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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:

414535

Prepared for:

Falcon Panel Products Ltd

Clock House
Station Approach
Shepperton
Middlesex
TW17 8AN

Test date:

10th July 2019

1762

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:

Integrity	64 (sixty four) minutes
Insulation	64 (sixty four) minutes *

* Failure by virtue of integrity failure

Summary of specimens:

A latched one and a half leaf single acting doorset, hung opening in towards the furnace

Leaf size –
left leaf: 2522mm high x 970mm wide x 54mm thick

right leaf: 2522mm high x 470mm wide x 54mm thick

1 Introduction

The doorset was manufactured and supplied for test by the client and delivered during July 2019. At the request of the client, Warringtonfire constructed a plasterboard clad timber stud supporting construction and 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 2522mm high x 970mm wide x 54mm thick and the right leaf measured 2522mm high x 470mm wide x 54mm thick. The doorset was hung to open in towards the furnace. The results of this test were obtained from a doorset fitted with an engaged latch.

2.2 Door perimeter gaps

The gaps between the edge of the door and frame were measured prior to test. A total of 16 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)
Left leaf	37	13
Right leaf	None fitted	

3 Description of Construction (Refers to clients drawings and 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		Oak veneered Falcon Panel Products Strebord particleboard*	54 thick	520-630*	7.2-7.8	1
Adhesive	Lippings	Dynea - Prefere 4152 urea formaldehyde polymer glue*	-	-	-	-
	Veneer	Dynea - Prefere 4152 urea formaldehyde polymer glue*	-	-	-	-
Lippings – all edges		American White Oak	20 thick	770**	8.1	2

* 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 101 deep	770**	9.0	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**	8.1	4
Frame to supporting construction fire stopping detail	Rockwool mineral fibre for full depth of frame capped with intumescent mastic on both faces	Nominally 14.5 - 30 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
Left leaf closing edge	Lorient Polyproducts Ltd LP1504DS Type 617	15 x 4	Fitted 8mm from the exposed face	5
	Lorient Polyproducts Ltd LP1504 Type 617	15 x 4	Fitted 33mm from the exposed face	6
Leaf – bottom edge	Lorient Polyproducts Ltd drop seal Ref. LAS8001 si	56.5 high x 18 wide (end plate size)	Fitted 28mm from the exposed face rebated into the bottom edge of the leaf	7
Frame reveal – head and jambs	Lorient Polyproducts Ltd LP1504 Type 617	15 x 4	Fitted 8mm from the exposed face	8
	Lorient Polyproducts Ltd LP1504DS Type 617	15 x 4	Fitted mm from the exposed face	9
Acoustic seal	Lorient Polyproducts Ltd LAS 1206	10 x 4	Self-adhered to the upstand of the stop	10

Intumescent interruptions and additional hardware protection

	Make/type	Size (mm)	Location
Around hinge blade	Partially interrupted	-	Hinge blade fully interrupts 1st seal in frame reveal leaving 2nd seal continuous
Under hinge blade	Tectus 8820 graphite type kit*	1 thick	Fitted under hinge blade on frame and leaf
Around concealed closer	Partially interrupted	-	Concealed 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 manufacturers instructions
Around latch forend	Partially interrupted	-	Latch forend partially interrupts both seals in left leaf edge with 10mm of both seals remaining continuous
Under latch forend	Sealed Tight Solutions Ltd graphite type*	1 thick	Fitted under the latch forend
Encasing latch body	Sealed Tight Solutions Ltd graphite type*	1 thick	Fitted encasing latch body
Under latch keep	Sealed Tight Solutions Ltd graphite type*	1 thick	Fitted under the latch keep
Around flush bolt keep	Partially interrupted	-	Flush bolt keep fully interrupts

* Stated by client, not verified by laboratory

Intumescent interruptions and additional hardware protection (continued)

	Make/type	Size (mm)	Location
Under flush bolt keep	Sealed Tight Solutions Ltd graphite type*	1 thick	Fitted under the flush bolt keep
Lining flush bolt rebates	Sealed Tight Solutions Ltd graphite type*	1 thick	Fitted lining the rebate
Around drop seal	Partially interrupted	-	Drop seal fully interrupts 2nd seal leaving 1st seal intact
Lining drop seal rebate	Sealed Tight Solutions Ltd graphite type*	1 thick	Fitted lining the rebate

* Stated by client, not verified by laboratory

Hardware

	Make/type	Size (mm)	Location	Key to figures
Hinge	3No. Simonswerk soss hinges Ref. Tectus 527FR*	155 x 26 x 33 (blade size)	Fitted 200mm, 655mm and 2160mm from the head of the leaf	11
Closer – left leaf only	Geze Boxer concealed overhead type closer*	460 x 20 (closer arm footprint)	Closer body rebated into left leaf head, closer arm rebated into frame head, as per the manufacturers instructions	12
Latch - engaged	AGB mortice lock/latch and keep	195 x 17.5 (forend size)	Latch nib fitted 940mm from the bottom of the leaf	13
Furniture	Olivan lever type handle and lock escutchen	Ø51 (rose size)	Fitted appropriate to the latch	14
	Self-adhesive 'Fire door' signs	Ø75	Fitted 975mm from the head of the leaf	15
Flush bolts	Eurospec Ref. FBT1008/R*	204 x 19.5 x 38*	Fitted 6mm from the exposed face in the right leaf closing edge	16

* 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 22°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.

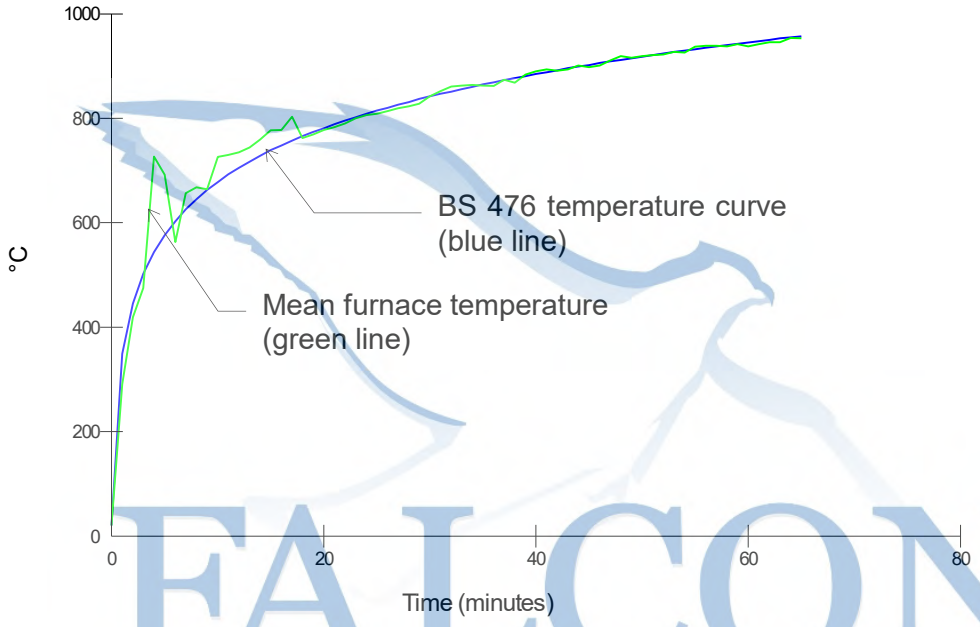
The temperature of the unexposed face was monitored by means of five thermocouples fixed to the surface of the door leaves, and four thermocouples attached to the frame, one at mid-height on each jamb and one centrally located above each leaf on the frame head.

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.

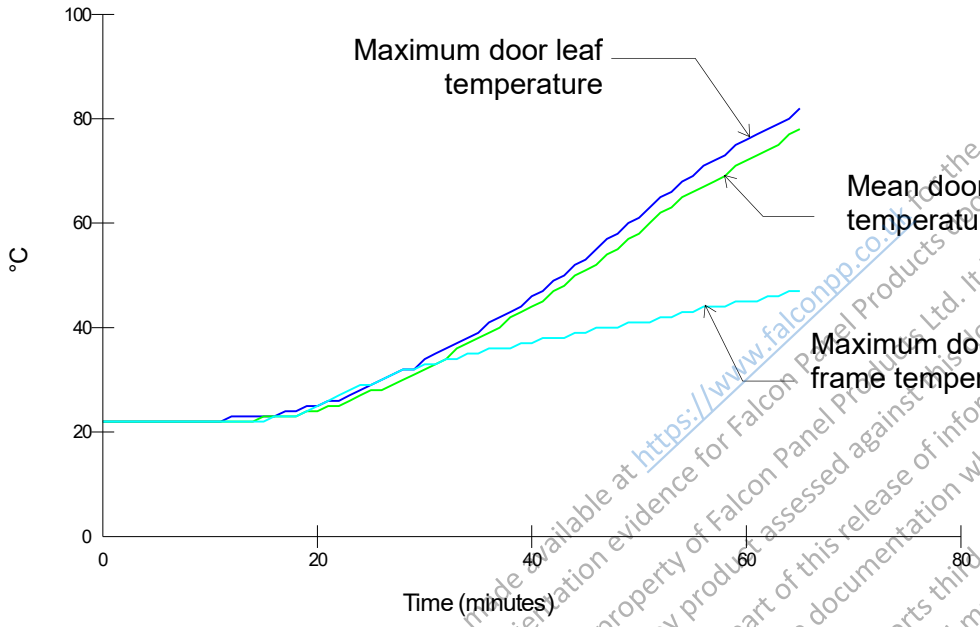
5 Test results

The following data and observations were recorded during the test.

5.1 Furnace Temperature Curve

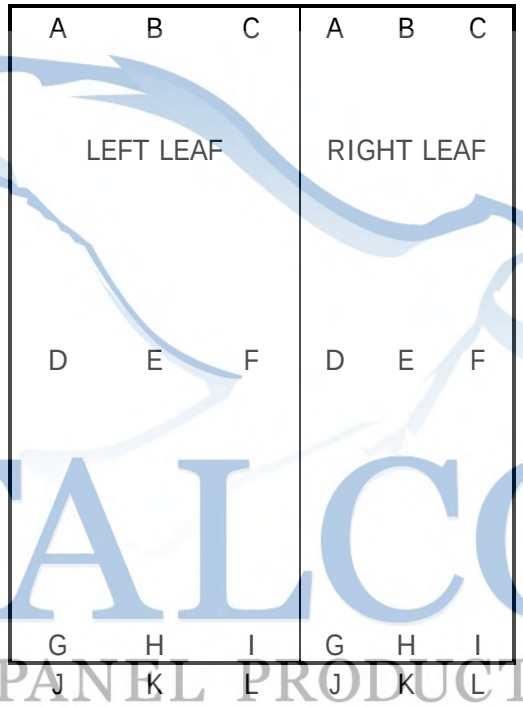


5.2 Unexposed Face Temperature Curves



5.3 Door Distortion Data

The following tables show the distortion of the door leaves in mm with an accuracy of ±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.



Left 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	2	-1	4	4	-3	0	1	0	-1	-1	-1	-4
30	4	2	5	4	-5	-4	0	0	1	-2	-2	-4
45	4	-3	4	0	-16	-17	1	-4	-3	-2	-3	-
60	8	-5	5	1	-56	-47	3	-7	-1	-2	-3	-

Right leaf - hung on the right and opening in towards the furnace

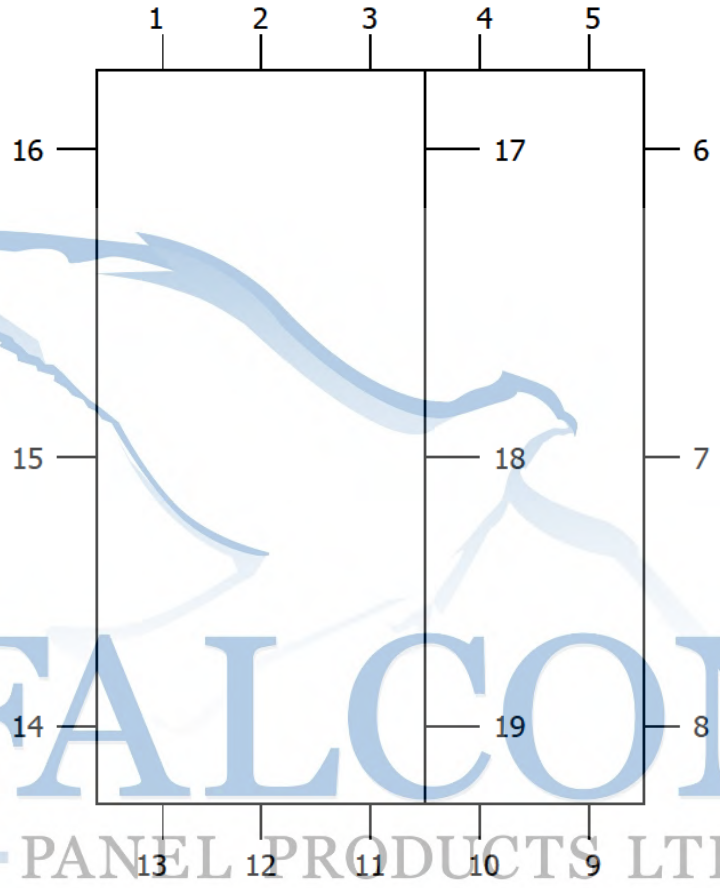
TIME mins	A	B	C	D	E	F	G	H
0	0	0	0	0	0	0	0	0
15	1	1	-2	4	-3	0	0	-2
30	4	5	1	8	-3	2	-1	-2
45	2	5	-18	5	-7	0	-2	-3
60	4	6	-32	3	-13	4	2	-4

5.4 Observations

All comments relate to the unexposed face unless otherwise specified.

Time (minutes)	Comments
00:00	Test started
02:30	There is smoke Issuing at the top meeting edge.
03:00	There is smoke Issuing on the right leaf at the top hinge position.
03:40	Right leaf, there is smoke issuing at the top hanging corner.
04:20	There is an increase in smoke issuing at the top meeting edge.
04:45	There is smoke issuing on the left leaf at the top hanging corner.
06:00	On the left leaf there is smoke issuing at the bottom hanging corner.
07:20	On the right leaf there is smoke issuing at the hanging edge approx. 1600mm down.
08:15	There is an increase of smoke issuing at the top meeting edge.
10:00	There is an increase if smoke issuing spreading across the head.
10:30	There is an increase in smoke issuing and discolouration at the latch position.
11:30	Smoke issuing at the meeting edge, 500mm down from the top.
12:00	There is an increase in smoke issuing on the right leaf at the top hinge position.
22:00	Left leaf, there is an increase in the smoke issuing and discoloration at the top hinge position.
23:00	There is discolouration across the head.
33:50	There is smoke issuing at the cylinder position.
36:00	Graphite squeezing out from under the cylinder rose.
40:00	There is an increase in smoke issuing on the left leaf at the top hanging corner and latch position only.
41:00	The handle has dropped.
50:00	Left leaf, there is smoke issuing at the head, 100mm from the top meeting edge.
51:00	There is an increase in smoke issuing at the latch position.
63:45	There is a glow visible at the top meeting edge.
64:18	A cotton pad integrity test was performed at the glow on the left leaf at the top hanging corner, which failed to ignite the cotton pad. No failure.
64:55	There is continuous flaming on the left leaf at the top hanging corner thereby constituting **integrity failure.**
65.00	Test terminated.

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*
2.6	2.5	3.3	3.1	3.2	3.8	3.6	3.6	3.9	4.1	4.0	2.8
13*	14	15	16	17	18	19					
2.4	3.7	3.7	3.6								
Mean		3.4		Maximum		4.1		Minimum		2.4	

Gap Between Face of Leaf and Doorstop in mm at Position											
1	2	3	4	5	6	7	8	9*	10*	11*	12*
1.7	1.8	2.8	2.8	2.8	5.3	3.4	3.3	-	-	-	-
13*	14	15	16	17	18	19					
-	2.8	3.4	3.1								

Gap Between Doorframe and Supporting Construction in mm at Position											
1	2	3	4	5	6	7	8	9	10	11	1*
13.0	18.0	19.0	20.0	20.0	7.0	7.0	7.0	-	-	-	-
13*	14	15	16	17	18	19					
-	15.0	14.0	14.0								

* 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	**64 (sixty four) minutes**
Insulation	**64 (sixty four) minutes ***

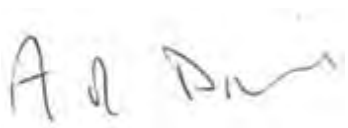
* Failure by virtue of integrity failure

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 leaves opened into 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.

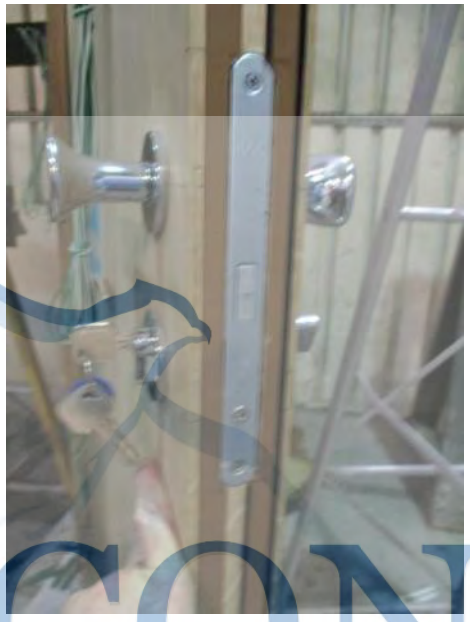
	Written and checked by:	Authorised by:
Signature:		
Name:	Anthony Davis	Nikolas Whitelock
Title:	Senior Technical Author	Technical Manager
Date of issue:	18/09/2019	18/09/2019

Photographs

Intumescent interruptions by hardware

Around hinge blade

Around latch forend



Intumescent fitted to latch keep

Closer arm in frame head

Closer body in leaf head

At start of test

After 16 minutes

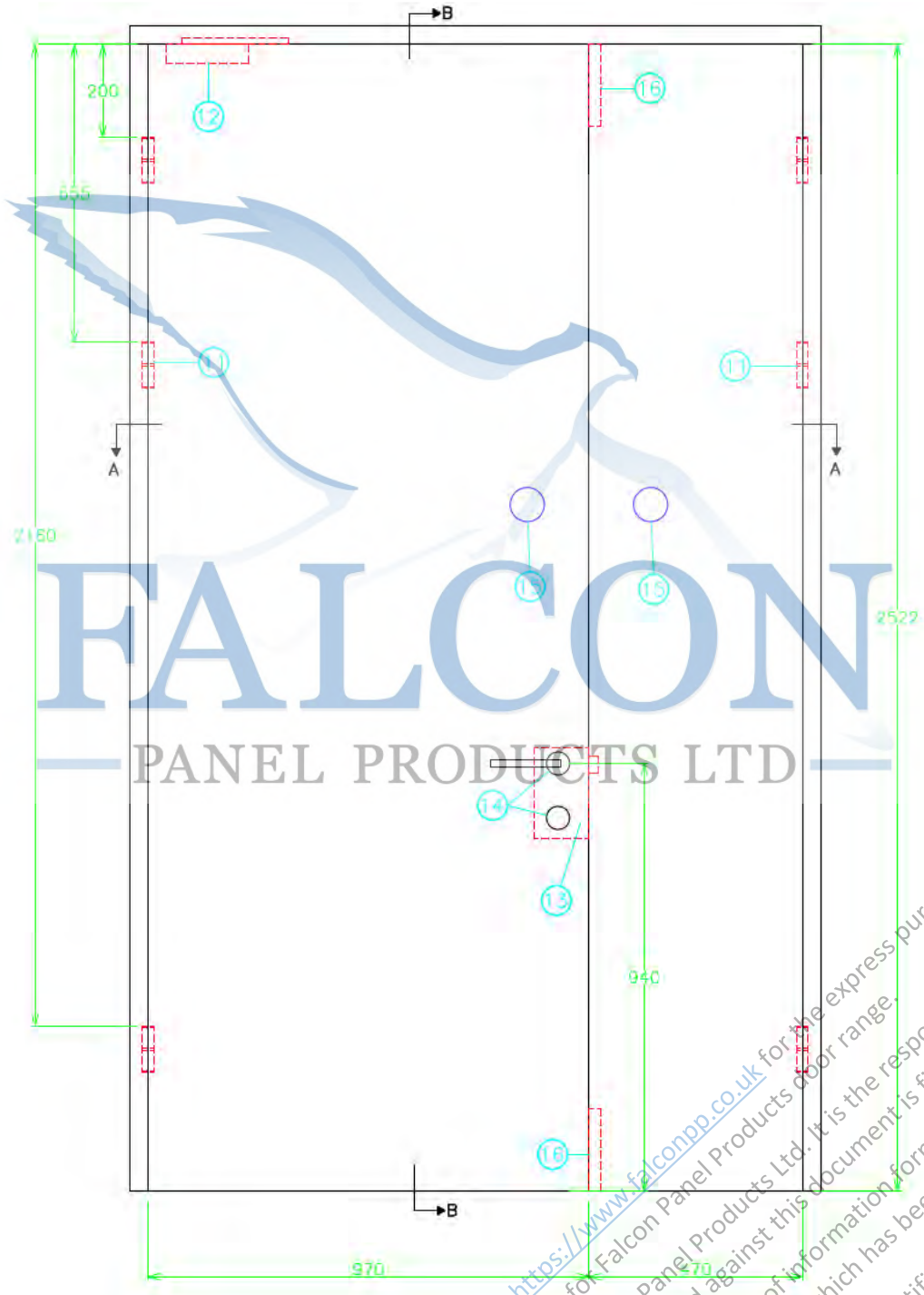
At 30 minutes

After 45 minutes

At 60 minutes

Exposed face – post test

Appendix – clients drawings and figures 1 to 4



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

Date Drawn	Drawn By	Scale
30/08/19	ARD	NTS
Project No.		
WF 414535		Appendix

 Falcon Panel Products Ltd

Section A–A

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Title		
Horizontal cross–sections (All dimensions in mm)		
Date Drawn 30/08/19	Drawn By ARD	Scale NTS
Project No. WF 414535		Appendix

Section B–B

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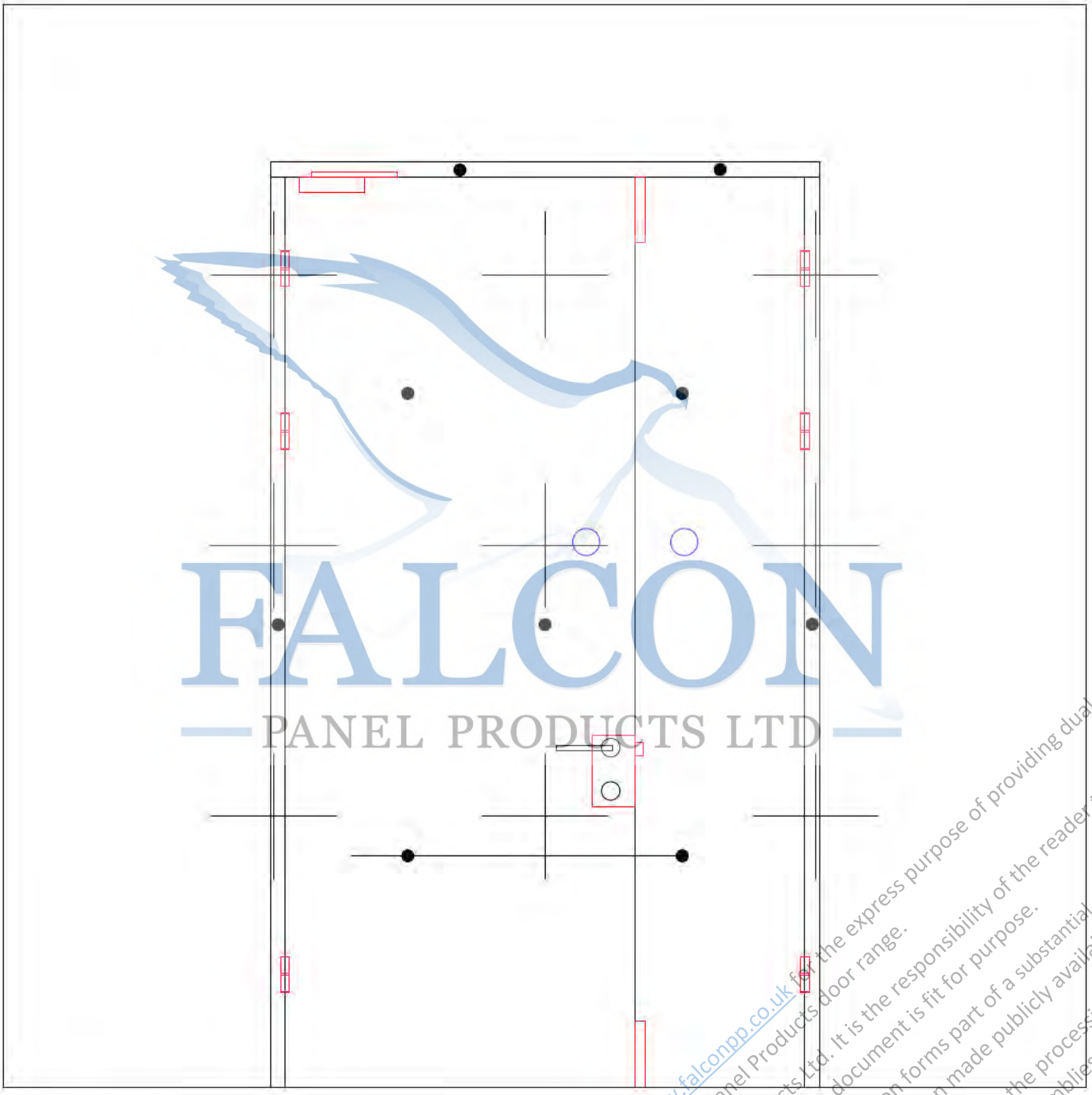
Title
Vertical cross-section
(All dimensions in mm)

Date Drawn	Drawn By	Scale
30/08/19	ARD	NTS

Project No.	
WF 414535	Appendix



+ : Furnace Thermocouples

• : Unexposed Face Thermocouples

Viewed From Unexposed Face

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Title: Thermocouple positions
(All dimensions in mm)

Date Drawn	Drawn By	Scale
30/08/19	ARD	NTS

Project No.	
WF 414535	Appendix