



Title:

The fire resistance performance of a one and a half leaf single-acting doorset, when tested in accordance with BS 476: Part 20/22: 1987

WF Report No:

421142



Prepared for:

Falcon Panel Products Ltd

Clock House
Station Approach
Shepperton
Middlesex
TW17 8AN

Test date:

8th November 2019



1762

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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: <table border="1" data-bbox="778 616 1246 745"> <tr> <td>Integrity</td><td>67 minutes</td></tr> <tr> <td>Insulation</td><td>67 minutes *</td></tr> </table> <p>* Failure by virtue of integrity failure</p>	Integrity	67 minutes	Insulation	67 minutes *
Integrity	67 minutes				
Insulation	67 minutes *				

	Summary of specimen: A one and a half leaf single-acting doorset, with an engaged latch and engaged flush bolts. Both leaves hung opening out away from the furnace Leaf size – left leaf: 2512mm high x 470mm wide x 54mm thick right leaf: 2512mm high x 970mm wide x 54mm thick
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1 Introduction

The doorset was manufactured and supplied for test by the client and delivered on 6th November 2019. At the request of the client, Warringtonfire constructed a plasterboard clad timber stud supporting construction and the client then installed the specimen into the wall.

2 Specification

Details of the specimen are shown in the Appendix.

2.1 Door leaf

The left leaf measured 2512mm high x 470mm wide x 54mm thick and the right leaf measured 2512mm high x 970mm wide x 54mm thick. The doorset was hung to open out away from the furnace. The results of this test were obtained from a doorset fitted with an engaged latch and an engaged flush bolts.

2.2 Door perimeter gaps

The gaps between the edge of the door and frame were measured prior to test. A total of 21 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 Moment	Closing Moment
Left leaf	None fitted	
Right leaf	24	14

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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 blank

		Species/type	Dimensions (mm)	Density (kg/m³)	Moisture (% w/w)	Key to figures
Stiles and rails		None fitted	-	-	-	-
Core		Falcon Panel Products Strebord particleboard with a 0.5 thick oak veneer*	54 thick	Nominally 520-630*	12.1-13.3	1
Adhesive	Lippings	Dynea - Prefere 4152 urea formaldehyde polymer glue*	-	-	-	-
	Veneer	Dynea - Prefere 4152 urea formaldehyde polymer glue*	-	-	-	-
Lippings – all edges		American white oak*	19 thick	770**	-	2

* Stated by client, not verified by laboratory

** Nominal density – TRADA Timber database

Door frame

	Species/type	Dimensions (mm)	Density (kg/m ³)	Moisture (% w/w)	Key to figures
Head and jambs	American white oak*	40 wide x 101 deep	770**	11.3-11.9	3
Head to jamb jointing detail	Mortice and tenon– glued with Dynea - Prefere 4152 urea formaldehyde polymer glue*	-	-	-	-
Stop – planted (pinned)	American white oak*	18 high x 43 wide	770**	-	4
Frame to supporting construction fire stopping detail	Rockwool mineral fibre for full depth of frame capped with intumescent mastic on both faces	Nominally 5 – 17 wide x 10 deep mastic size	-	-	-
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
Right leaf closing edge	Lorient Polyproducts Ltd LP1504 Type 617	15 x 4	Fitted 33mm from the opening face	5
	Lorient Polyproducts Ltd LP1504DS Type 617	15 x 4	Fitted 8mm from the opening face	6
Leaf head	Lorient Polyproducts Ltd LP1504 Type 617	15 x 4	Fitted centrally along leaf head	7
Leaf – bottom edge	Lorient Polyproducts Ltd drop seal Ref. LAS8001 si	57 high x 18 wide (end plate size)	Fitted 8mm from the closing face along the bottom edge of both leaves	8
Frame reveal – head and jambs	Lorient Polyproducts Ltd LP1504 Type 617	15 x 4	Fitted 32mm from the exposed face	9
	Lorient Polyproducts Ltd LP1504DS Type 617	15 x 4	Fitted 7mm from the exposed face	10
Acoustic seal	Lorient Polyproducts Ltd LAS 1206	10 x 4	Self-adhered to the upstand of the stop	11

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Intumescent interruptions and additional hardware protection

	Make/type	Size (mm)	Location
Around hinge blade	Partially interrupted	-	Hinge blade fully interrupts 1 st seal in frame reveal leaving 2 nd seal continuous
Under hinge blade	Tectus 8820 kit, graphite type*	1 thick*	Fitted under hinge blade on frame and leaf
Around concealed closer	Partially interrupted	-	Concealed closer fully interrupts seal in leaf head, and closer arm partially interrupts both seals in frame head with 10mm of both seals remaining continuous
Under concealed closer	Manufacturers supplied graphite intumescent kit	-	Fitted as per the manufacturer's instructions
Around latch forend	Partially interrupted	-	Latch forend partially interrupts both seals in right leaf edge with 10mm of both seals remaining continuous
Under latch forend	Sealed Tight Solutions Limited raw graphite*	1 thick*	Fitted under the latch forend
Encasing latch body	Sealed Tight Solutions Limited raw graphite*	1 thick*	Fitted encasing latch the latch body*
Under latch keep	Sealed Tight Solutions Limited raw graphite*	1 thick*	Fitted under the latch keep
Around flush bolt keep	Partially interrupted	-	Flush bolt keep fully interrupts 1 st seal in the frame reveal, leaving the second seal continuous.
Under flush bolt keep	Sealed Tight Solutions Limited raw graphite*	1 thick*	Fitted under the flush bolt keep*
Lining flush bolt rebates	Sealed Tight Solutions Limited raw graphite*	1 thick*	Fitted lining the rebate*
Around drop seal	Partially interrupted	-	Drop seal fully interrupts 2 nd seal leaving first seal continuous in the meeting edge of the right leaf
Lining drop seal rebate	Sealed Tight Solutions Limited raw graphite*	1 thick*	Fitted lining the rebate*

* Stated by client, not verified by laboratory

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Hardware

	Make/type	Size (mm)	Location	Key to figures
Hinge	3No. Simonswerk Tectus 527FR hinges*	155 x 26 x 33 (blade size)*	Fitted 200mm, 655mm and 2140mm from the head of the leaf	12
Closer – right leaf only	Geze 2-4 Boxer concealed overhead type closer*	440 x 20 (closer arm footprint)*	Closer body rebated into right leaf head, closer arm rebated into frame head, as per the manufacturer's instructions	13
Latch - engaged	AGB mortice lock/latch and keep	196 x 18 x 3 (forend size)* 81 x 22 (keep size)	Latch nib fitted 945mm from the bottom of the leaf	14
Furniture	Olivari conca round rose lever type handle and escutcheon	Ø51 (rose size)	Fitted appropriate to the latch	15
	Self-adhesive 'Fire door' signs	Ø75	Fitted 975mm from the head of the leaf	16
Flush bolts – engaged	Eurospec FBT1008/R*	204 x 19.5 x 38*	Fitted 6mm from the unexposed face in the left leaf closing edge	17

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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 10°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 was monitored by means of five thermocouples fixed to the surface of the door leaves, and four thermocouples attached to the frame, one at mid-height on each jamb and one centrally located above each 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 doorset are shown graphically in Section 5.2.

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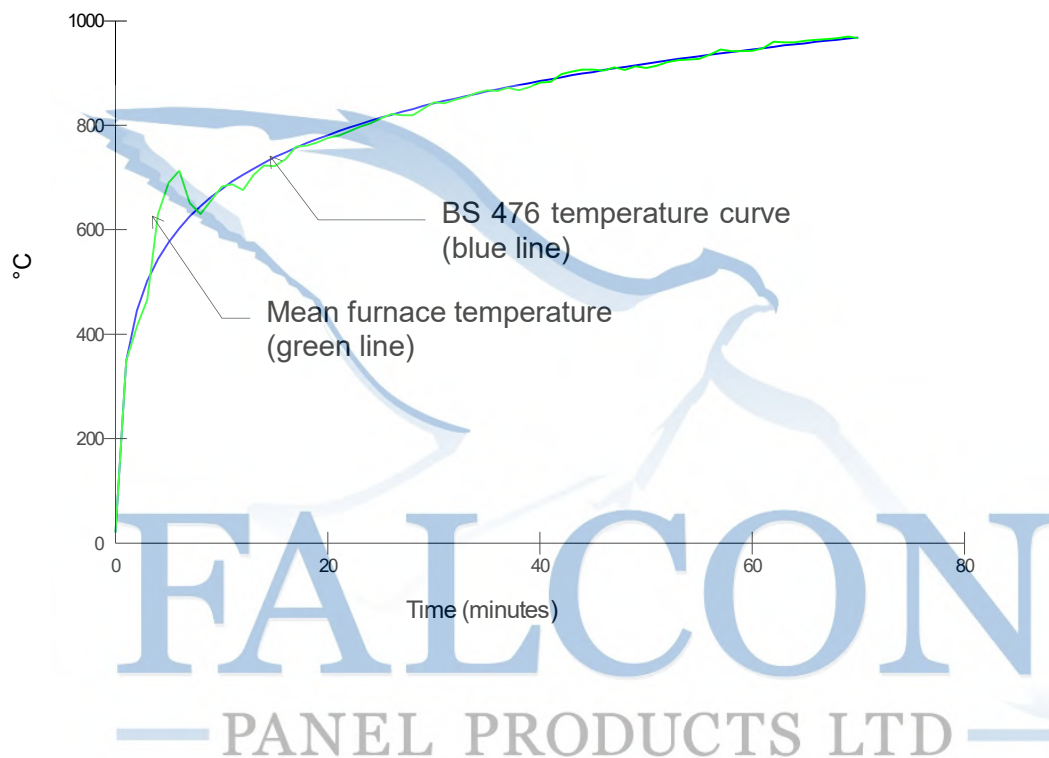
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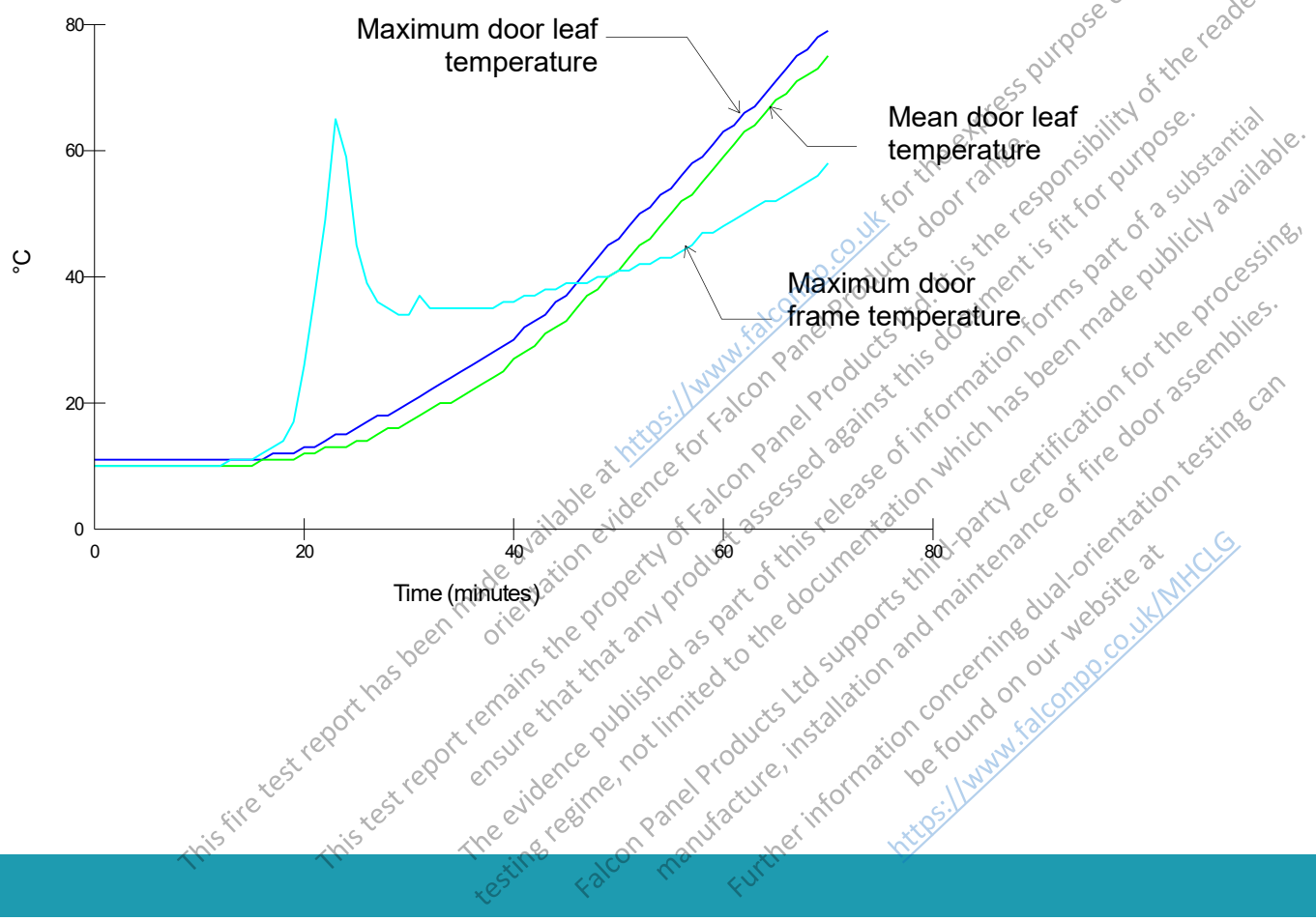
5 Test results

The following data and observations were recorded during the test.

5.1 Furnace Temperature Curve



5.2 Unexposed Face Temperature Curves



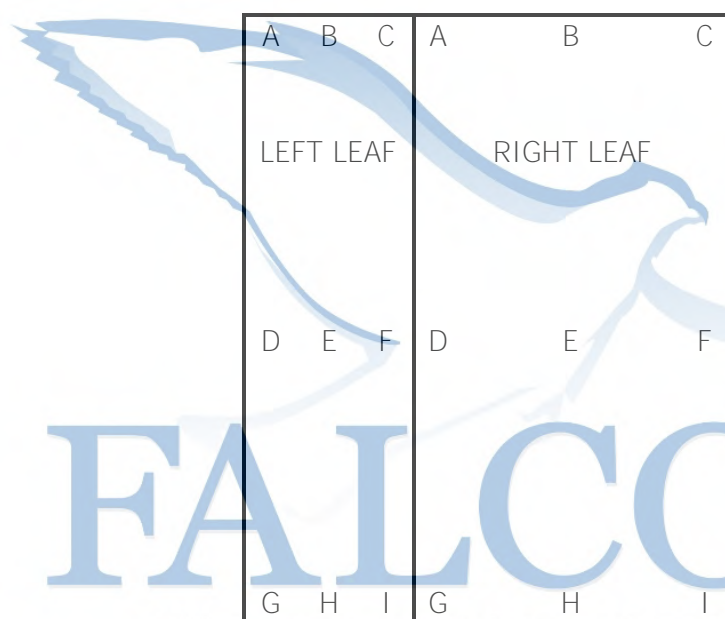
5.3 Door Distortion Data

The following tables show the distortion of the door leaves in mm with an accuracy of $\pm 1\text{mm}$.

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.



Left leaf - hung on the left 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	0	1	0	-1	-1	-1	-1	0	-1	0	0	0
30	1	1	3	0	0	2	0	0	0	0	0	-1
45	1	1	1	1	-8	-12	3	-2	-5	-1	-1	0
60	5	2	-1	3	-19	-30	-	-	-	-	-	-

Right 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	0	1	1	0	1	2	-3	-1	-1	0	0	-1
30	0	0	0	-5	-4	1	-2	-3	-1	-1	-1	-1
45	-1	-1	2	-21	22	0	-14	-16	-1	-	-	-1
60	-2	-1	4	-36	-39	2	-25	-38	-4	-	-	-1

Where a dash (-) applies, a distortion measurement could not be taken

5.4 Observations

All comments relate to the unexposed face unless otherwise specified.

Time (minutes)	Comments
00:00	Test Started
03:06	There is smoke issuing at the top meeting edge.
03:25	There is smoke issuing at the top hinge position of the left leaf.
03:41	There is smoke issuing at the bottom hinge position of the right leaf.
04:00	There is smoke issuing at the top hanging corner and the top meeting corner of the left leaf.
04:00	There is smoke issuing at the top meeting corner, the top hanging corner and the centre of the right leaf.
04:54	There is smoke issuing at the latch.
05:10	There is smoke issuing at the keyhole.
06:13	There is moisture across the centre of the head of the right leaf.
07:26	There is smoke issuing at the threshold of the left leaf.
13:00	There is an increase in smoke issuing at the head of the right leaf.
23:29	There is discolouration on the frame above the right leaf.
35:34	There is discolouration on the left leaf by the hanging edge, approximately 600mm down from the top hanging corner.
35:40	There is a glow visible at the threshold at the door gap of the right leaf. The furnace is visible.
40:28	There is smoke issuing from the middle hinge position to the top hanging corner of the left leaf.
41:38	There is discolouration at the centre of the base of the right leaf.
48:09	The handle has dropped.
49:52	There is discolouration and smoking issuing at the top hinge position on the right leaf.
50:30	There is discolouration around the handle and escutcheon.
52:00	There is discolouration at the bottom hanging corner of the left leaf.
53:32	There is discolouration at the bottom hinge position of the right leaf.
54:35	There is discolouration at the top of the meeting edge.
54:50	There is intermittent flaming through the gap at the threshold of the right leaf.

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- 60:49 A cotton pad test was performed at the threshold of the right leaf which did not result in the ignition of the cotton pad. No failure.
- 65:21 A cotton pad test was performed at the threshold of the right leaf which did not result in the ignition of the cotton pad. No failure.
- 66:06 There is burn-through at the bottom meeting corner of the right leaf.
- 66:38 A cotton pad test was performed at the bottom meeting corner of the right leaf which did not result in the ignition of the cotton pad. No failure.
- 67:18 There is continuous flaming at the handle, thereby constituting **integrity failure**.
- 67:56 There is continuous flaming at the threshold of the right leaf, thereby constituting **further integrity failure**.
- 68:00 Test terminated.



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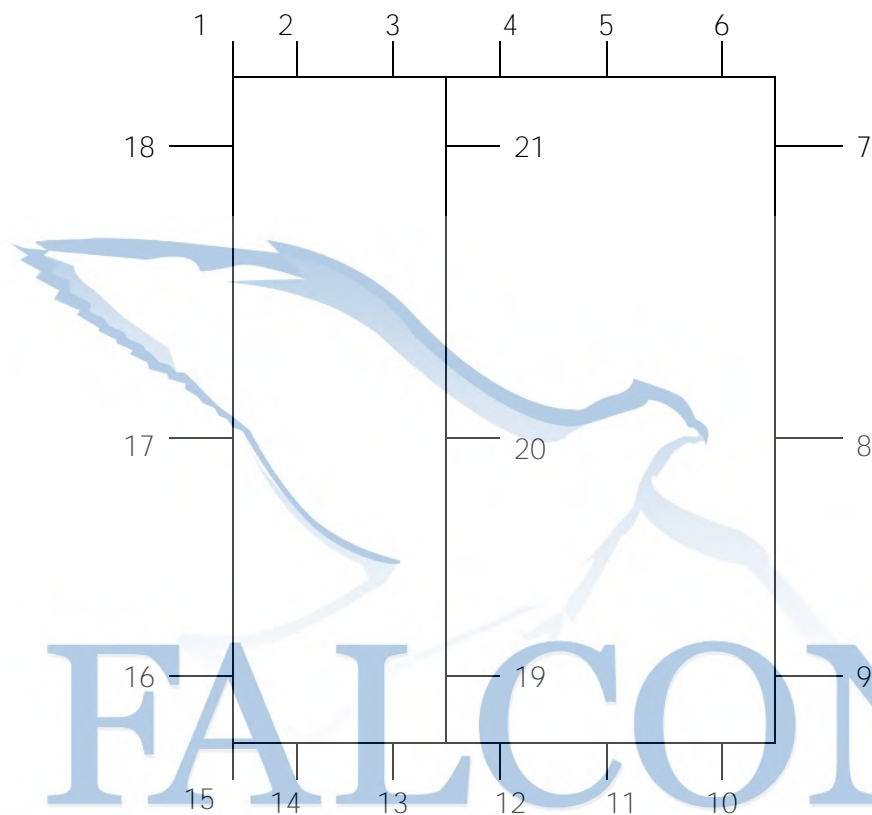
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5.5 Leaf edge to frame gaps pre-test measurement



Gap Dimension in mm at Position											
1	2	3	4	5	6	7	8	9*	10*	11*	12*
3	2.9	2.9	3	2.1	2	2.6	2.2	3	5.2	5	5.1
13*	14*	15	16	17	18	19	20	21			
5.2	5.1	5	2.7	2.3	3	2.7	2.6	2.5			
Mean		2.8		Maximum		5.0		Minimum		2	

Gap Between Face of Leaf and Doorstop in mm at Position											
1	2	3	4	5	6	7	8	9	10	11	12
2.5	2.4	2.5	2.4	2.4	2.3	2.3	2.3	2.5	-	-	-
13	14	15	16	17	18	19	20	21			
-	-	2.5	2.5	2.4	-	-	-	-			

Gap Between Doorframe and Supporting Construction in mm at Position											
1	2	3	4	5	6	7	8	9	10	11	12
12	13	14	15	16	17	11	13.6	15	-	-	-
13	14	15	16	17	18	19	20	21			
-	-	5	6	5	-	-	-	-			

* Dimension not included in calculations

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:

Integrity	67 minutes
Insulation	67 minutes*

* Failure by virtue of integrity failure

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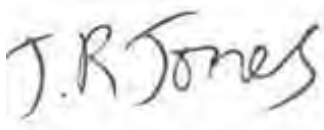

6 Limitations

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 leaves opened away from the heating conditions of the test. 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.

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	Written and checked by:	Authorised by:
Signature:		
Name:	John Jones	Victor Kearley
Title:	Technical Officer	Technical Author
Date of issue:	20/02/2020	20/02/2020

Photographs

Intumescent interruptions by hardware

Around hinge blade



Around latch forend



Closer arm channel in frame head



Around drop seal



Intumescent under latch keep



At start of test



After 15 minutes



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At 30 minutes



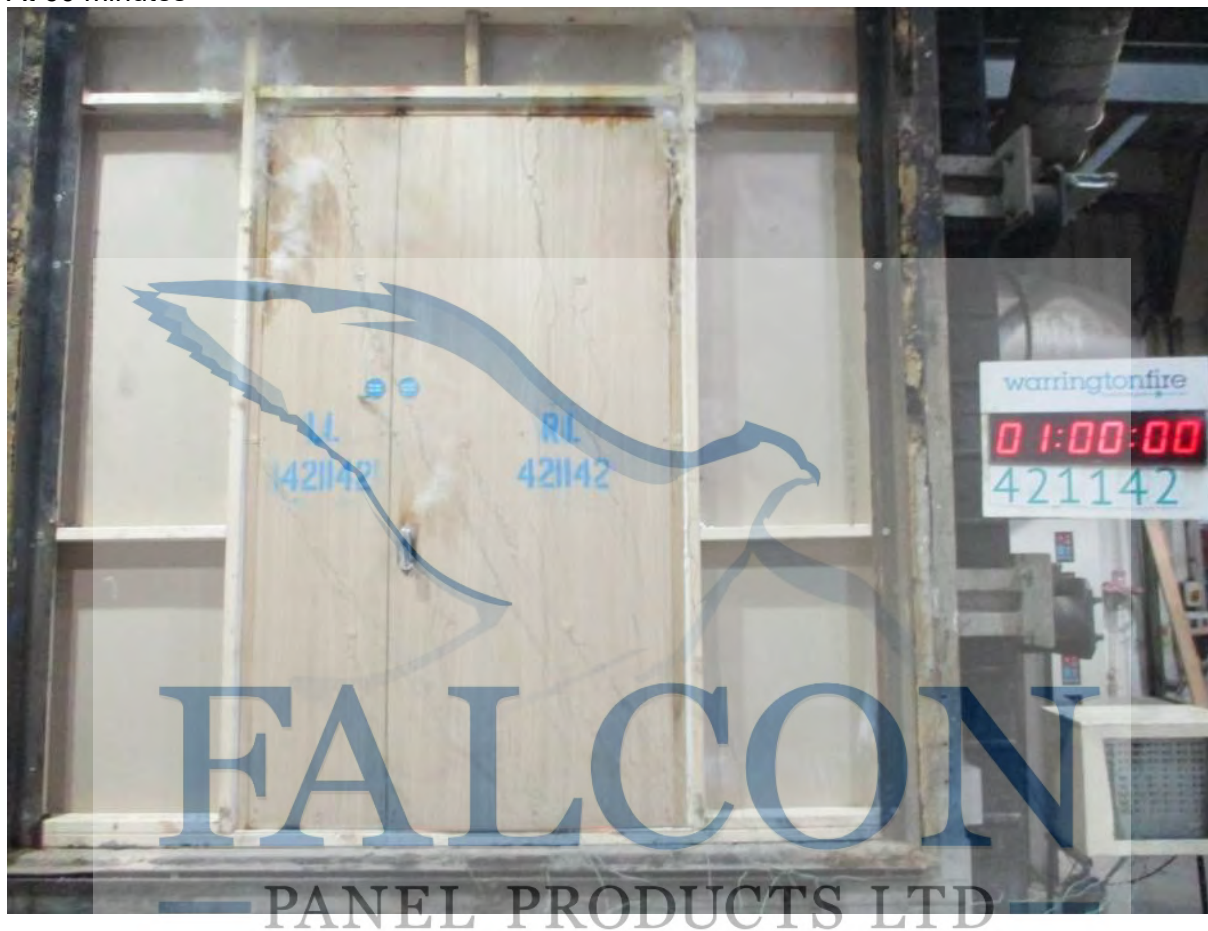
At 45 minutes

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At 60 minutes



Exposed face – post test



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Appendix – Figures 1 to 4



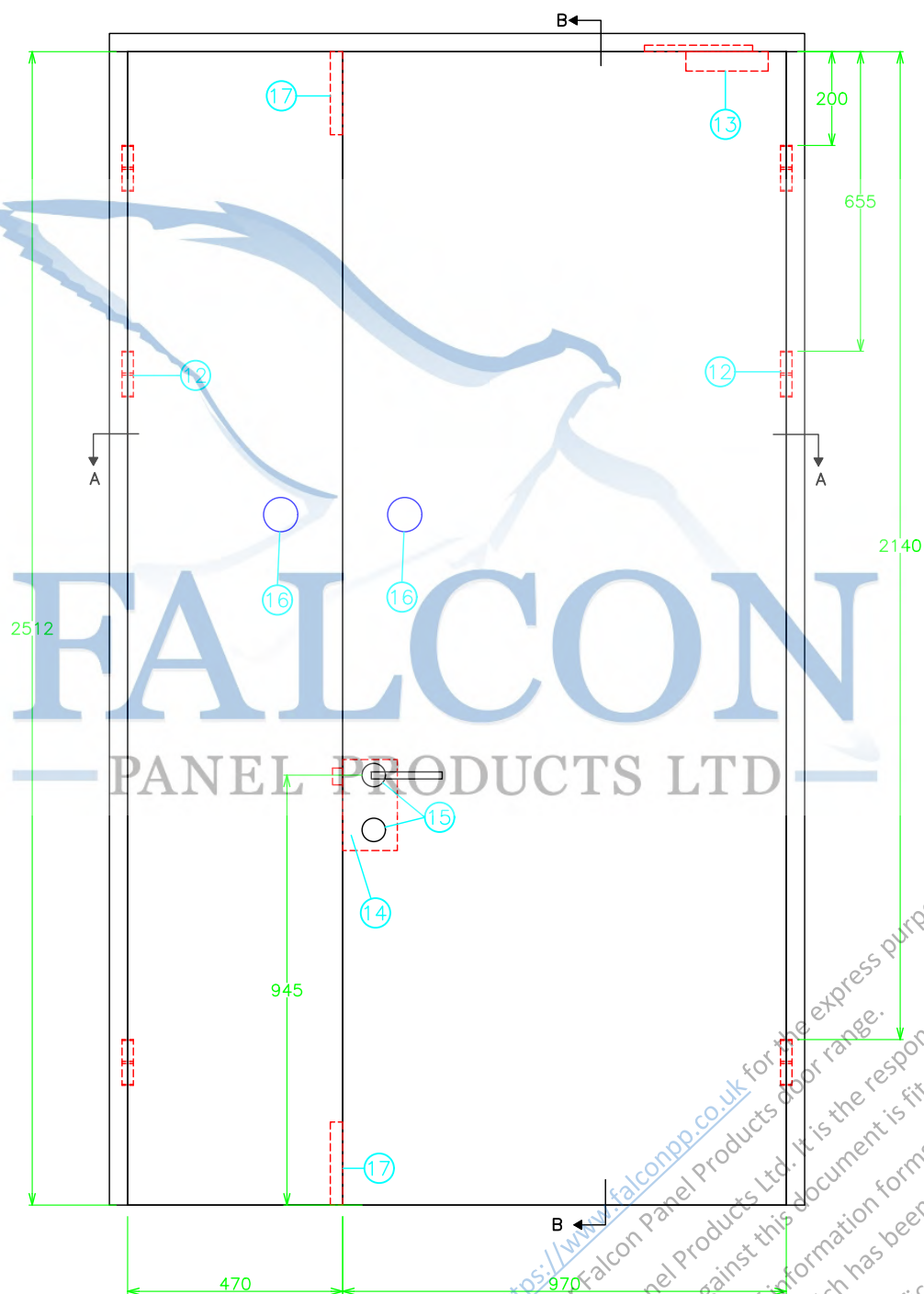
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warringtonfire
 Proud to be part of BSI

Warringtonfire, Stocking Lane,
 Hughenden Valley, High Wycombe,
 Buckinghamshire, HP14 4ND, UK.
 Tel: +44 (0)1494 569750

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

Date Drawn

12/11/19

Drawn By

ARD

Scale

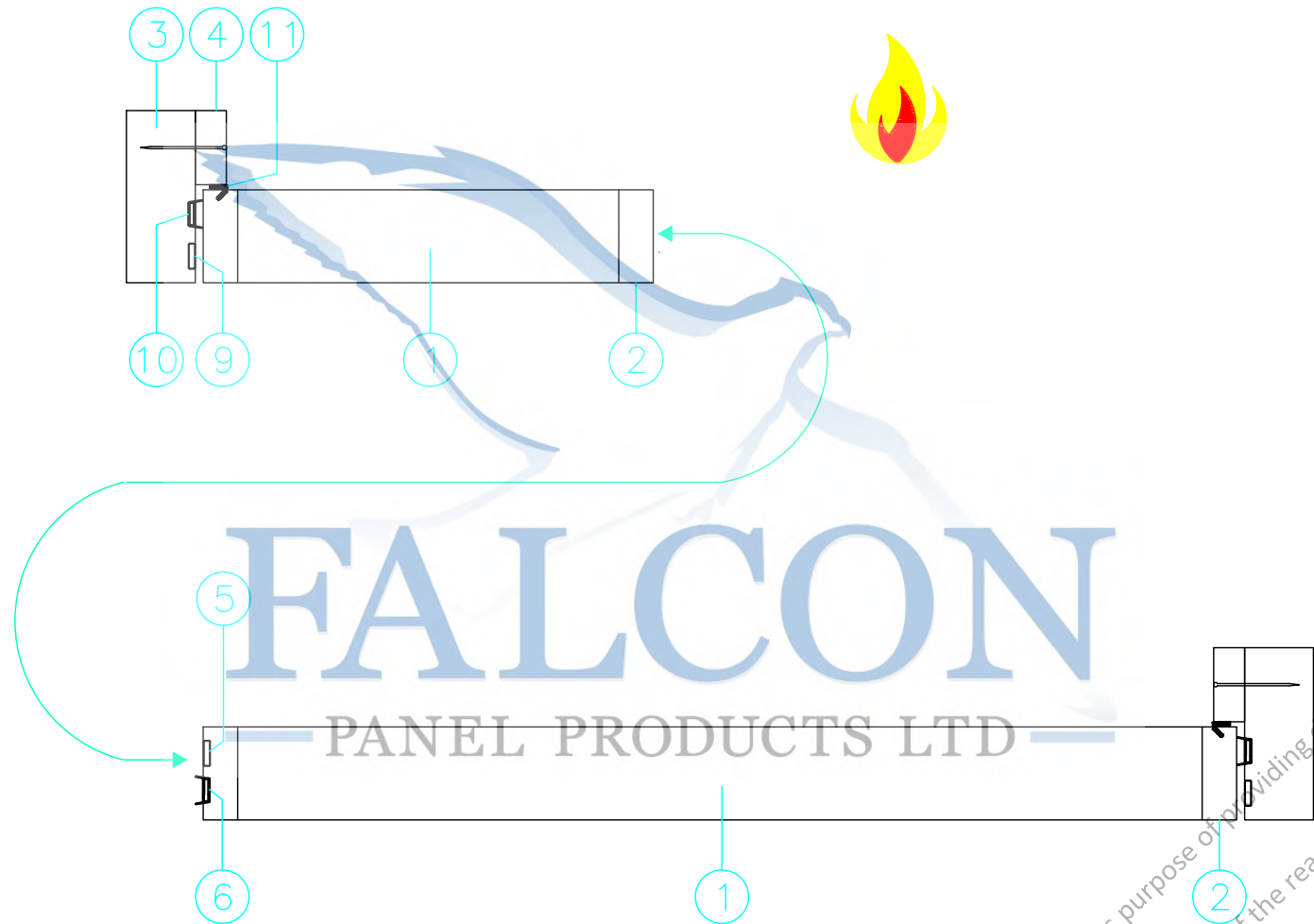
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Project No.

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Appendix

Section A-A



Section B-B



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Warringtonfire, Stocking Lane
Hughenden Valley, High Wycombe,
Buckinghamshire, HP14 4ND, UK.
Tel: +44 (0)1494 569750

Title

Vertical cross-section
(All dimensions in mm)

Date Drawn

12/11/19

Drawn By

ARD

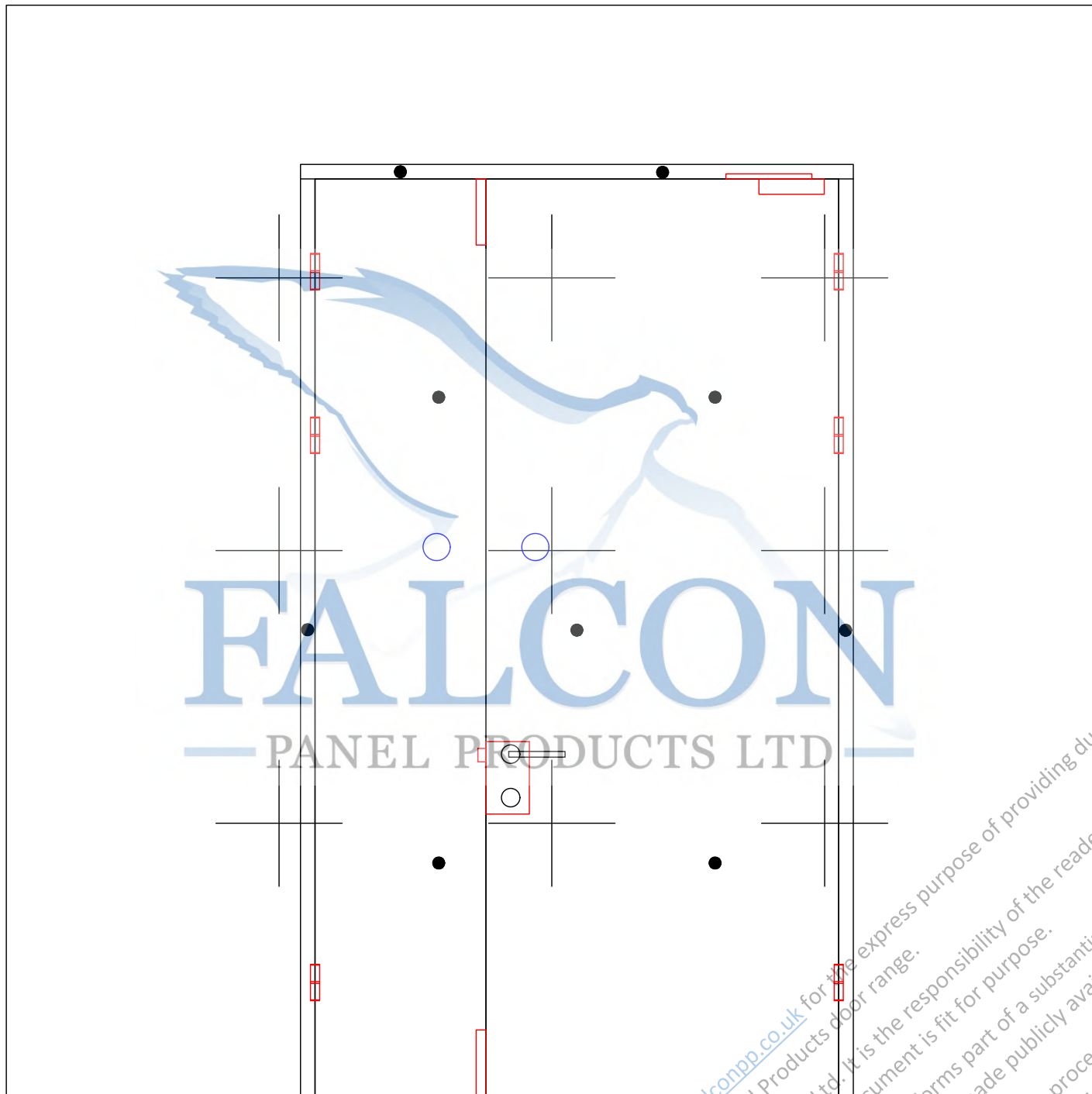
Scale

NTS

Project No.

WF 421142 AR1

Appendix



- ✚ : Furnace Thermocouples
● : Unexposed Face Thermocouples

Viewed From Unexposed Face

warringtonfire
Proud to be part of **BSI**

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Buckinghamshire, HP14 4ND, UK.
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Title Thermocouple positions
(All dimensions in mm)

Date Drawn
12/11/19

Drawn By
ARD

Scale
NTS

Project No.
WF 421142

Appendix