

Exova Warringtonfire
Chiltern House
Stocking Lane
Hughenden Valley
High Wycombe
Buckinghamshire
HP14 4ND

T: +44 (0) 1494 569 800
F: +44 (0) 1494 564 895
E: globalfire@exova.com
W: www.exova.com



Testing, calibrating, advising.

Title:

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

WF Report No:

399929



Prepared for:

Housing Property
Services

City of London
Corporation
Barbican Estate Office
Ground Floor
3 Lauderdale Place
London EC2Y 8EN

Test date:

2nd June 2018



1762

Contents

	Page No
Summary of Performance	3
1 Introduction.....	4
2 Specification	4
2.1 Door leaf and overpanel	4
2.2 Door perimeter gaps	4
2.3 Closer forces.....	4
3 Description of Construction (Refers to Figures 1 to 4 of the Appendix)	5
4 Test Conditions	8
5 Test Results	9
5.1 Furnace Temperature Curve	9
5.2 Unexposed Face Temperature Curves.....	9
5.3 Door, Side screen and overpanel Distortion Data.....	11
5.4 Leaf edge to frame gaps pre-test measurement.....	12
5.5 Observations.....	13
5.6 Times to Failure	15
6 Limitations	16
Photographs.....	17
Appendix - Figures 1 to 4	21

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"><tr><td>Integrity</td><td>35 (thirty five) minutes</td></tr><tr><td>Insulation</td><td>24 (twenty four) minutes*</td></tr></table>	Integrity	35 (thirty five) minutes	Insulation
Integrity	35 (thirty five) minutes			
Insulation	24 (twenty four) minutes*			

* Roving thermocouple reading recorded on side screen



Summary of specimen:

A latched single leaf single acting doorset with sidescreen and overpanel opening in towards the furnace

Leaf size – 1995mm high x 915 wide x 45mm thick

Overpanel size – 340mm high x 860mm wide x 45mm thick

Sidescreen size – 2290mm high x 490mm wide x 45mm thick

1 Introduction

The doorset was manufactured and supplied for test by the client and delivered on 29th May 2018. Exova 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 and overpanel

The leaf measured 1995mm high x 915 wide x 45mm thick. The overpanel measured 340mm high x 860mm wide x 45mm thick and the side screen measured 2290mm high x 490mm wide x 45mm thick. The doorset was hung to open in towards the furnace. The results of this test were obtained from a doorset fitted with a latch that was engaged for 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 12 readings were taken. The measurements (in mm) are given in Section 5.4.

2.3 Closer forces

Measured in accordance with FTSG Resolution No 63.

Opening force (Nm)	Closing force (Nm)
29	12

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

Leaf and overpanel

	Species/type	Dimensions (mm)	Density (kg/m ³)	Moisture (% w/w)	Key to figures
Stiles and rails	None fitted	-	-	-	-
Core	Engineered Pine*	39 thick*	420*	-	1
Facings	Plywood – species unknown*	4 thick*	530*	11.2-12.9	2
Adhesive	All adhesives within the construction remain unknown.				
Lippings – leaf hanging edge	Mahogany*	15 thick*	620*	-	3
Lipping – leaf closing edge	Mahogany*	7 thick*	620*	-	4
Lippings – top of leaf and bottom edge of overpanel	Mahogany*	21 thick with a 23 wide x 12 deep rebate*	620*	-	5

* Stated by client, not verified by laboratory

Side screen

	Species/type	Dimensions (mm)	Density (kg/m ³)	Moisture (% w/w)	Key to figures
Stiles and rails	None fitted	-	-	-	-
Core	Unknown material, identified to include Asbestos post-test	45 thick*	Unknown	-	6
Core beading – planted (screwed)	Pine fitted on the unexposed face only*	13 thick x 45 wide*	420*	-	7
Facings	None fitted	-	-	-	-
Letter plate mounting pattress	Aluminium – Manufacturer and product reference unknown*	353 high x 385 wide x 20 thick*	-	-	8

* Stated by client, not verified by laboratory

Door and side screen frame

	Species/type	Dimensions (mm)	Density (kg/m ³)	Moisture (% w/w)	Key to figures
Head and jambs and side screen bottom edge	Pine*	32 wide x 146 deep	420-510*	11.2	9
Stop – planted (screwed) – continuing around over panel perimeter	Two part – Pine*	25 high x 52 wide (overall)	420-510*	10.2	10
Head to jamb jointing detail	Mortice and tenon – screwed	-	-	-	-
Frame to supporting construction fire stopping detail	Rockwool mineral fibre capped with 10mm deep intumescent mastic on the exposed face	Nominally 10-15 wide x full depth of frame	-	-	-
Frame to supporting construction fixing detail	4No. steel screws per jamb	6Ø x 100 long	-	-	-
Architrave	European Redwood	45 wide x 18 thick	510**	15.0	-
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 edge	Vertical edges and bottom edge	Intumescent Seals Ltd Therm-A-Blade*	10 x 4	Fitted 18mm from the exposed face	11
	Head	Intumescent Seals Ltd Therm-A-Blade*	10 x 4	Fitted in the rebate of the leaf head 10mm from the exposed face	12
Frame reveal		None fitted*	-	-	-
Overpanel		None fitted*	-	-	-
Side screen		None fitted*	-	-	-

* Stated by client, not verified by laboratory

Intumescent interruptions and additional hardware protection

	Make/type	Size (mm)	Location
Around hinge blade	Fully interrupted	-	Hinge blade fully interrupts the seal in the frame reveal
Under hinge blades	None fitted*	-	-
Encasing lock body	Interdens	1 thick	Fitted around the body of the lock
Under lock forend	None fitted	-	-
Around lock forends	Fully interrupted	-	Lock forends fully interrupts the seal in the leaf edge
Under lock keep	None fitted*	-	-
Letter plate	Intumescent Seals Ltd Therm-A-Flex*	240 x 45 x 3 thick*	Fitted lining the letter plate aperture*

* Stated by client, not verified by laboratory

Hardware

	Make/type	Size (mm)	Location	Key to figures
Hinges	2No. manufacturer and reference unknown, stainless steel, brass and steel bearing butt type hinge	162 x 35 (blade size)	Fitted 220mm and 1638mm from the head of the leaf	13
Closer	Rutland TS11204 overhead type closer*	250 x 62 (footprint)	Surface fixed on the exposed face	14
Latch – engaged	ASSA key mortice lock complete with 33Ømm escutcheons, Product references unknown.	140 x 22 (forend size) 100 x 70 x 17 (case size)*	Bottom of escutcheon fitted 1010mm from the leaf threshold	15
		168 x 25 (keep size)		
Lock	ERA key/thumb turn (exposed face) complete with 56Ømm escutcheons, Product references unknown.	120 x 26 (forend size) 76 x 75 x 15 (case size)*	Bottom of escutcheon fitted 1137mm from the bottom edge of the leaf	16
		85 x 23 (keep size)		
Furniture	Round door pull Manufacturer and product reference unknown	Ø63 (rose size)	Fitted 1010mm from the bottom of the leaf	17
	Letter plate Manufacturer and product reference unknown	279 x 88 (footprint to exposed face)	Fitted 601mm from the bottom edge of the side screen	19

* 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 18°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.

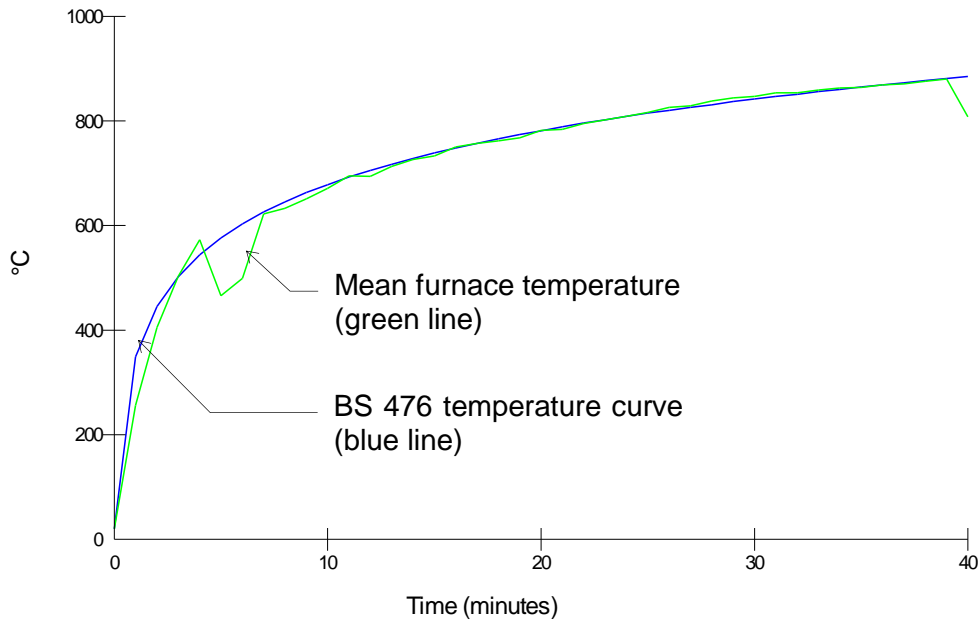
The temperature of the unexposed face was monitored by means of five thermocouples fixed to the surface of the door leaf, two thermocouples fixed to the surface of the overpanel, three thermocouples fixed to the side screen, five thermocouples attached to the frame, one at midheight on each jamb and one centrally located on the frame head above the overpanel and side screen. Two additional thermocouples used to monitor the letter plate temperature – one fixed to the letter plate and one fixed to the pattern 25mm from the letter plate

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

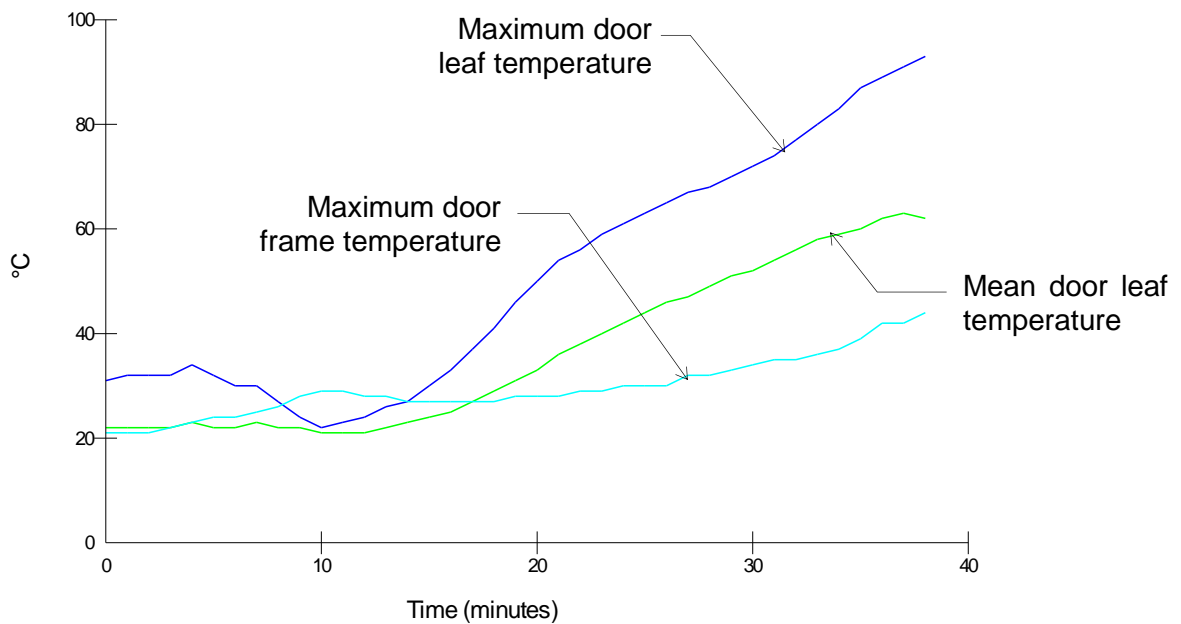
5 Test Results

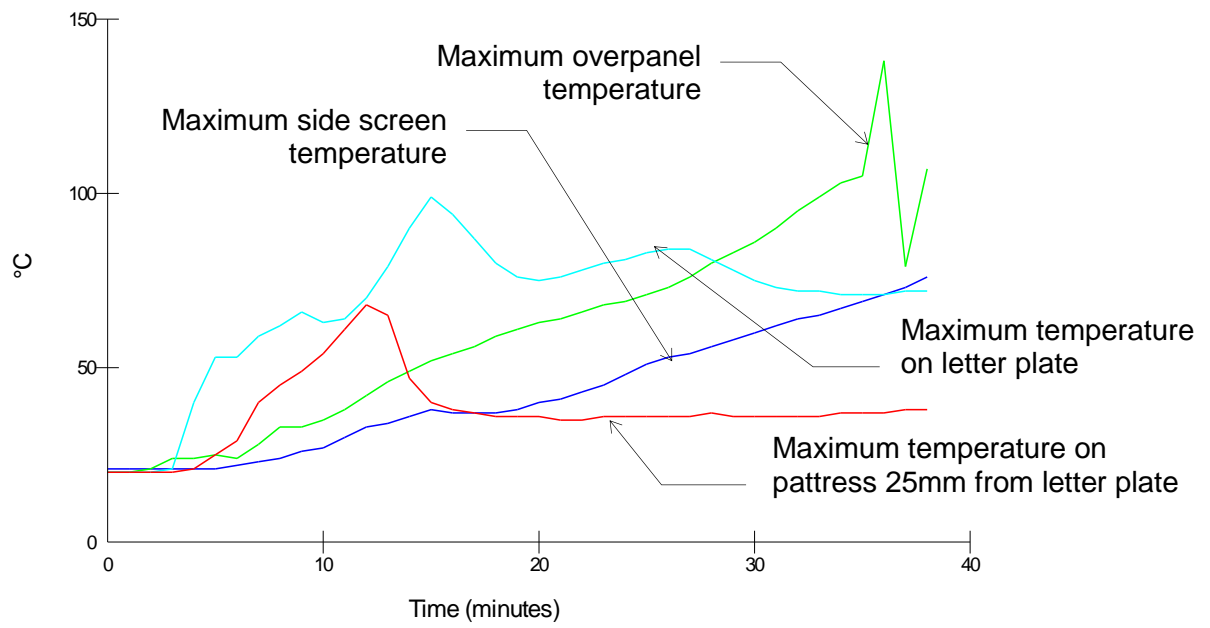
The following data and observations were recorded during the test.

5.1 Furnace Temperature Curve



5.2 Unexposed Face Temperature Curves





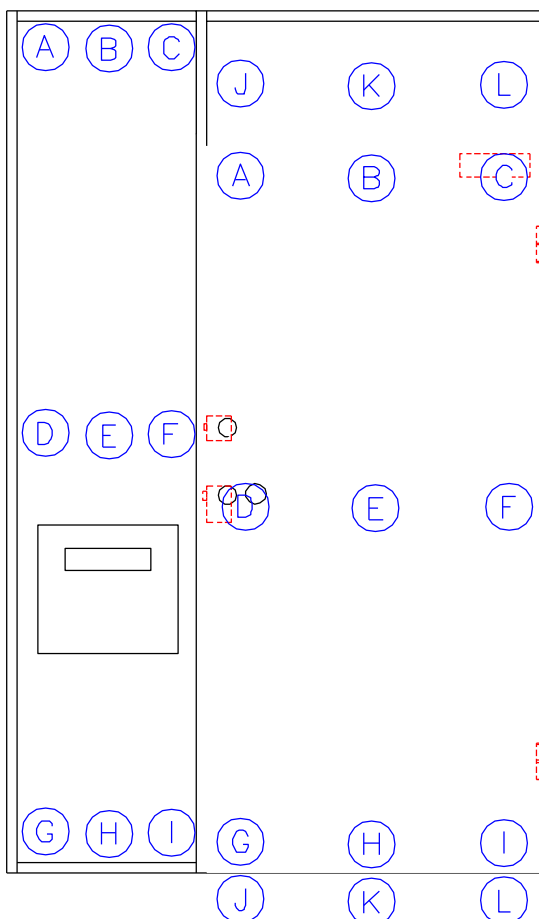
5.3 Door, Side screen and overpanel Distortion Data

The following tables show the distortion of the door in mm with an accuracy of ± 1 mm.

A positive measurement indicates distortion towards the furnace.

A negative measurement indicates distortion away from the furnace.

J, K and L of the table titled leaf give vertical movement of the door, a negative reading indicates that the door has dropped.



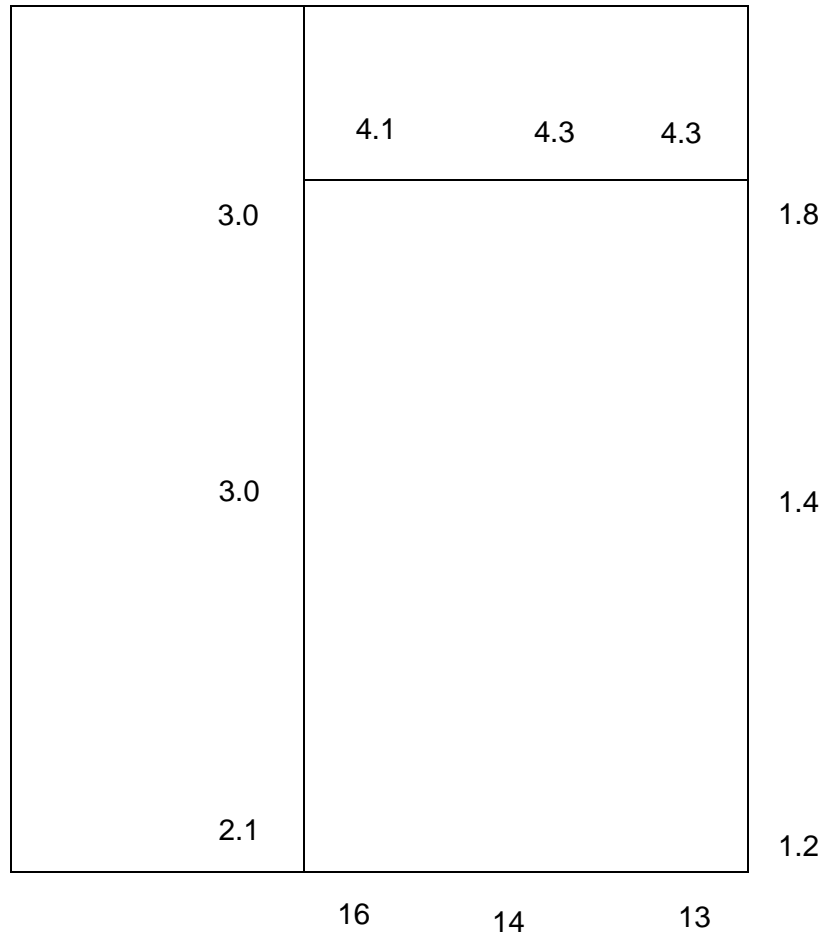
Leaf (hung on the right and opening in towards the furnace)

Time	A	B	C	D	E	F	G	H	I	J	K	L
10	2	3	4	3	4	-4	1	-1	-1	-1	-1	0
20	8	6	8	1	-3	2	2	0	0	-2	-2	-1
30	10	7	9	-3	-22	0	2	-2	2	-4	-4	-3

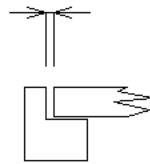
Side screen and over panel

Time	A	B	C	D	E	F	G	H	I	J	K	L
10	6	5	6	4	3	1	0	0	-1	3	4	3
20	6	8	11	4	3	1	0	0	0	4	4	6
30	5	7	5	6	4	2	0	0	0	3	3	5

5.4 Leaf edge to frame gaps pre-test measurement



Gaps shown



5.5 Observations

All comments relate to the unexposed face unless otherwise specified.

Time (minutes)	Comments
00:00	Test started.
02:20	There is smoke issuing at the leaf head.
02:30	There is smoke issuing at the left panel and the hanging edge.
03:00	There is an increase in smoke issuing at the top left corner of the over panel.
03:30	There is an increase in smoke issuing at the left panel.
03:40	There is an increase in smoke issuing at the letter plate.
05:00	There is a decrease in smoke issuing at all previous positions.
05:15	There is discolouration at the over panel due to increasing smoke issuing at the head.
06:20	There is an increase in smoke issuing at the hanging edge, left panel and all of the previous.
07:20	There is discolouration at the hanging edge approximately 500mm from the head.
08:00	There is an increase in smoke issuing at the head and the top hinge position.
08:20	There is an increase in smoke issuing at the letter plate and the right edge of the side panel.
09:00	There is an increase in smoke issuing at the upper keyhole.
10:50	The paint on the letter plate bubbling.
11:20	There is an increase in smoke issuing at all of the previous locations.
12:00	There is discolouration at the letter plate and the surrounding case.
16:00	There is increasing smoke issuing at the top right corner of the side panel.
16:40	There is a decrease in smoke issuing at the top hinge position.
17:00	There is continuous smoke issuing at the head of the over panel.
18:00	There is discolouration at the closing edge above the letter plate.
18:40	There is discolouration at the top right corner of the side panel.
21:00	There is discolouration at the right edge of the side panel.

- 24:00 A roving thermocouple recorded a temperature of 312°C at the top right corner of the side screen.
- 26:40 There is glow at the leaf head local to the top closing corner of the leaf.
- 27:15 A cotton pad test was performed at the top closing corner which did not result in the ignition of the cotton pad. No failure.
- 29:00 A cotton pad test was performed at the top closing corner which did not result in the ignition of the cotton pad. No failure.
- 29:42 A cotton pad integrity test was performed at the top right corner of the side panel which did not result in the ignition of the cotton pad. No failure.
- 32:08 A cotton pad integrity test was performed at the top right corner of the side panel which did not result in the ignition of the cotton pad. No failure.
- 32:40 A cotton pad integrity test was performed at the top closing corner which did not result in the ignition of the cotton pad. No failure.
- 34:00 A cotton pad integrity test was performed at the top closing corner which did not result in the ignition of the cotton pad. No failure.
- 35:15 A cotton pad integrity test was performed at top closing corner which resulted in the ignition of the cotton pad thereby constituting **integrity failure**.
- 35:28 There is continuous flaming at the leaf head thereby constituting **further integrity failure**.
- 37:40 There is continuous flaming at the top of the over panel thereby constituting **further integrity failure**.
- 38:00 A cotton pad integrity test was performed at the top right corner of the side panel which did not result in the ignition of the cotton pad. No failure.
- 39:00 Test terminated.

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	35 (fifty four) minutes
Insulation	24 (twenty four) minutes*



* Roving thermocouple reading recorded on side screen

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 5.4 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 towards the heating conditions of the test. The test result may not be appropriate to situations where the leaves open away from the heating conditions.

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. Exova 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:	Adam Scott	Nikolas Whitelock
Title:	Laboratory Manager	Lead Technical Officer
Date of issue:	23/10/2018	23/10/2018

Photographs

Intumescent interruptions by hardware

Around hinge blade



Around bottom lock forend



Top lock forend



At start of test



At 10 minutes



At 20 minutes



After 37 minutes

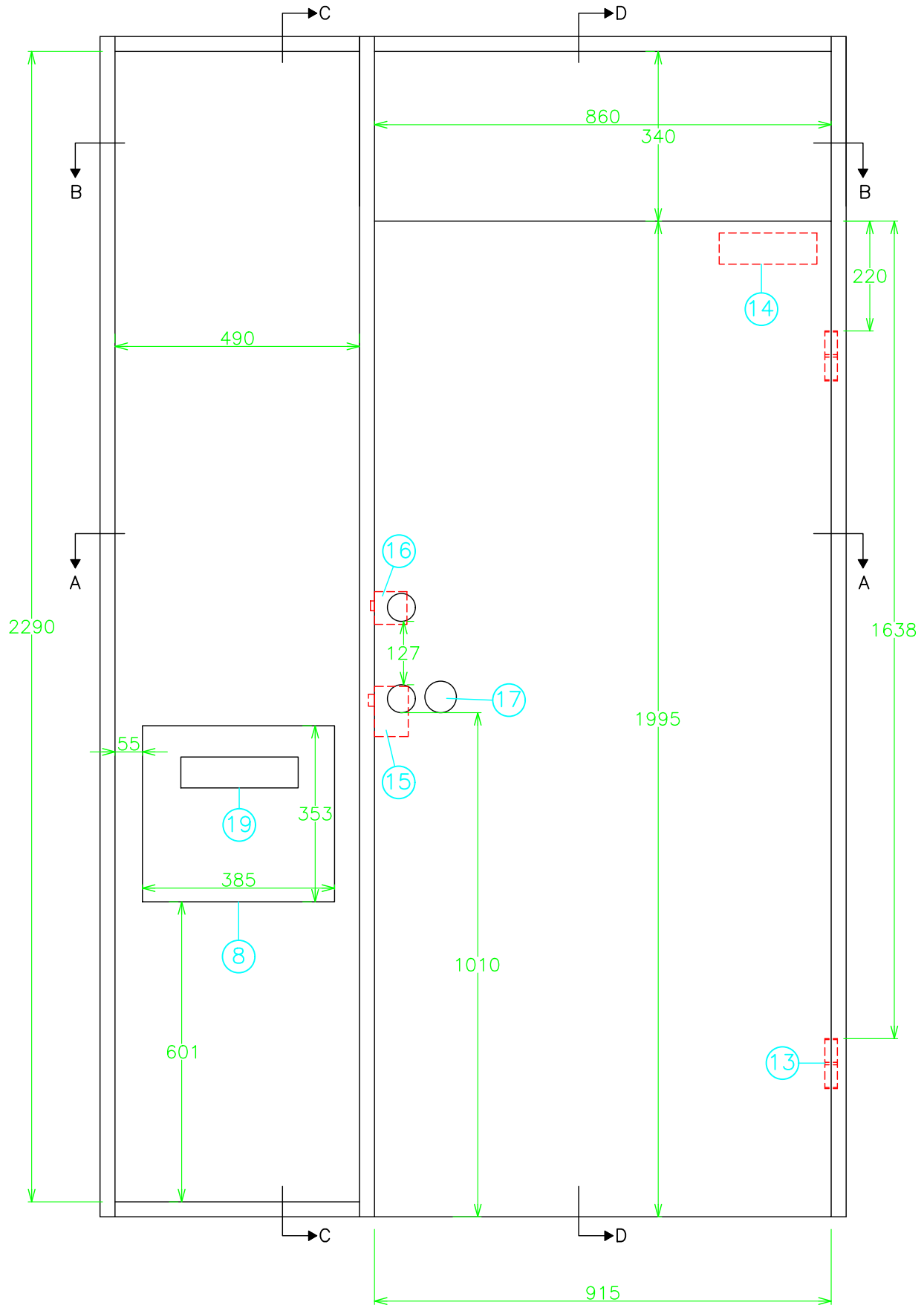


Exposed face – post test



Appendix - Figures 1 to 4





Exova Warringtonfire, Stocking Lane,
 Hughenden Valley, High Wycombe,
 Buckinghamshire, HP14 4ND, UK.

Tel: +44 (0)1494 569800
 Fax: +44 (0)1494 564895

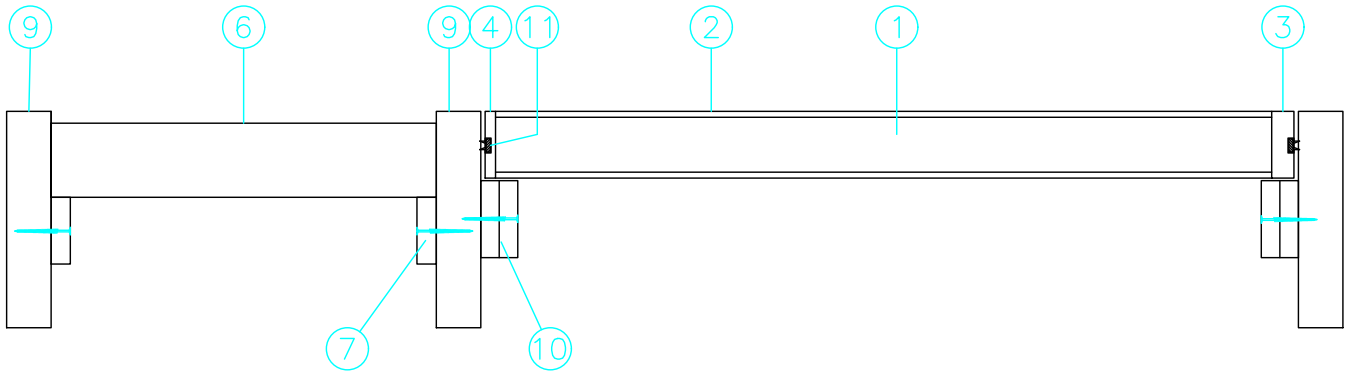
Title Unexposed face elevation
 showing hardware positions
 (All dimensions in mm)

Date Drawn 17/07/18	Drawn By ARD	Scale NTS
------------------------	-----------------	--------------

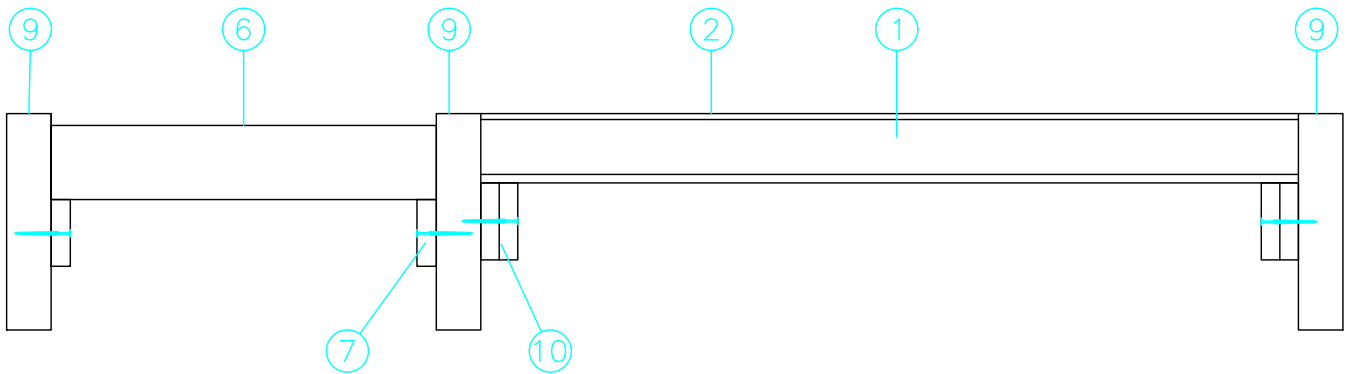
Project No.
 WF 399929

Appendix

Section A-A



Section B-B

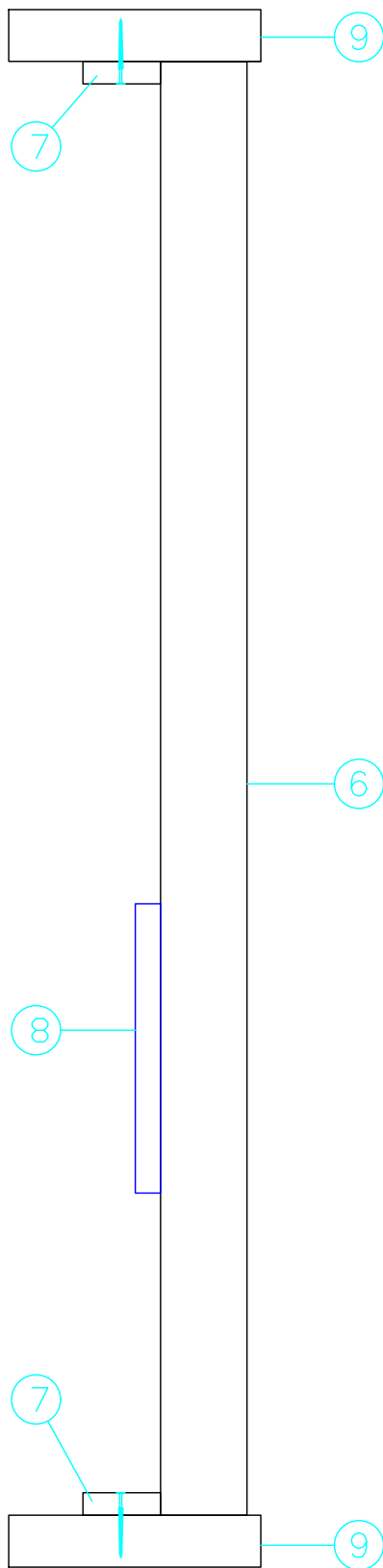


Exova Warringtonfire, Stocking Lane,
Hughenden Valley, High Wycombe,
Buckinghamshire, HP14 4ND, UK.

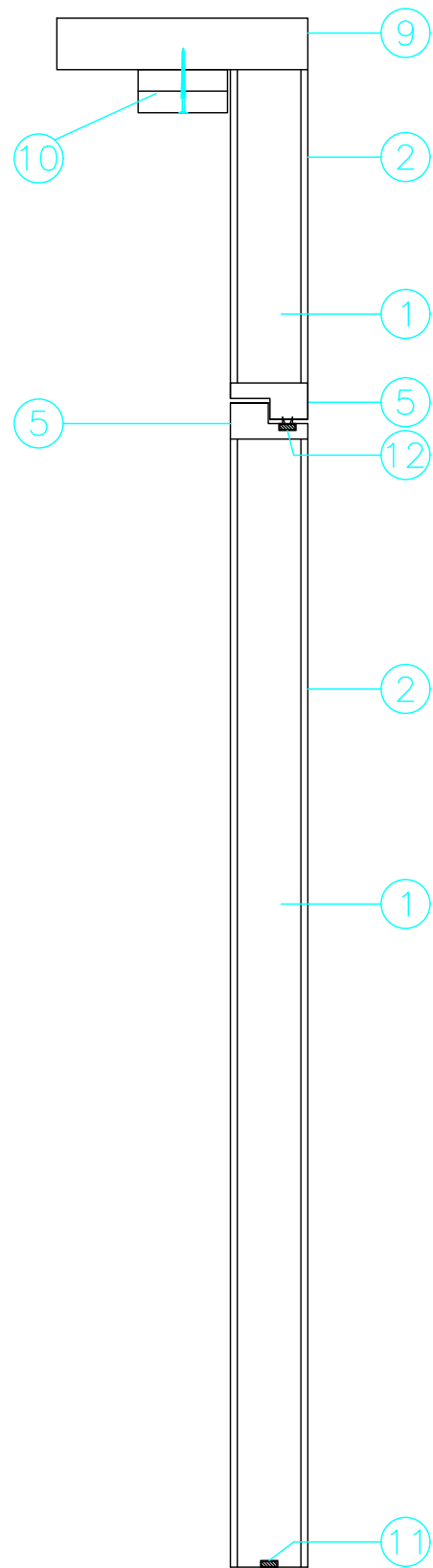
Tel: +44 (0)1494 569800
Fax: +44 (0)1494 564895

Title		
Horizontal cross-sections (All dimensions in mm)		
Date Drawn	Drawn By	Scale
17/07/18	ARD	NTS
Project No.		Appendix
WF 399929		

Section C-C



Section D-D



Exova Warringtonfire, Stocking Lane,
Hughenden Valley, High Wycombe,
Buckinghamshire, HP14 4ND, UK.

Tel: +44 (0)1494 569800
Fax: +44 (0)1494 564895

Title

Vertical cross-sections
(All dimensions in mm)

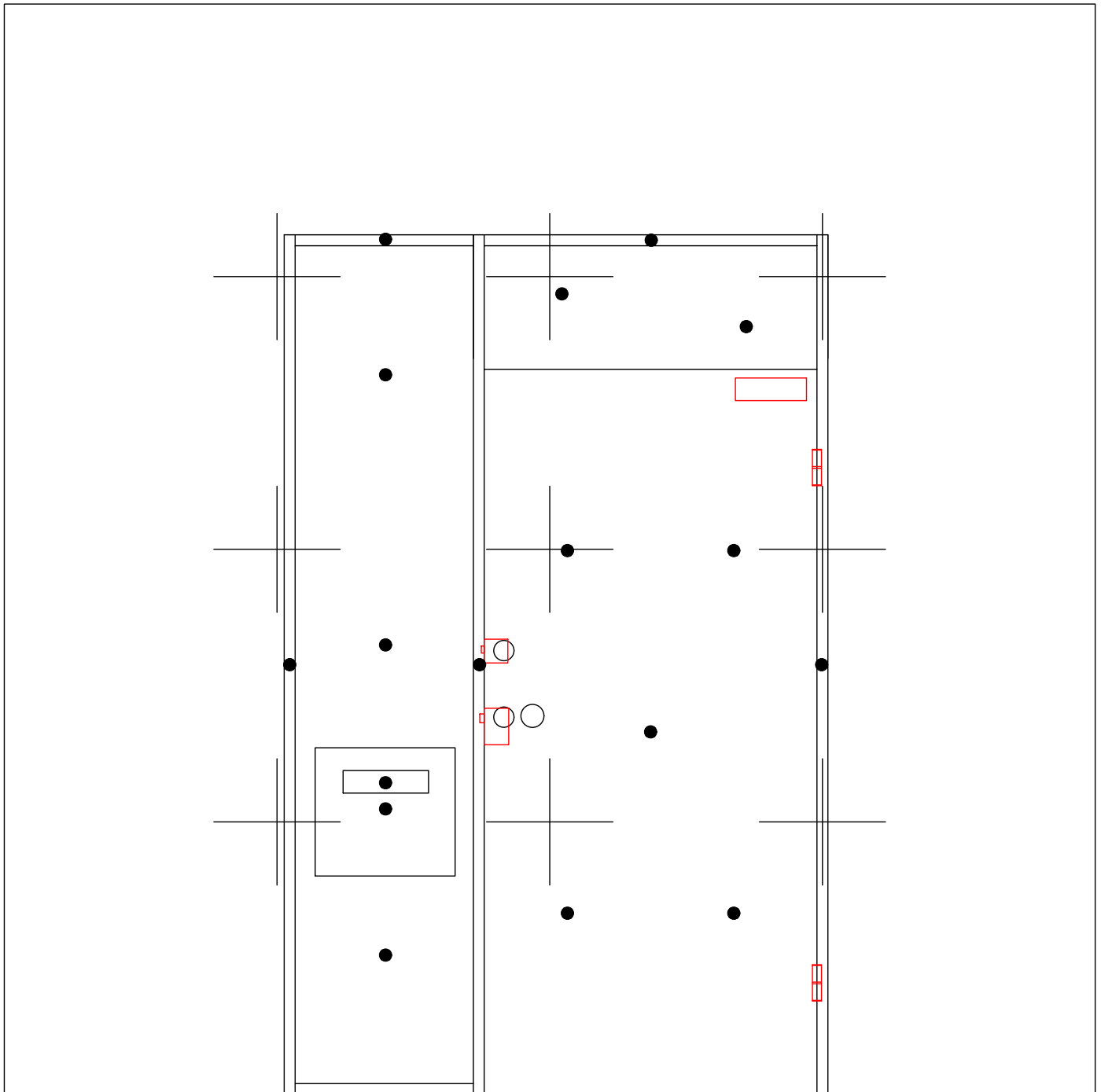
Date Drawn
17/07/18

Drawn By
ARD

Scale
NTS

Project No.
WF 399929

Appendix



- ⊕ : Furnace Thermocouples
- : Unexposed Face Thermocouples

Viewed From Unexposed Face



Exova Warringtonfire, Stocking Lane,
Hughenden Valley, High Wycombe,
Buckinghamshire, HP14 4ND, UK.

Tel: +44 (0)1494 569800
Fax: +44 (0)1494 564895

Title Thermocouple positions

(All dimensions in mm)

Date Drawn 17/07/18	Drawn By ARD	Scale NTS
Project No. WF 399929		Appendix