

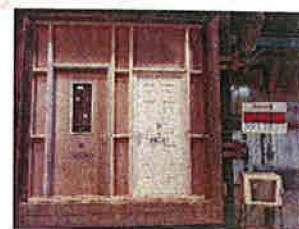
Testing, calibrating, advising

Title:

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

WF Report No:

391787



Prepared for:

Sealed Tight Solutions Ltd

Unit 1B, 1C & 1D
Princess Court
Lower Prudhoe Industrial Estate
Prudhoe
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Test date:

10th November 2017

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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	16 (sixteen) minutes	45 (forty five) minutes*
Insulation	16 (sixteen) minutes **	45 (forty five) minutes*

* No failure at test termination

** Failure by virtue of integrity failure, in accordance with the note to clause 7.6.1.1 of BS 476: Part22: 1987, the glazing has not been evaluated for insulation



Summary of specimens:

Two latched single leaf single acting doorsets, one with glazing, both hung opening in towards the furnace

Leaf size: doorset A – 2135mm high x 925mm wide x 44mm thick

Leaf size: doorset B - 2015mm high 785mm wide x 45mm thick

1 Introduction

The doorsets were manufactured and supplied for test by the client and delivered during November 2017.

Exova 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 leaf measured 2135mm high x 925mm wide x 44mm thick. The right doorset was designated doorset B and the leaf measured 2015mm high x 785mm wide x 45mm thick. Both doorsets were hung to open in towards the furnace. The results of this test were obtained from doorsets fitted with a latch, 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 24 readings were taken. The measurements (in mm) are given in Figure 4 of the Appendix.

2.3 Closer forces

Measured in accordance with FTSG Resolution No 63.

	Opening force (Nm)	Closing force (Nm)
Doorset A	25	18
Doorset B	34	17

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

Leaf – doorset A

	Species/type	Dimensions (mm)	Density (kg/m ³)	Moisture (% w/w)	Key to figures
Stiles and rails	None fitted	-	-	-	-
Core	Manufacturer?? product ref?? particleboard	44 thick	??	8.5	1
Facings	None fitted	-	-	-	-
Adhesive	Lippings	??	-	-	-
Lippings – all edges	Sapele??	6 thick	640**	13.0	2

* Nominal density – Exova BM TRADA timber data base

Leaf – doorset B

	Species/type	Dimensions (mm)	Density (kg/m ³)	Moisture (% w/w)	Key to figures
Stiles	Mixed wood finger jointed lamels	41 wide x 38 thick	640*	10.5	3
Rails – top and bottom	Mixed wood finger jointed lamels*	41 wide x 38 thick	640*	9.5-10.6	4
Core	Phenolic foam*	38 thick reducing to 15 thick at fielded areas	75*	-	5
Facings	Moulded GRP*	3 thick	-	-	6
Lippings	None fitted	-	-	-	-

* Stated by client, not verified by laboratory

Frame – doorset A

	Species/type	Dimensions (mm)	Key to figures
Head and jambs	2-part 2mm thick profiled steel Manufacturer?? product ref??	60 wide x 90 deep including a 15 high x 50 wide integral stop and 45 wide x 15 deep integral architrave on the exposed face	7
Frame jointing details	??	-	-
Stops – integral	-	-	-
Frame to supporting construction fire stopping detail	??	??	-
Frame to supporting construction fixing details	Self tapping screws	No. 50 long, fitted at 200mm centres	-
Architrave	Integral	-	-
Threshold	Non combustible	-	-

Frame – doorset B

	Species/type	Dimensions (mm)	Density (kg/m³)	Moisture (% w/w)	Key to figures
Head and jambs	Sheerframe Profiled PVC extrusion Product reference SH77950	70 wide x 70 deep including a 22high integral stop	-	-	8
Frame reinforcement	Steel box section Ref.S119	30 x 35 x 1.5 thick	-	-	9
Frame jointing details	Mitred – fully plastic welded with steel angle bracket at the back of the frame	-	-	-	-
Stops – integral	-	-	-	-	-
Frame to supporting construction fire stopping detail	Sealed Tight Solutions ST99 Fire Foam	Fitted fully filling the gap between the frame and supporting construction	-	-	-
Frame to supporting construction fixing details	4No. steel wood screws per jamb	No. 10 x 100 long, fitted at 600-800mm centres	-	-	-
Architrave	None fitted	-	-	-	-
Threshold	Masterguard 25 aluminium extrusion	22 high x 80 deep	-	-	10

Intumescent and sealing materials – doorset A

	Make/type	Size (mm)	Location	Key to figures
Leaf edge head and jambs	Sealed Tight Solutions Ltd Product reference ??	20 x 4	Fitted 12mm from the exposed face in the leaf edge	11
Weather seal	Rubber buffer seal Product reference ??	??	Fitted to the upstand of the stop	12
Glazing perimeter	Sealed Tight Solutions Product reference??	??	Fitted between the glass and bead on both faces	13

Intumescent and sealing materials – doorset B

		Make/type	Size (mm)	Location	Key to figures
Leaf edge		None fitted	-	-	-
Frame reveal	Head and jambs	Sealed Tight Solutions Ltd Product reference ST25x2.5	25 x 2.5	Fitted 13mm from the exposed face in the frame reveal	14
Behind frame		Sealed Tight Solutions Ltd Product reference ST30x2.5	30 x 2.5	Fitted in the frame profile at the back of the frame	15
Weather seal		Rubber buffer seal Product reference ??	??	Fitted in the upstand of the stop pre fitted to frame	16
		2No. Brush seals	??	Fitted 5mm and 33mm from the exposed face in the frame reveal	17

Intumescent interruptions and additional hardware protection – doorset A

	Make/type	Size (mm)	Location
Around hinges	Fully interrupted	-	Hinge blade fully interrupts seal in leaf edge
Under hinge blade	Sealed Tight Solutions graphite	1 thick	Fitted under the hinge blade on the leaf only
Encasing lock/ latch body	None fitted	-	-
Around lock/latch forend	Fully interrupted	-	Lock/latch forend fully interrupts seal in leaf edge
Under lock/latch forend	None fitted	-	-
Under lock/latch keep	None fitted	-	-

Intumescent interruptions and additional hardware protection – doorset B

	Make/type	Size (mm)	Location
Around hinges	Fully interrupted	-	Hinge blade fully interrupts seal in frame reveal
Under hinge blade	Sealed Tight Solutions graphite	1 thick	Fitted under the hinge blade on frame and leaf
Around closer	Fully interrupted	-	Closer plate fully interrupts seal in frame reveal
Under closer	Sealed Tight Solutions graphite	1 thick	Fitted under the closer plate in the frame reveal
Encasing closer body	Sealed Tight Solutions graphite	1 thick	Fitted encasing the closer body
Encasing lock/ latch bodies	Sealed Tight Solutions graphite	1 thick	Fitted around lock/latch cases on the exposed side only
Under lock/latch forend	Sealed Tight Solutions graphite	1 thick	Fitted under the lock/latch forend
Around all latch keeps	Fully interrupted	-	Latch keeps fully interrupt seal in frame reveal
Under latch keeps	Sealed Tight Solutions graphite	1 thick	Fitted at the bottom of all keeps

Hardware – doorset A

	Make/type	Size (mm)	Location	Key to figures
Hinges	3No. Simonswerk bearing butt type hinges	95 x 35 (blade size)	Fitted 150mm, 1005mm and 1855mm from the head of the leaf	18
Closer	Rutland TS3204 overhead type closer	224 x 62 (footprint size)	Fitted on the exposed face as per the manufacturer's instructions	19
Lock/latch – engaged	Laidlaw steel mortice lock/latch	18 wide x 235 high (forend size) 165 x 95 x 16 (case size)	Lock/latch fitted 995mm from the threshold of the leaf	20
		200 x 32 (keep size)		
Furniture	Laidlaw aluminium lever type handle	100 x 40 (footprint size)	Fitted appropriate to the lock/latch	21

Hardware – doorset B

	Make/type	Size (mm)	Location	Key to figures
Hinges	3No. SEA Ltd mk4 aluminium butt type hinges	101 x 40 x 3 (blade size)	Fitted 150mm, 955mm and 1755mm from the head of the leaf	22
Closer	Astra leaf edge/jamb fitted concealed type closer	110 x 32 (forend size)	Fitted in the leaf edge/frame jamb as per the manufacturer's instructions	23
Lock/latch – engaged at centre latch only	Winkhaus AV2 multi-point lock /latch	20 wide x 1768 high (forend size) 175 x 24 (case size)	Centre latch fitted 1020mm from the threshold of the leaf	24
	Centre keep	235 x 30 (keep size)		
	Top and bottom keeps	180 x 30 (keep size)	Fitted 285mm and 1730mm from the leaf threshold	25
Furniture	Trojan aluminium lever type handle	250 x 34 (footprint size)	Fitted appropriate to the centre lock/latch	26

Glazing – doorset A

	Make/type	Size (mm)	Location	Key to figures
Glass type	Fireglass North Pyrobelite 7	7 thick	Fitted 235 from the leaf head, 280mm from the closing edge	27
Aperture size	-	?? high x ?? wide	-	-
Sight size	-	840 high x 320 wide	-	-
Beading	Sapele (nominal density 640kg/m ³ density, 12.9% m.c.)	?? high x 24 deep including a 9 x ?? bolecion return and a ??° chamfer	Fitted around the perimeter of the glass on both faces	28
Beading fixings	Steel pins	?? long	Fitted 40mm from corners at 170mm centres	29

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 11°C.

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.

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 doorset A was monitored by means of five thermocouples fixed to the surface of the door leaf, and three thermocouples attached to the frame, one at midheight on each jamb and one centrally located above the leaf on the frame head. Two additional thermocouples were fixed to the glazing.

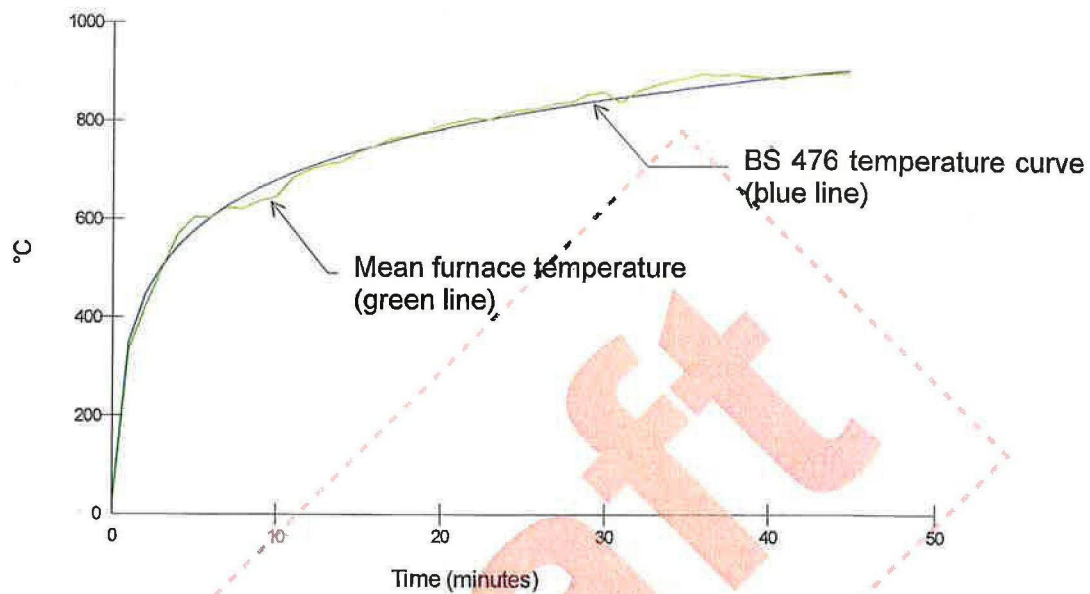
The temperature of the unexposed face of doorset B was monitored by means of five thermocouples fixed to the surface of the door leaf, and three thermocouples attached to the frame, one at midheight on each jamb and one centrally located above the leaf on the frame head.

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

5 Test results

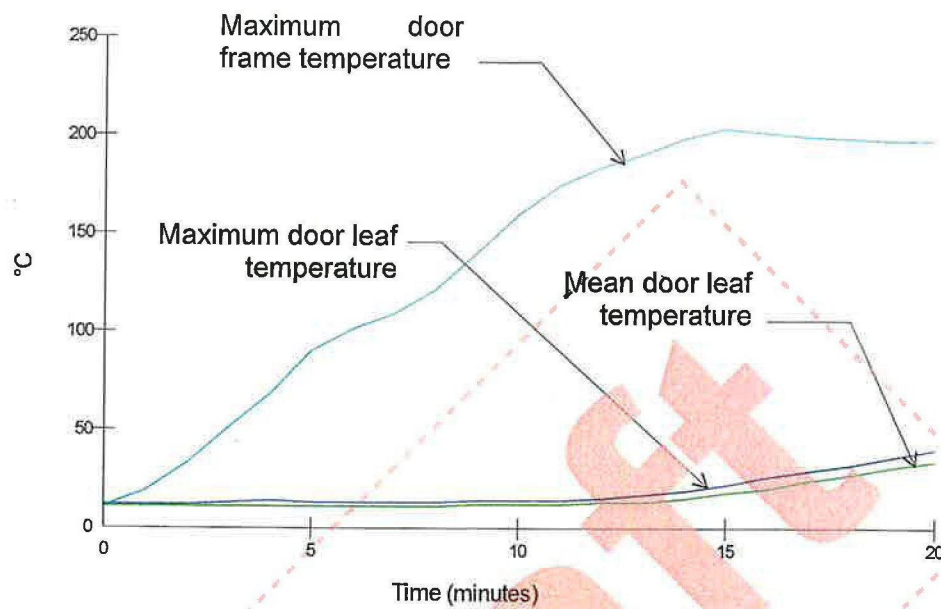
The following data and observations were recorded during the test.

5.1 Furnace Temperature Curve

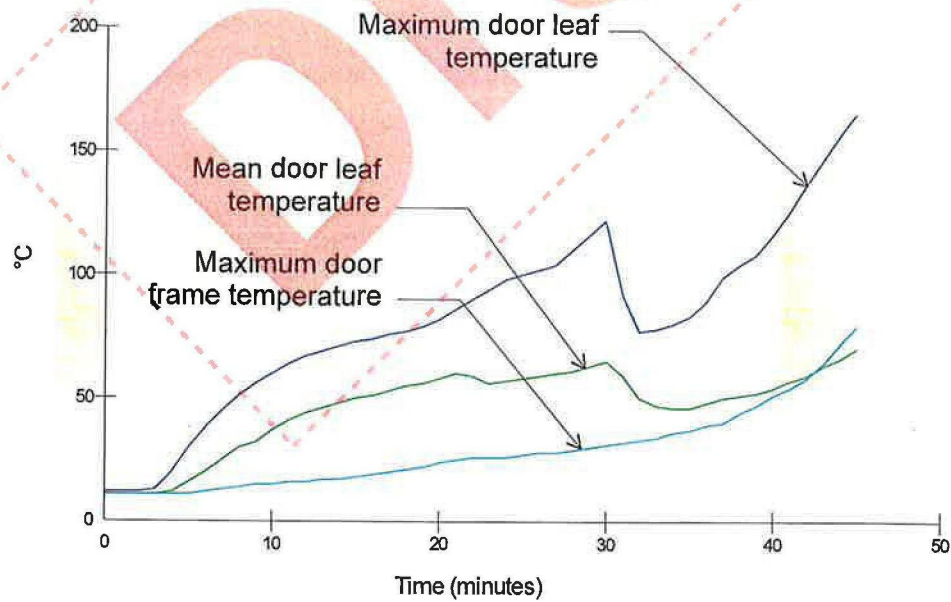


5.2 Unexposed Face Temperature Curves

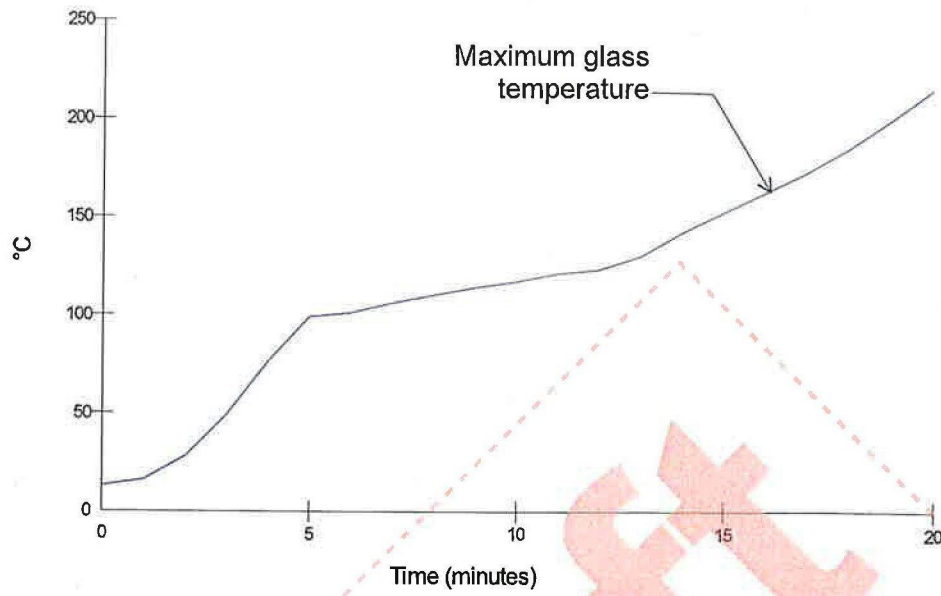
Doorset A



Doorset B



Glazing - doorset A



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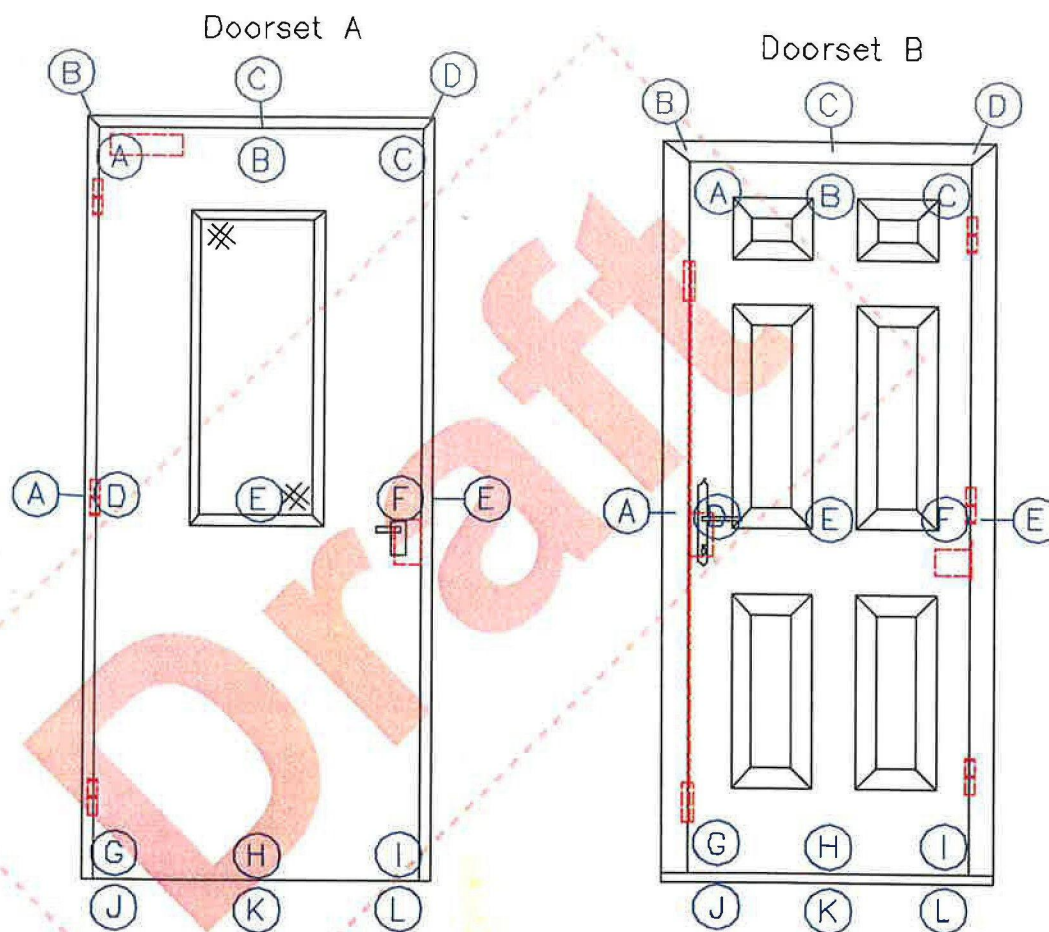
5.3 Frame and Door Distortion Data

The following tables show the distortion of the frame and door 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.



Doorset A – frame

Time	A	B	C	D	E
10	10	10	12	11	14

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

Time	A	B	C	D	E	F	G	H	I	J	K	L
10	8	18	30	13	15	17	1	11	2	1	0	1
20	-	-	-	-	-	-	-	-	9	-	-	-

Doorset B – frame

Time	A	B	C	D	E
10	15	7	3	6	2
20	14	16	3	6	3
30	14	16	3	5	2
40	14	3	0	5	2

Doorset B - 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	14	9	7	5	-5	2	3	-4	-14	0	0	1
20	7	10	8	2	-5	4	6	-4	-8	-1	0	1
30	11	11	10	0	-3	7	4	-4	-7	-1	-3	-2
40	14	11	13	6	-2	8	9	-2	-5	-5	-2	-1

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5.4 Observations

All comments relate to the unexposed face unless otherwise specified.

Time (minutes)	Comments
00:00	Test started
03:24	Doorset A, there is smoke issuing at the head.
04:03	Doorset B, there is smoke issuing at the head and top closing corner.
04:30	Doorset A, the glazing has reacted.
05:31	Doorset A, there is smoke issuing at the top closing corner, top hanging corner, and closing edge.
08:00	Doorset A, there is discolouration from the latch position, up the closing edge to the top closing corner, the head and top hanging corner.
10:10	Doorset A, there is a glow visible at the top closing corner.
10:53	Doorset A, 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.
11:10	Doorset B, there is discolouration at the top closing corner across the head and at the top hanging corner.
12:33	Doorset A, 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.
13:00	Doorset A, there is smoke issuing and discolouration at the middle hinge position.
14:19	Doorset A, 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.
16:35	Doorset A, there is intermittent flaming at the latch position.
16:41	Doorset A, a cotton pad integrity test was performed at the latch position which resulted in the ignition of the cotton pad, thereby constituting integrity failure .
17:45	Doorset B, there is smoke issuing and discolouration at the top hinge position.
18:31	Doorset A, a cotton pad integrity test was performed at the top closing corner which resulted in the ignition of the cotton pad thereby constituting further integrity failure . Doorset sealed off
25:00	No Change.
31:00	Doorset B, there is intermittent flaming at the bottom closing corner.
32:00	Doorset B, there is smoke issuing at the keyhole.

32:50 Doorset B, there is smoke issuing and discolouration at the middle hinge position.

33:30 Doorset B, the seal has fallen away at the top hanging corner.

33:50 Doorset B, there is erosion starting at the bottom closing corner.

34:00 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.

35:30 Doorset B, exposed face, the facing has fallen away at the top half of the leaf.

36:11 Doorset B, the seal is falling away at the top closing corner.

36:21 Doorset B, is starting to discolour at the panel fielded areas.

37:40 Doorset B, there is smoke issuing at the latch position.

38:27 Doorset B, exposed face, the facing has fallen away.

40:00 Doorset B, there is smoke issuing and discolouration at the threshold.

42:00 Doorset B, the head of the frame is starting to drop.

43:11 Doorset B, there is discolouration at the latch position.

43:59 Doorset B, there is a glow visible at the head.

44:58 Doorset B, A cotton pad integrity test was performed at the head which did not result in the ignition of the cotton pad, no failure.

45:45 Test terminated.

5.5 Times to Failure

When doorset A was tested in accordance with BS 476: Part 22: 1987, Method 7, determination of fire resistance of partially insulated doorsets and shutter assemblies, and doorset B was tested in accordance with BS 476: Part 22: 1987, Method 6, determination of fire resistance of insulated doorsets and shutter assemblies, the requirements of the standards were satisfied for the following periods:

	Doorset A	Doorset B
Integrity	16 (sixteen) minutes	45 (forty five) minutes*
Insulation	16 (sixteen) minutes*	45 (forty five) minutes*

* No failure at test termination at 45 minutes

** Failure by virtue of integrity failure, in accordance with Section 7.6.1.1 of BS 476: Part 22: 1987, the glazing has not been evaluated for insulation

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 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. Exova Warringtonfire 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.

	Written by:	Checked by:
Signature:		
Name:	Christian Tottman	Nikolas Whitelock
Title:	Technical Officer	Lead Technical Officer
Date of issue:		

Photographs

Intumescent interruptions by hardware

Around hinge blade – doorset A



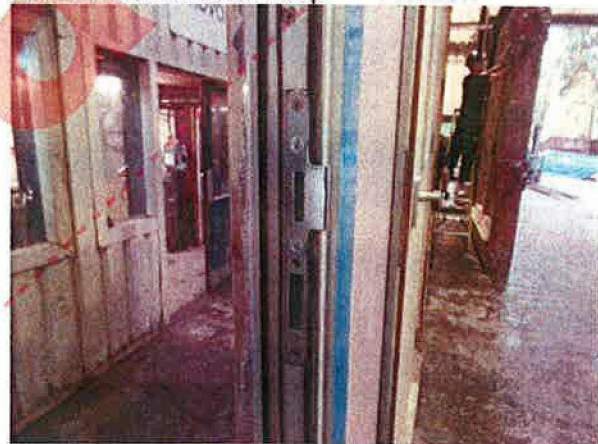
Around hinge blade – doorset B



Around latch forend – doorset A



Around centre latch keep – doorset B



Around top and bottom hook keeps –
doorset B



At the start of the test



After 10 minutes



At 20 minutes



At 30 minutes



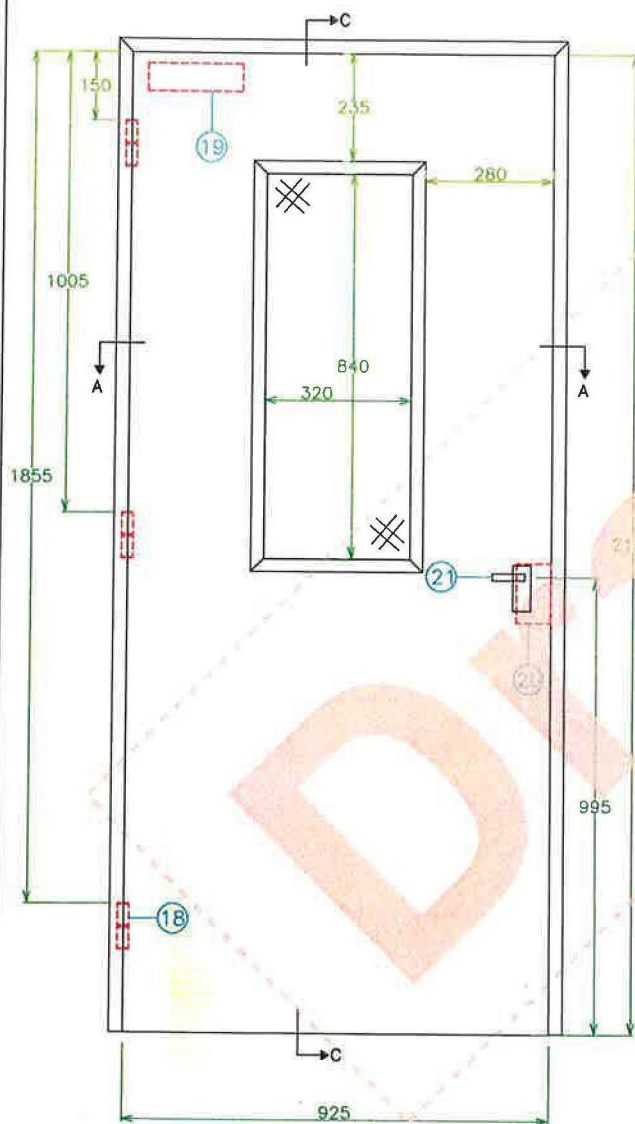
At 40 minutes



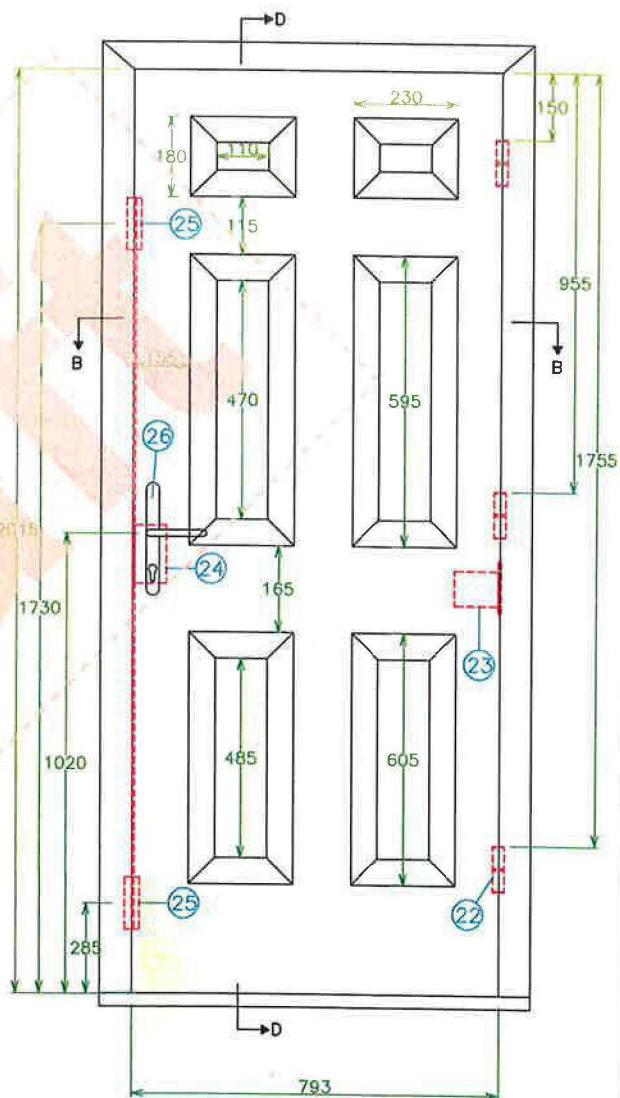
Appendix – figures 1 to 4



Doorset A



Doorset B



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

Tel: [REDACTED]
Fax: [REDACTED]

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

Date Drawn
19/01/18

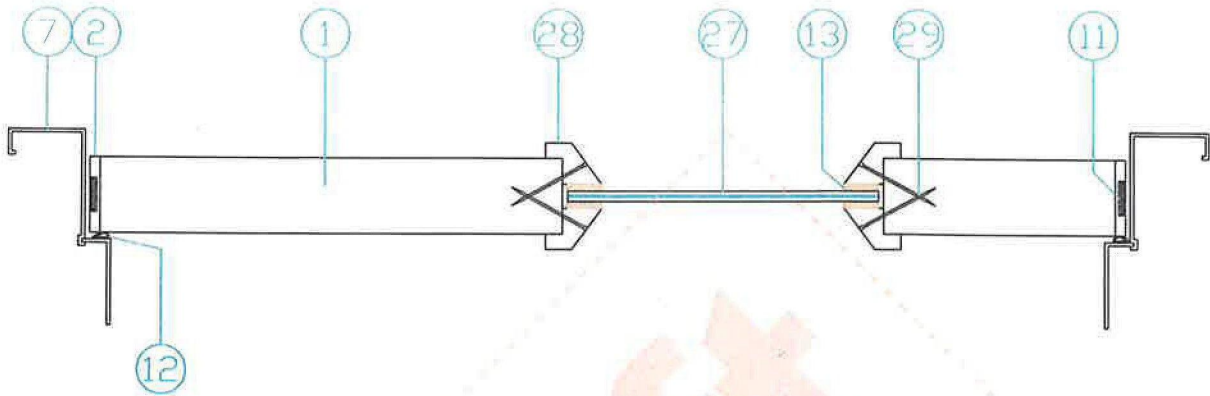
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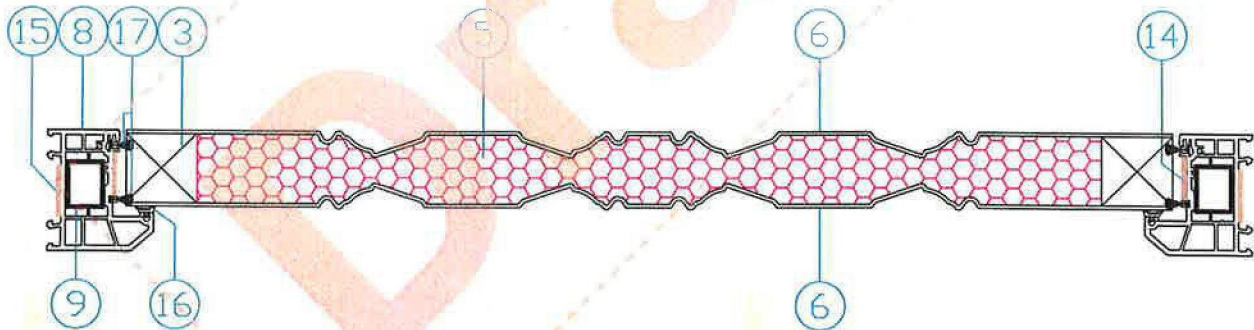
Project No.
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Appendix MET00040097/24

Section A-A



Section B-B



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

Tel:

Fax:

Title

Horizontal cross-sections
(All dimensions in mm)

Date Drawn

19/01/18

Drawn By

ARD

Scale

NTS

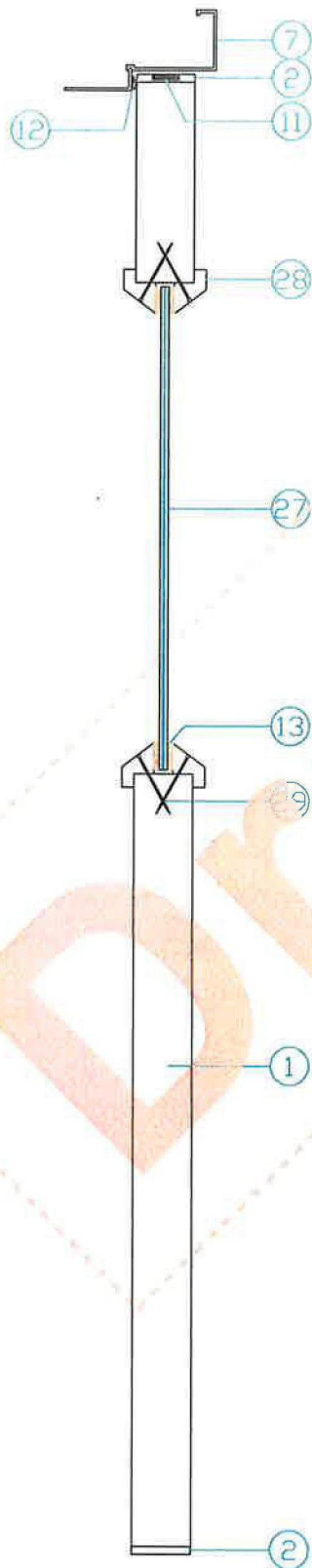
Project No.

WF 391787

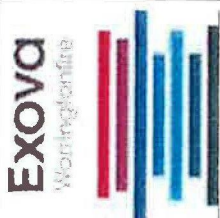
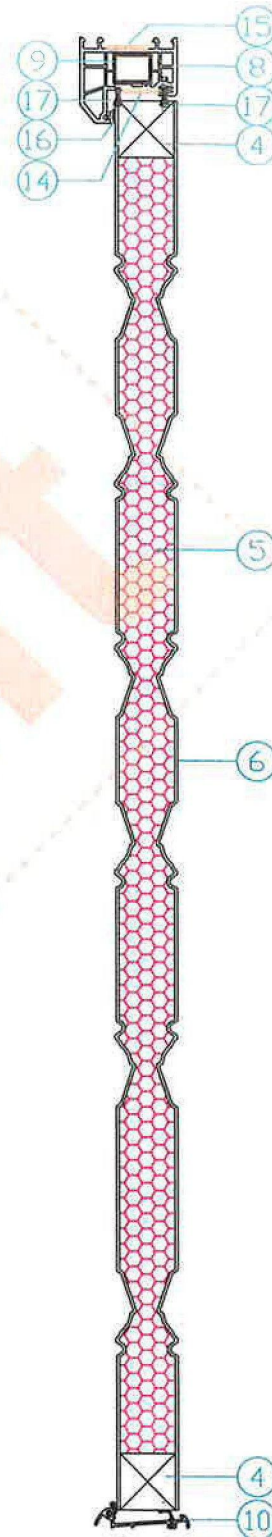
Appendix

MET00040097/25

Section C-C



Section D-D



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

Tel: [REDACTED]
Fax: [REDACTED]

Title

Vertical cross-sections
(All dimensions in mm)

Date Drawn
19/01/18

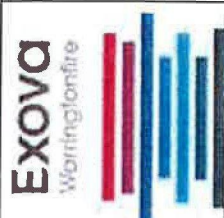
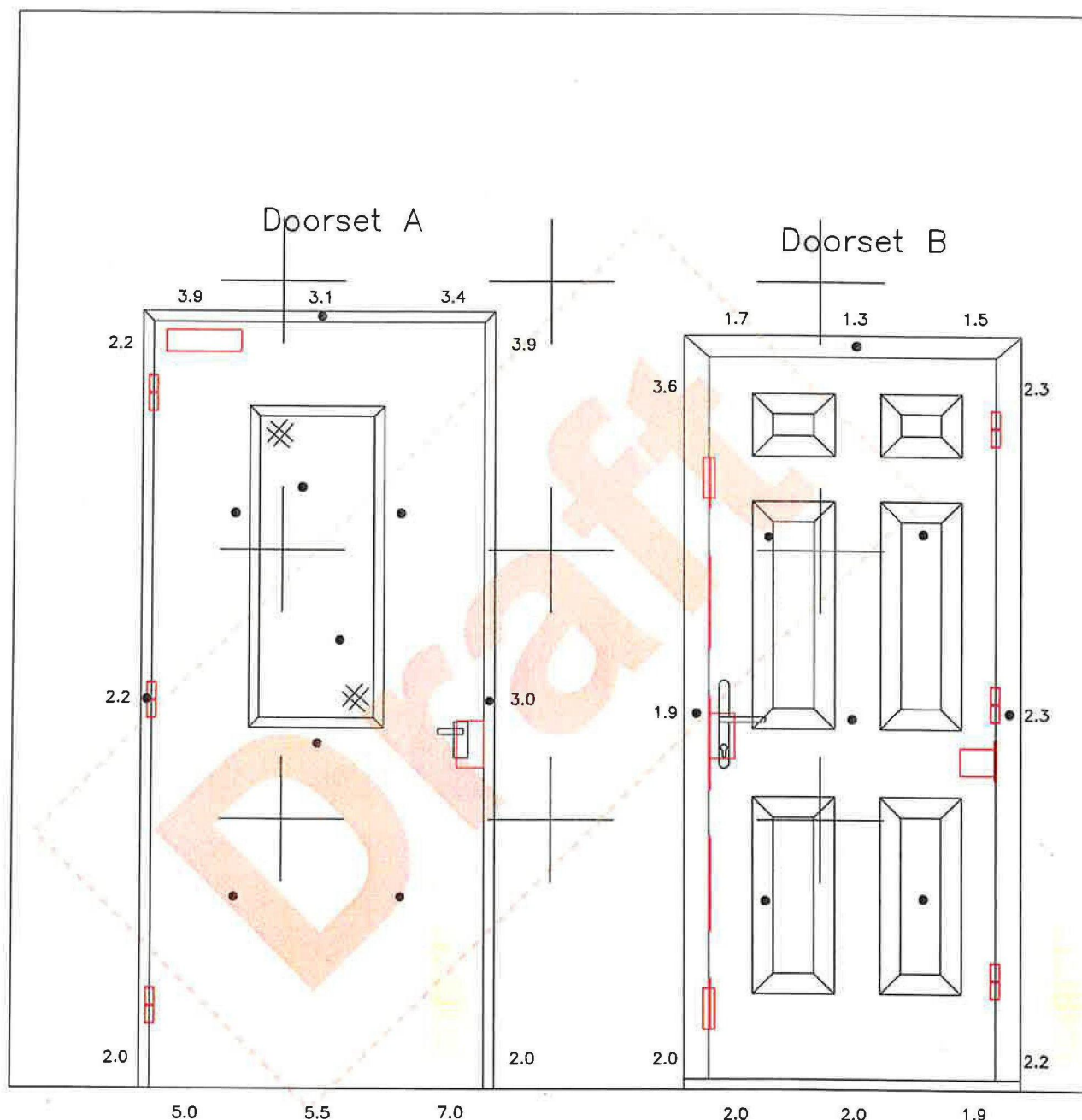
Drawn By
ARD

Scale
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WF 391787

Appendix

MET00040097/26



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

Tel: [REDACTED]
Fax: [REDACTED]

Title Thermocouple positions and
leaf/frame gaps
(All dimensions in mm)

Date Drawn
19/01/18

Drawn By
ARD

Scale
NTS

Project No.
WF 391787

Appendix

MET00040097/27