner.
63:13	Doorset A, a cotton pad integrity test was performed at the top hanging corner which did not result in the ignition of the cotton pad. No failure.
64:22	Doorset A, a cotton pad integrity test was performed at the top hanging corner which did not result in the ignition of the cotton pad. No failure.
65:19	Doorset A, a cotton pad integrity test was performed at the top hanging corner which did not result in the ignition of the cotton pad. No failure.
66:23	Doorset A, a cotton pad integrity test was performed at the top hanging corner which did not result in the ignition of the cotton pad. No failure.
67:45	Doorset A, a cotton pad integrity test was performed at the top hanging corner which resulted in the ignition of the cotton pad therefore constituting **integrity failure**.
69:00	Doorset A, There is continuous flaming at the top hanging corner thereby constituting **further integrity failure**.
70:00	Doorset B, There is an increase in smoke issuing at the closing edge 400mm up.
72:04	Doorset B, a cotton pad integrity test was performed at the bottom closing corner which did not result in the ignition of the cotton pad. No failure.
75:10	Doorset B, There is a glow visible at the hanging edge 800mm down.
76:30	Doorset B, a cotton pad integrity test was performed at the hanging edge 800mm down which did not result in the ignition of the cotton pad. No failure.
77:00	Doorset B, There is a glow visible at the top hinge position.
78:20	Doorset A, There is a glow visible at the top hinge position.
79:30	Doorset A, There is continuous flaming at the bottom closing corner thereby constituting **further integrity failure**.
80.00	Test terminated.

5.5 Leaf edge to frame gaps pre-test measurement



View from unexposed face View from unexposed face

Door Ref	Gap Dimension in mm at Positions											
A	1	2	3	4	5	6	7*	8*	9*	10	11	12
	3.5	3.6	3.3	1.1	1.9	2.0	3.0	3.1	3.0	2.7	2.6	3.0
B	13	14	15	16	17	18	19*	20*	21*	22	23	24
	4.2	3.8	3.7	3.0	2.7	2.2	3.1	3.0	2.9	3.0	3.3	2.7

Door Ref	Gap Between Face of Leaf and Doorstop in mm at Position											
A	1	2	3	4	5	6	7*	8*	9*	10	11	12
	1.8	2.0	2.0	1.5	2.0	2.0	-	-	-	1.9	1.8	1.8
B	13	14	15	16	17	18	19*	20*	21*	22	23	24
	2.0	2.0	2.0	1.7	1.9	2.0	-	-	-	1.9	1.7	1.9

Door Ref	Gap Between Doorframe and Supporting construction in mm at Position											
A	1	2	3	4	5	6	7*	8*	9*	10	11	12
	10.0	14.0	13.0	12.0	18.0	24.0	-	-	-	12.0	11.0	16.0
B	13	14	15	16	17	18	19*	20*	21*	22	23	24
	12.0	10.0	11.0	14.0	12.0	13.0	-	-	-	5.0	5.9	6.0

* Dimension not included in calculations at the bottom
# Gap not measured

5.6 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 standard were satisfied for the following periods:

	Doorset A	Doorset B
Integrity	67 (sixty seven) minutes	80 (eighty) minutes*
Insulation	67 (sixty seven) minutes **	80 (eighty) minutes*

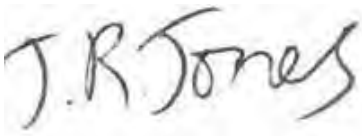
* No failure at test termination.
** Failure by virtue of integrity failure.

6 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 specimens provided for testing, and the door to frame gaps recorded in Section 5.5 of this report. Further, where information in relation to the specimen has been provided to us but not verified by us, we have assumed that it is correct; and where comments above identify particular materials or substances comprised in the specimen those comments are based on information supplied to us and/or on general visual inspection undertaken during the process of testing of the sample, and in either case have not been verified by reference to materials testing or documentary evidence except as described above. The fire resistance performance of doors of this design may be different if any aspect of the design or construction differs from that tested. This includes, by way of example only, any difference as a result of (i) any deviation from the information supplied to us, or (ii) the employment of different door to frame gaps. The tested assembly was asymmetrical and was tested such that the door leaf of doorset A opened into the heating conditions of the test and the door leaf of doorset B opened away from the heating conditions of the furnace. The test result may not be appropriate to situations where by the samples tested have been installed in a different configuration to that which they are tested.

The specification and interpretation of fire test methods are the subject of ongoing development and refinement. Changes in associated legislation may also occur. No assurance can be given that this test or its results will reflect current practice, and/or be consistent with prevailing legislative / regulatory requirements, at any time after the date of this report. Warringtonfire will be able to offer the addressee of this report, at any time on request, 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. It is strongly recommended that, at the latest, such a review be sought at intervals of no more than five years.

	Written and checked by:	Authorised by:
Signature:		
Name:	John Jones	Nikolas Whitelock
Title:	Technical Officer	Technical Manager
Date of issue:	19/09/2019	19/09/2019

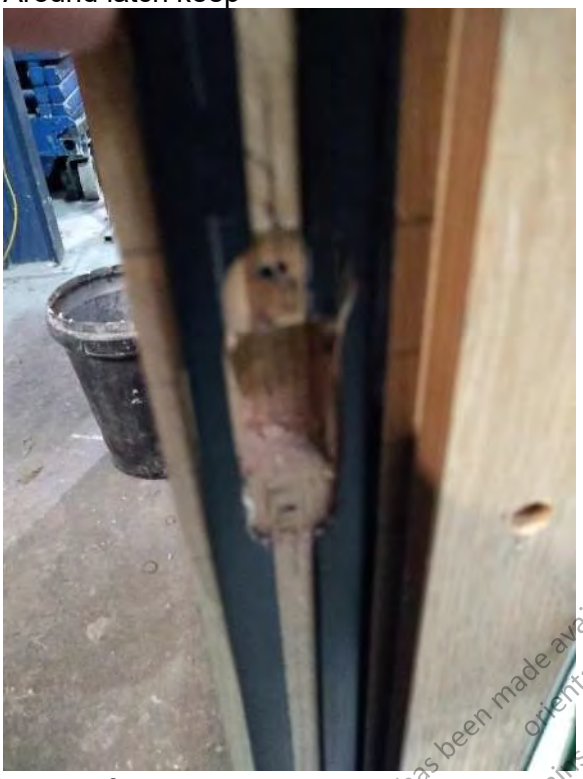
Photographs

Intumescent interruptions by hardware

Around hinge blade

Around closer slide channel

Around latch keep



Closer body in leaf head

At start of test

At 15 minutes

At 30 minutes

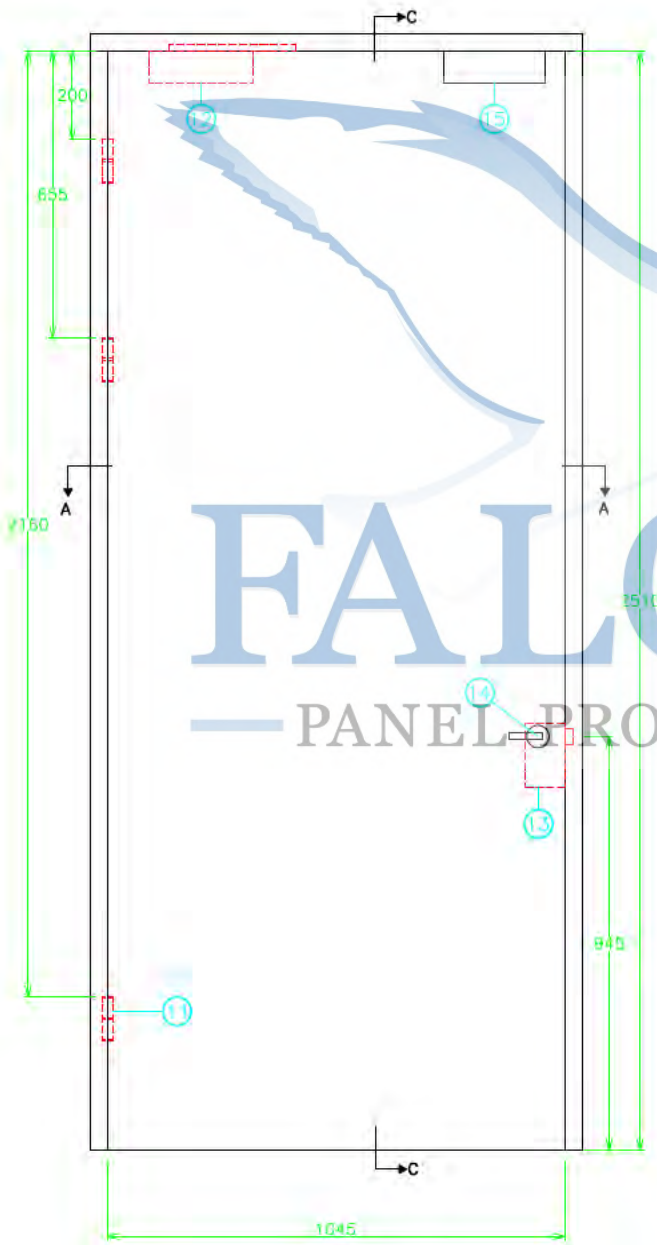
After 45 minutes

At 60 minutes

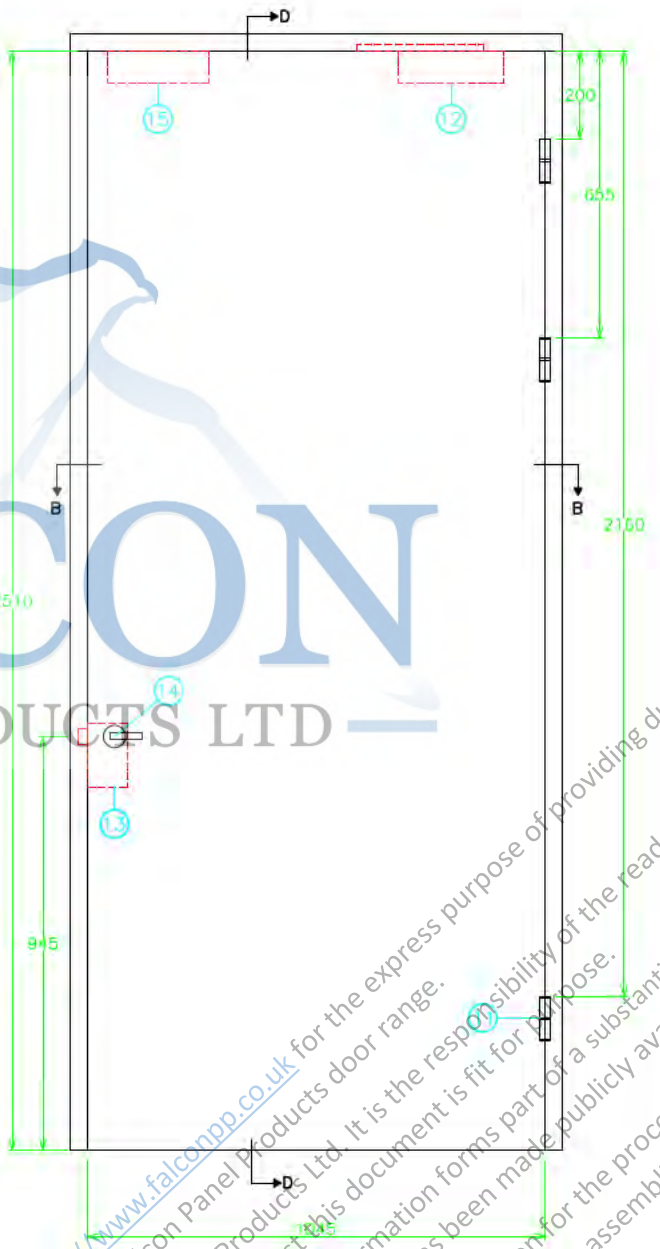
Exposed face – post test

Appendix – clients drawing and figures 1 to 4

Doorset A



Doorset A



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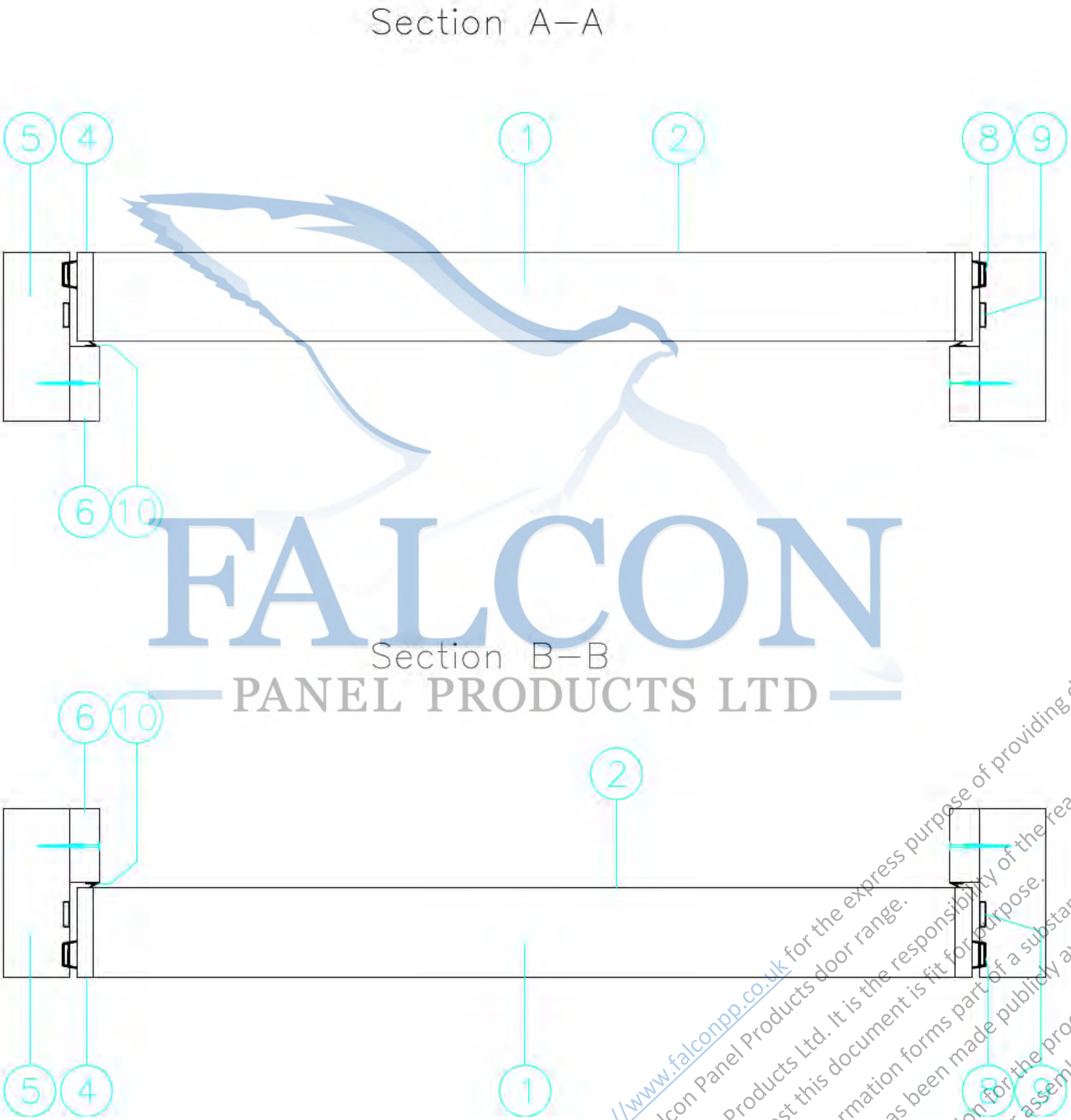
Title: Unexposed face elevation showing hardware positions
(All dimensions in mm)

Date Drawn	Drawn By	Scale
02/07/19	ARD	NTS
Project No. WF 414533		Appendix

Falcon Panel Products Ltd



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Title	Horizontal cross–sections (All dimensions in mm)

Date Drawn	Drawn By	Scale
02/07/19	ARD	NTS

Project No.	
WF 414533	Appendix

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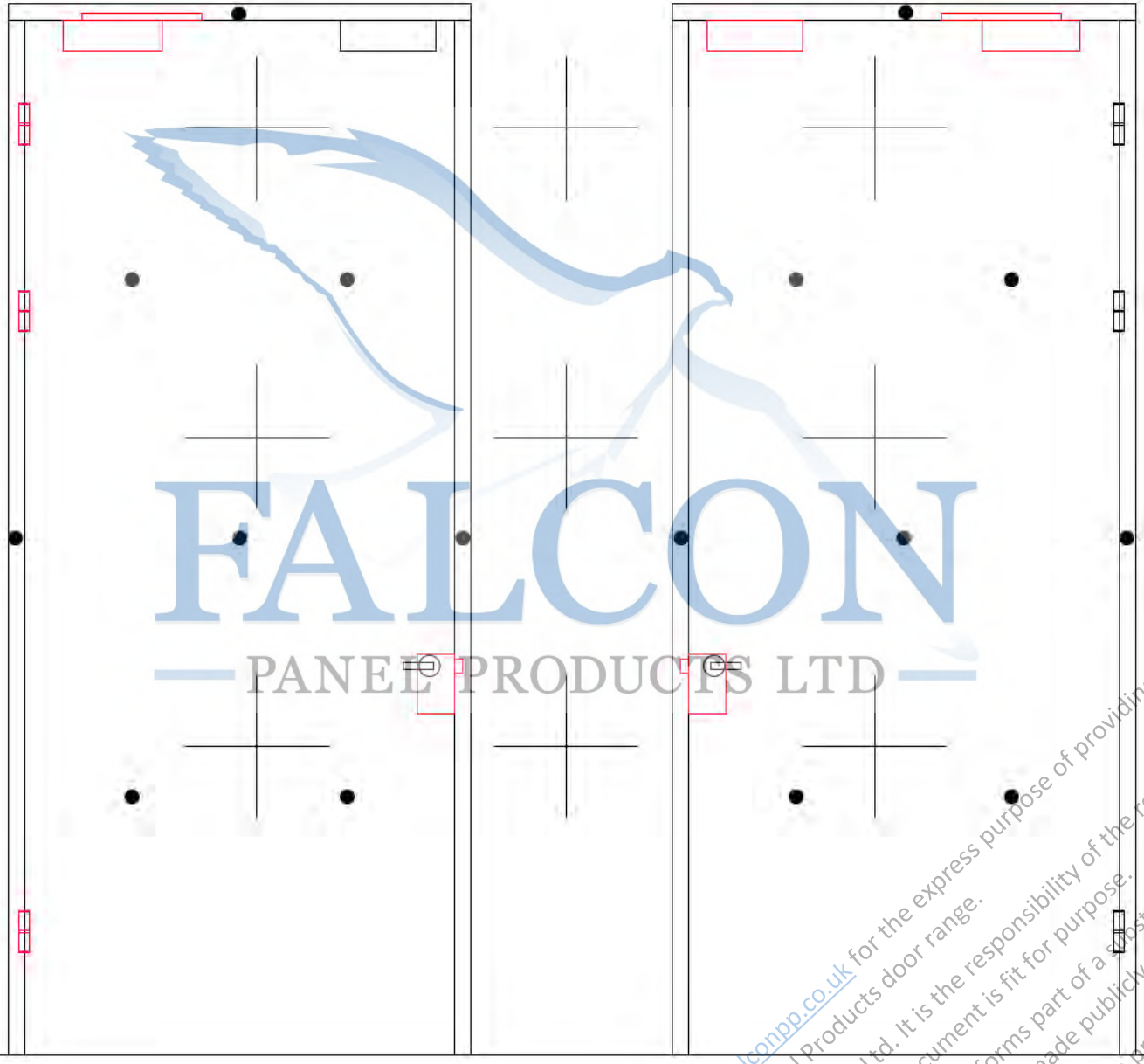
Title
Vertical cross-section
(All dimensions in mm)

Date Drawn	Drawn By	Scale
02/07/19	ARD	NTS
Project No. WF 414533		Appendix

Doorset A

Doorset A



+ : Furnace Thermocouples

• : Unexposed Face Thermocouples

Viewed From Unexposed Face

Warringtonfire, Stocking Lane, Hughenden Valley, High Wycombe, Buckinghamshire, HP14 4ND, UK.
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Title: Thermocouple positions

(All dimensions in mm)

Date Drawn	Drawn By	Scale
02/07/19	ARD	NTS

Project No.	
WF 414533	Appendix