CAMBRIDGE FIRERESEARCH

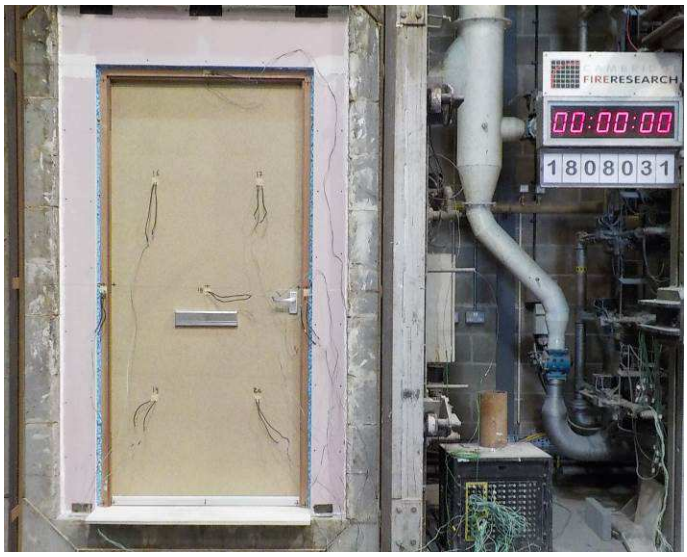
REPORT NUMBER CFR1808031

FIRE RESISTANCE TEST
IN ACCORDANCE WITH BS 476: PART 22: 1987

Sponsor:	Exitex Limited
Address:	Mountpleasant Dundalk County Louth Ireland
Date of test:	3rd August 2018

Results:

Test duration:	61 minutes
Integrity:	39 minutes
Insulation	39 minutes



Summary of test specimen:

A graduated density timber door, with sapele lippings and sapele frame, and incorporating a letter plate, tested as an insulated latched doorset.

Leaf size:
2040 high x 925 wide x 54 thick

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1 PREPARATION FOR TESTING

1.1 Specimen conditioning

The specimen components were at Cambridge Fire Research for a period of 1 day. During this period, the temperature and relative humidity were measured and recorded within the range of 26 to 30°C and 44 to 56% respectively.

1.2 Associated construction

Cambridge Fire Research constructed a softwood timber-stud partition, which was clad with 2No.British Gypsum FireLine boards of 12.5mm thickness on the exposed side and 1No. British Gypsum FireLine board of 12.5mm thickness on the unexposed side to provide an aperture for the specimen of 2095 mm high x 1022 mm wide.

In accordance with Fire Test Study Group Resolution No. 51 continuity of the threshold was simulated by the installation of a solid non-combustible threshold extension by Cambridge Fire Research, such that the extension was flush with the threshold onto which the specimen was positioned.

1.3 Specimen construction

The complete specimen was supplied by the sponsor.

1.4 Specimen verification

Cambridge Fire Research carried out a detailed survey of the specimen to verify the information provided by the Sponsor. This included verifying the weight, densities, materials and dimensions of construction components wherever possible.

Details and drawings of the construction are shown in Appendix 1.

Photographs of details of the construction taken before the test are shown in Appendix 2.

1.5 Specimen installation and fixity

The sponsor installed the specimen into the associated construction. The specimen was asymmetrical and fitted such that the door opened towards the heating conditions of the test as this is regarded as more onerous. The leaf was latched prior to the start of the test.

The specimen was affixed to the associated construction as described in Appendix 1.

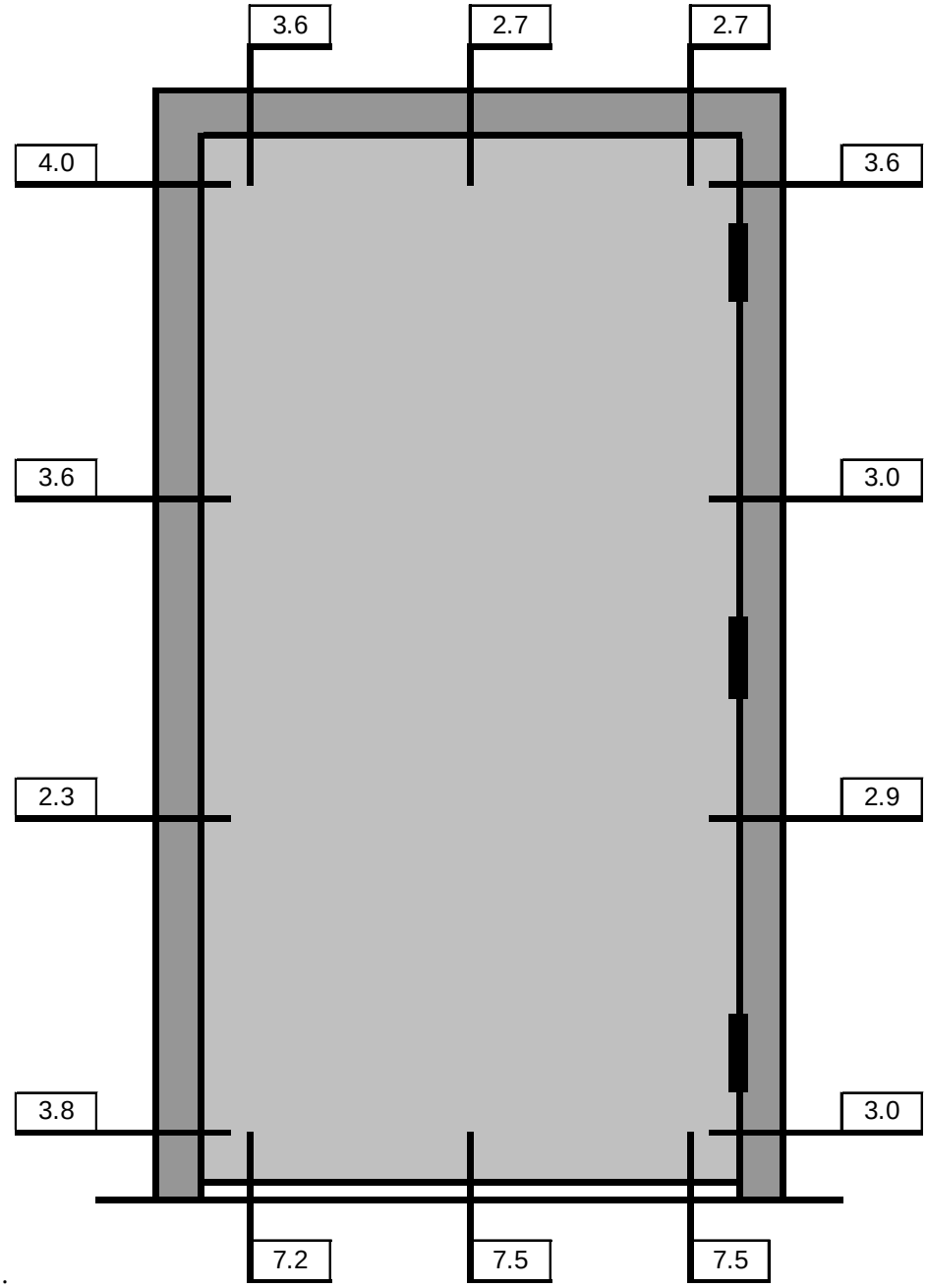
1.6 Specimen selection

Cambridge Fire Research was not involved in any selection or sampling procedures for the tested specimen.

2 PRE-TEST MEASUREMENTS AND SETTING

2.1 Gap measurements

The gap between the leaf edges and the frame and at the threshold was measured on the exposed face prior to the start of the test. The following figure shows the position at which the measurements were made and the recorded gap (mm) at those positions.



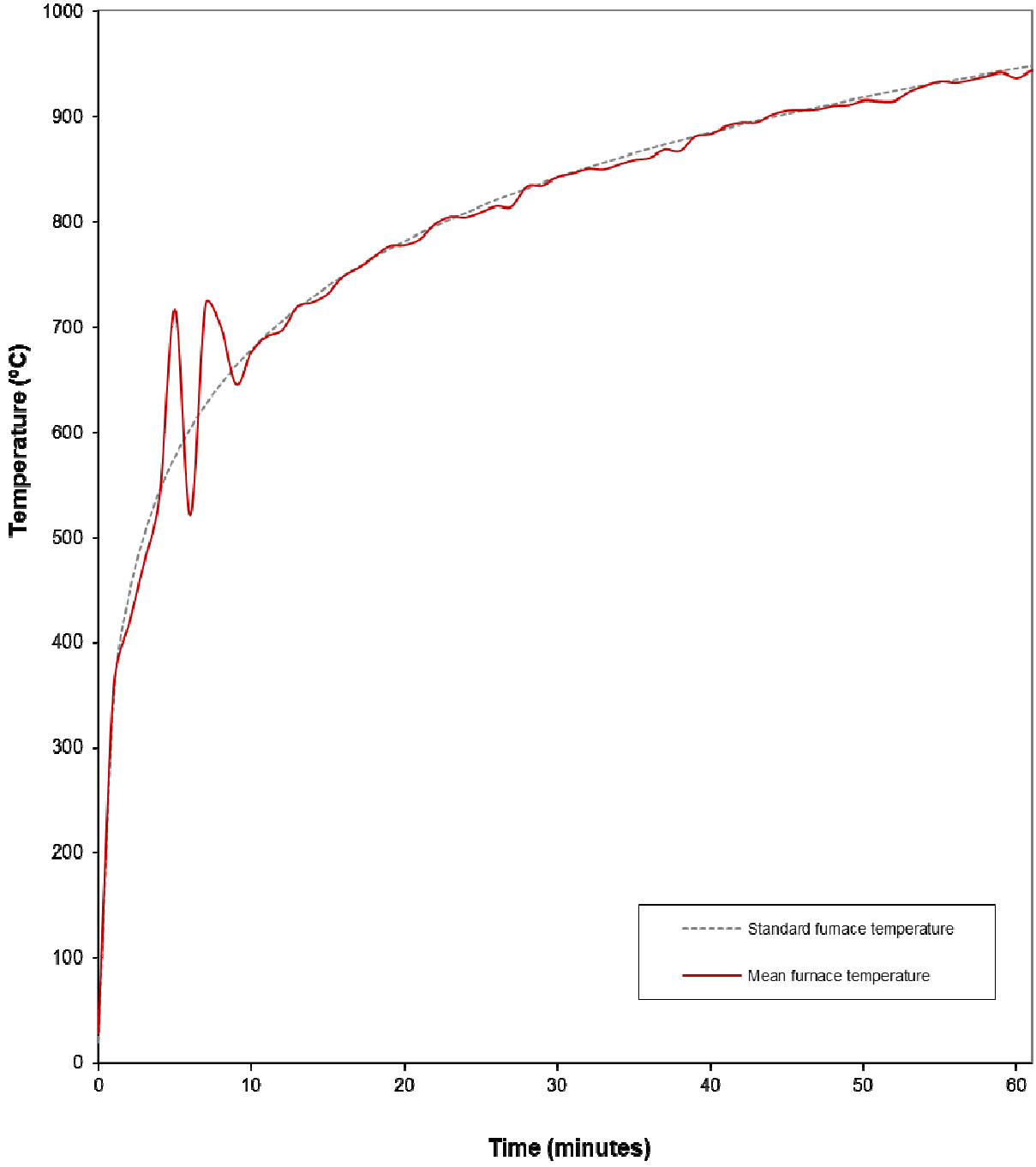
2.2 Closer force measurement

No closer was fitted to the doorset.

3 TEST CONDITIONS, INSTRUMENTATION AND MEASURING

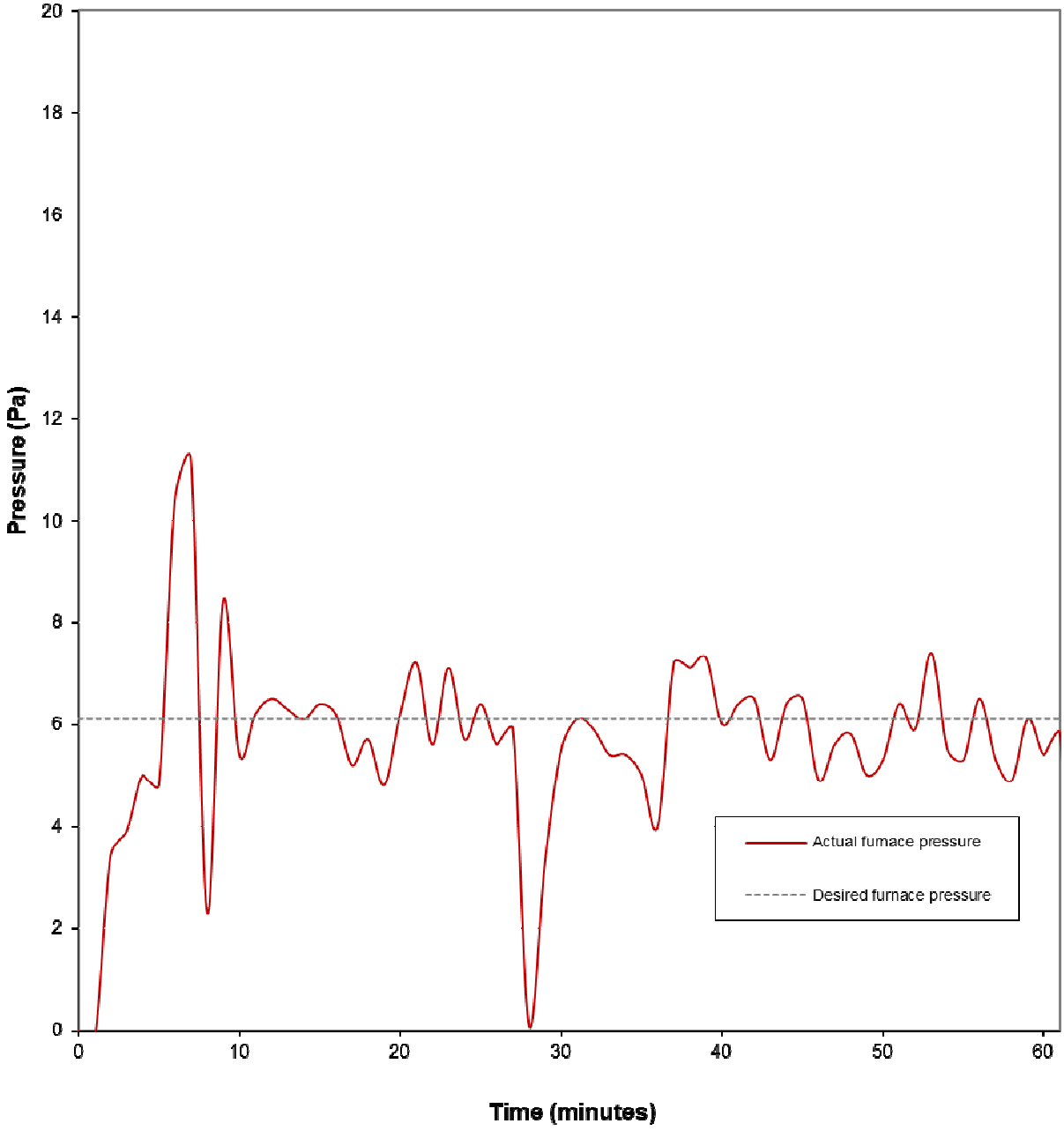
3.1 Furnace temperature

Furnace temperature was controlled so as to follow the standard temperature/time curve defined in the test standard and within the tolerances permitted. The furnace mean temperature was calculated from the output recorded using five furnace thermocouples of the design specified in the test standard. The following graph shows the standard and mean furnace temperature/time data.



3.2 Furnace pressure

Furnace pressure was maintained for the duration of the test at a nominal + 6.1 Pa measured at the pressure sensing head. When a linear pressure gradient of 8.5 Pa/m is applied this equates to + 0 Pa at 1 m above the notional floor level. The furnace pressure was controlled within the tolerances permitted in the test standard except for 7 instantaneous occasions which were transient events. The following graph shows the actual and desired furnace pressure/time data.



3.3 Ambient temperature

Ambient temperature at the start of the test was 27°C.
Ambient temperature ranged between 27°C and 28°C during the test.

3.4 Unexposed face specimen thermocouples

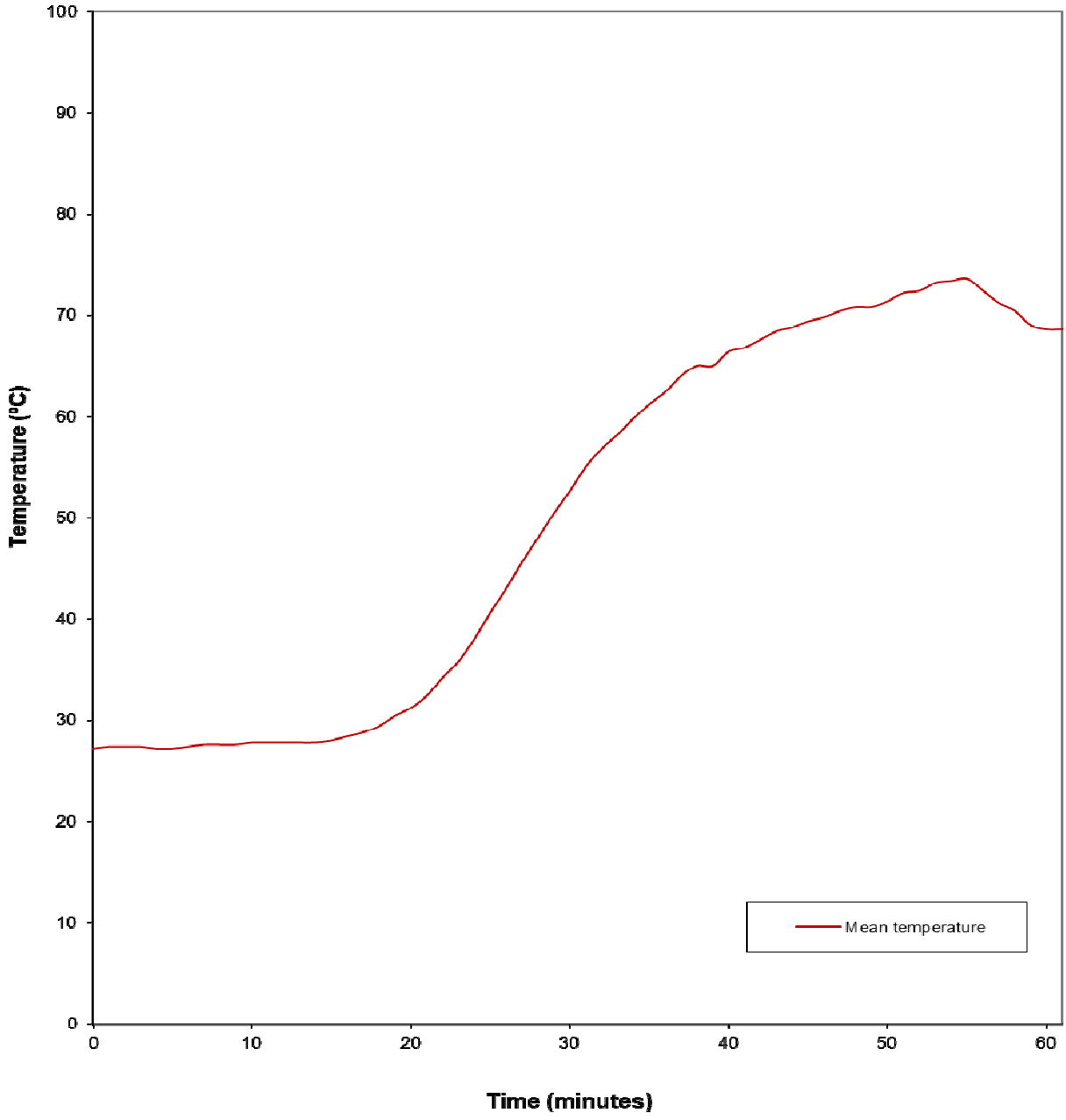
Surface temperature measuring thermocouples of the design specified in the test standard were affixed to the unexposed face of the specimen to monitor the temperature rise as follows:

Doorset leaf	Channels 16 to 20	(mean & maximum)
Doorset frame	Channels 21 to 23	(maximum only)

The positions of these thermocouples are shown in Appendix 3.

A roving thermocouple was available for measurement of any specific hotspots. Any instances of the use of the roving thermocouple are noted in the observations in Section 4.

The following time/temperature graph shows the mean leaf temperature.



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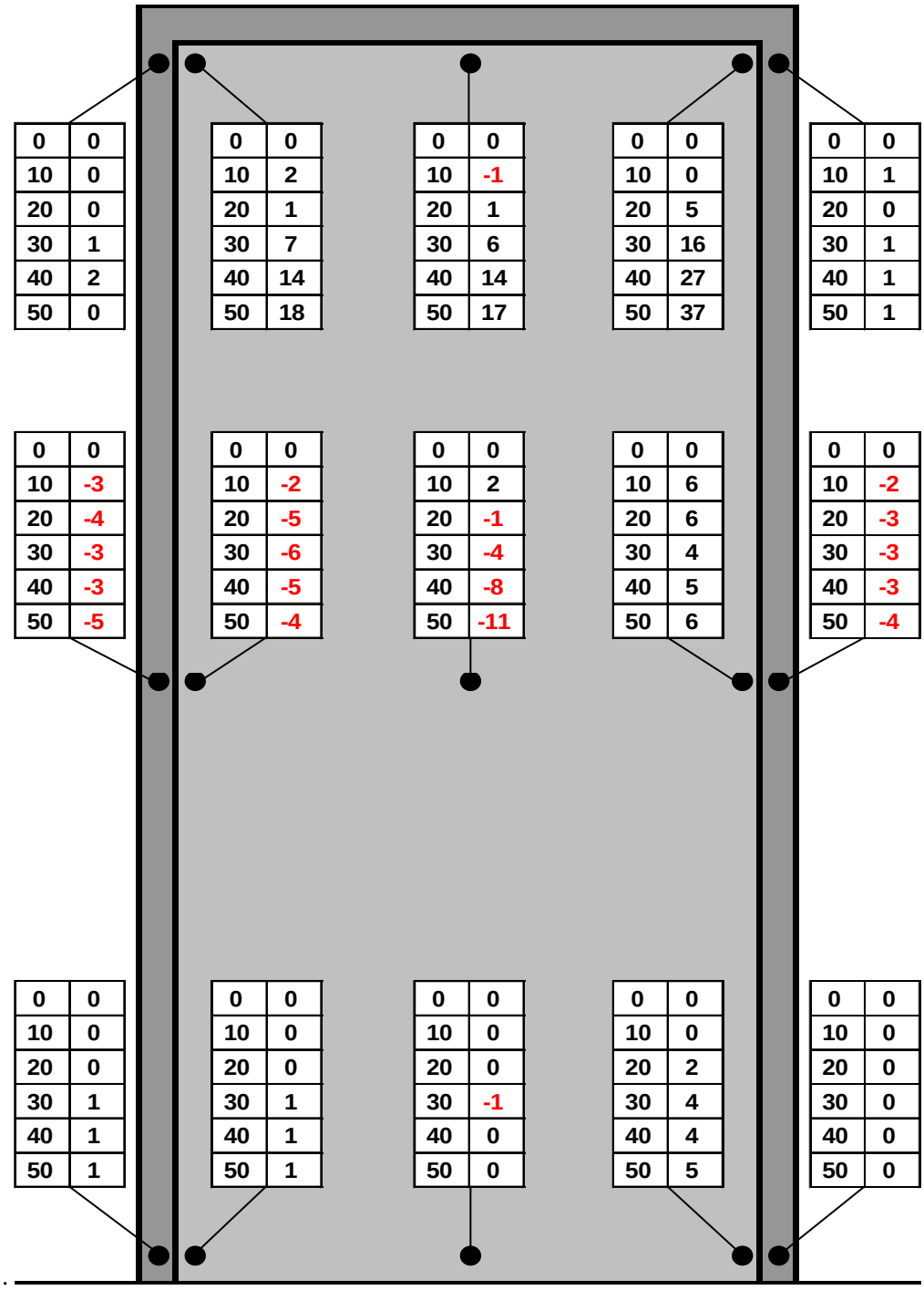
3.5 Deflection

Taut stainless steel wires were anchored horizontally across the unexposed face of the specimen such that any deflection experienced by the test specimen could be measured. One wire was positioned 10 mm vertically below the head of the leaf, the second at mid-height and the third 10 mm vertically above the threshold. The following figure shows these positions with the elapsed time (minutes) in the left hand column and the recorded deflection (mm) in the right hand column. Positive values indicate deflection towards the heating conditions of the test.



4 TEST OBSERVATIONS

Photographs taken during and after the test are shown in Appendix 2.

TEST OBSERVATIONS (E = Exposed face: U = Unexposed face)		
Time	Face	Observation
(min:sec)		
00:00		Start of the test.
05:00	U	Heavy smoke/steam issuing at head and jambs above mid height.
12:00	U	Medium smoke/steam issuing at head corner & jambs above mid height.
16:00	E	Letter plate in position
22:20	E	Letter plate missing. Intumescent has filled the aperture.
23:10	U	Medium smoke/steam issuing at bottom of letter plate.
30:50	U	Leaf blistering at mid height to right hand side of letter plate.
32:00	U	Medium smoke/steam issuing at closing stile/head corner and hanging stile/head corner. Leaf deflecting at closing stile/head corner exposing intumescent seal.
33:50	U	Intumescent seal at head detaching at closing corner.
36:30	U	Glow at closing stile/head corner.
37:11	U	A cotton pad was applied nominally at closing stile/head corner, no failure.
38:20	U	Flash flaming at the head 200mm from closing stile/head.
39:47	U	Flaming commences at closing stile/head corner of leaf.
39:57	U	**INTEGRITY FAILURE** due to sustained flaming. **INSULATION FAILURE** due to integrity failure.
41:00	U	Flaming extinguished and area sealed at request of sponsor.
42:00	U	Intumescent seal at hanging stile/head corner continues detaching.
47:50	U	Intumescent seal at hanging stile/head corner has detached
52:55	U	Ceramic blanket attached to closing stile/head corner of leaf to allow test to continue.
60:00	U	Glow at bottom of hanging stile adjacent to automatic door bottom.
61.10		Test terminated**.**

Key
Light smoke/steam – faint wispy
Medium smoke/steam – partially obscuring specimen
Heavy smoke/steam – completely obscuring specimen

6 LIMITATIONS

1. The test results relate only to the specimen tested. Appendix A of BS476: Part 20: 1987 provides guidance information on the application of fire resistance tests and the interpretation of test data. Application of the results to specimens of different dimensions, orientation or incorporating different components should be the subject of a design appraisal or further testing.

2. The results relate only to the behaviour of the specimen 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.

3. The doorset was asymmetrical and was tested such that the door leaf opened towards the heating conditions of the test. The test results may not be appropriate to situations where the door leaves open away from the heating conditions.

Report prepared by:

E Southern
Deputy Head of Testing

Report checked by:

E Wilson
Head of Testing

Report issued: **12th September 2018**

APPENDIX 1 SPECIMEN CONSTRUCTION

The item numbers listed in Appendix 1 Table 1 and shown in the figures in Appendix 1 refer to the components of the specimen construction. Any photo numbers refer to those in Appendix 2.

Please note that unless otherwise indicated the following applies:

a) All dimensions and materials of construction were verified by the laboratory.
b) Figures are not to scale.
c) All dimensions are given in mm.

Appendix 1 Table 1

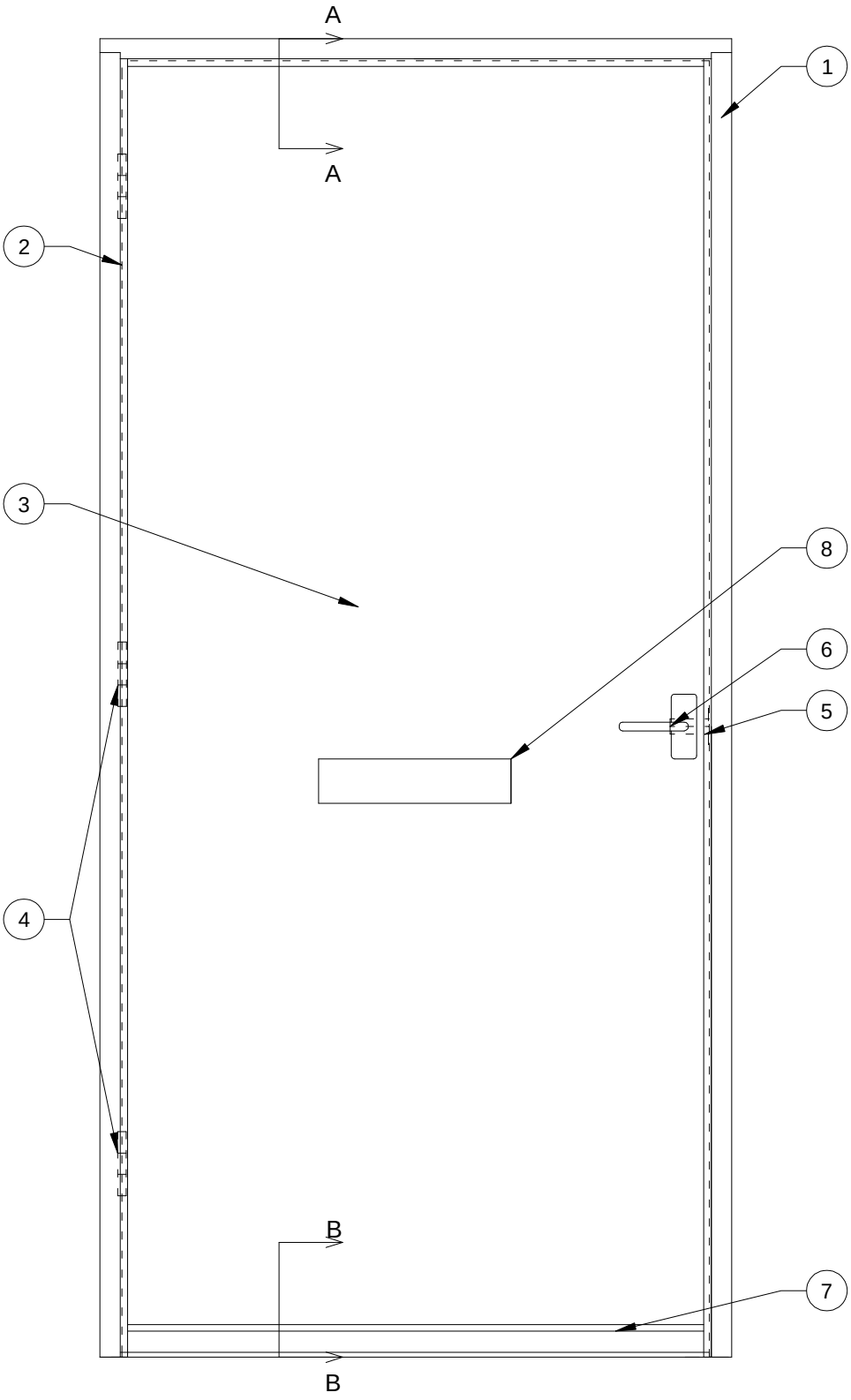
Item	Component	Information
1	**Door frame**	
	Supplier:	Exitex Limited.
	Description:	A 3 sided sapele frame with 8 high rebated joints at the top corners fixed with 2 No. 3½" x No12 countersunk woodscrews at 55 centres.
	Fixing to supporting construction:	5 No. 3" x No10 countersunk woodscrews set 220 from top and 300 from bottom with the remaining 3 No equally spaced on the jambs.
	Overall size (h x w x d):	2078 x 995 x 100 x 32
	Cross section size (h x d):	32 x 100
	Density (kg/m^3):	640**
2	**Stops**	
	Supplier:	Exitex**
	Description:	Sapele** butt jointed planted stops affixed at 460 centres with 16SWG x 50** pins
	Overall size (h x d x w):	12 x 32
3	**Leaf**	
	Supplier:	Exitex**
	Description:	A graduated density leaf core with lippings on all edges.
	Overall size (h x w x t):	2040 x 925 x 54
	Weight (kg):	63.9 (including ironmongery)
	Sub-components:	
	Core:	
	Manufacturer:	Falcon Panel Products**
	Type:	Strebord graduated density core.
	Size (t):	54
	Density (kg/m^3):	620**
	Lippings	
	Description:	Sapele** lippings to all edges adhered with PU adhesive**
	Overall size (w x d):	8 x 54
	Density (kg/m^3):	640**
	Letterbox aperture:	Letterbox aperture set 1115 below head of leaf and

Item	Component	Information
3 cont	Description: Overall size (w x d):	central to width. 51 x 276
4	**Hinges:** Manufacturer: Type: Description: Blade size (h x w x d x t): Knuckle size (Ø): Fixings to frame: Fixings to leaf:	 Royde and Tucker Hi Load 102 3 No. steel bearing butt hinges, set at 150, 920 and 1692 below the leaf head to the top of the hinge blade. 100 x 35 x 3 13 5 No. Ø4.5 x 25 countersunk steel wood screws 5 No. Ø4.5 x 32 countersunk steel wood screws.
5	**Latch/Lock** Supplier: Type: Description: Overall size: Body (h x w xd) Forend (h x d x t): Forend cover (h x d x t): Strike (h x d x t):	 Gridlock Cylinder mortice latch. A cylinder mortice latch with steel body and forend fitted with spindle 995 above bottom of leaf. A stainless steel cover to the forend is fitted. 24 x 62 x 15 57 x 24.5 x 1.5 60 x 25 x 0.8 76 x 38 x 1.2 (including tongue 35 x 12)
6	**Handleset** Supplier: Product code: Description: Backplate (h x w x d): Handle (h x w x d)	 Dale Hardware DH005706 SAA Sandal lever handle mainly aluminium with steel sub-components. 102 x 40 x 10 21 to 14 x 102 x 8
7	**Automatic door bottom** Manufacturer: Reference: Description: Overall size (h x w x d):	 Exitex Concealex face fixed. Aluminium body and cover with elastomeric seal activated by leaf closing/opening action. Positioned with bottom edge 1mm below bottom of leaf. 40 x 905 x 13
8	**Letterbox** Manufacturer: Reference: Description: Overall size: Faceplate (h x w x d):	 Exitex 12” FD60 letter plate Aluminium face plates with adjustable plastic sleeves incorporating a brush seal. Affixed with 4 screws at corners of each face plate to the leaf and 2 mid-height at the sides sleeve to sleeve. 70 x 303 x 16.3

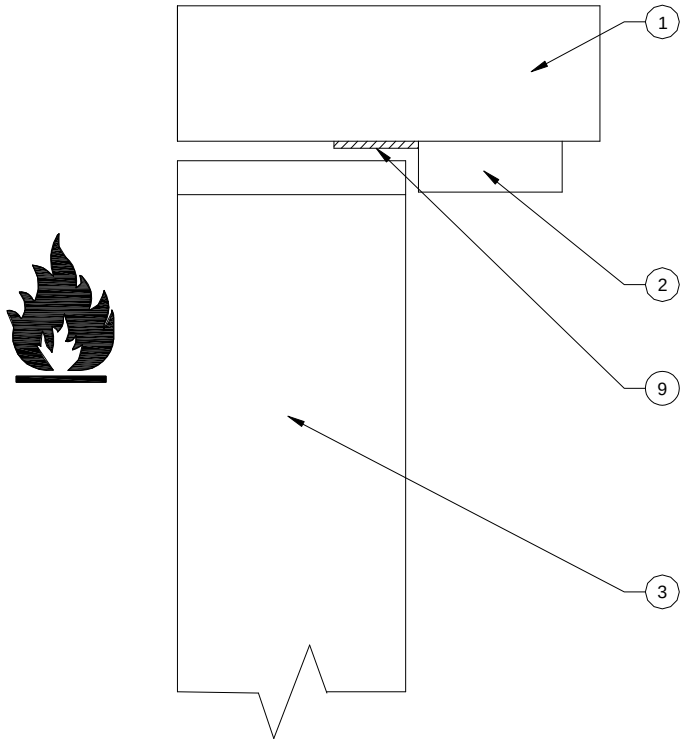
Item	Component	Information
8 cont	Outer sleeve (h x w x t): Inner sleeve (h x w x t):	45 x 262 x 1.5 40 x 258 x 1,5
9	**Intumescent to frame** Manufacturer: Reference: Description: Overall size (w x t):	 Exitex Surface mounted intumescent Surface mounted graphite based intumescent with plastic strip on exposed surface and with self-adhesive tape in contact with frame. Positioned adjacent to stop and bypassing the hinges and strike 19.3 x 1.6
10	**Intumescent to latch/lock** Manufacturer: Type: Description: Overall size (t):	 Exitex Exi Fire** A graphite based intumescent material with self-adhesive on one side is wrapped around the body of the latch. 1
11	**Intumescent to forend** Manufacturer: Type: Description: Overall size (d x w):	 Exitex Exi Fire** A graphite based intumescent material with self-adhesive on one side is positioned beneath the lock and strike forends. 1
12	**Intumescent to letterbox** Manufacturer: Type: Description: Overall size (d x h):	 Exitex Exi Fire** A strip of graphite based intumescent was fitted around the perimeter of the outer sleeve. 43 x 2.3
13	**Fire stopping details** Supplier: Reference: Description: Gap width (t):	 Craylon Limited Blue 60** The gaps between the frame and the associated supporting construction were filled with Craylon Blue 60 Expanding foam in conjunction with Craylon Blue 60 fire rated packers. The sponsor wished to evaluate the performance of stock which had exceeded its shelf-life (expiry date 25/05/2017) 17 head; 13.5 jambs

Key:
* Nominal value; ** Sponsor declared value or detail, not verified by laboratory
‡ Identified post test from remains of specimen

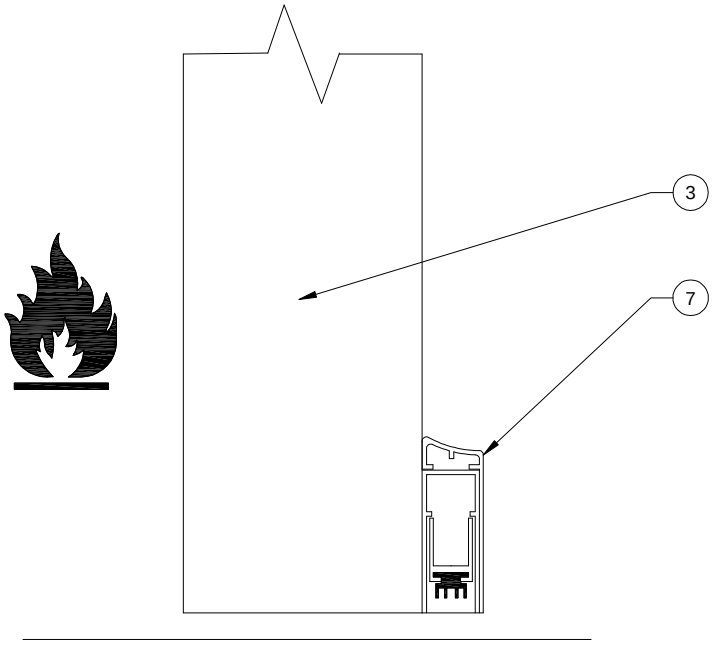
Appendix 1 Figure 1 – Elevation viewed from the unexposed side incl. hidden detail



Appendix 1 Figure 2 – Section A – A



Appendix 1 Figure 3 – Section B – B



APPENDIX 2 PHOTOGRAPHS

Appendix 2.1 Pre-test photos

Photo 2.1.1

Photo 2.1.2

Photo 2.1.3

Photo 2.1.4

Photo 2.1.5

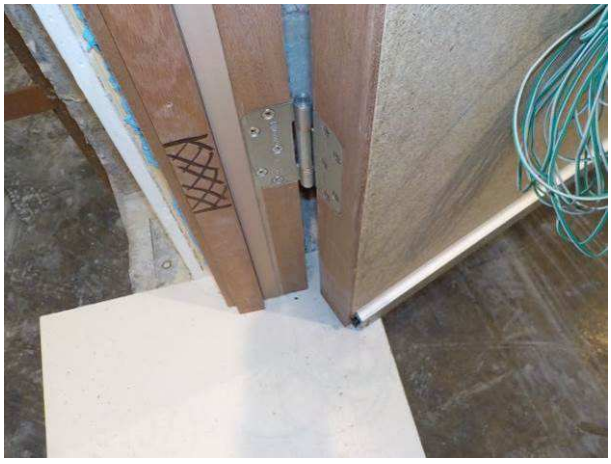


Photo 2.1.6

Photo 2.1.7

Photo 2.1.8

Photo 2.1.7

Appendix 2.2 During test photos

Photo 2.2.1

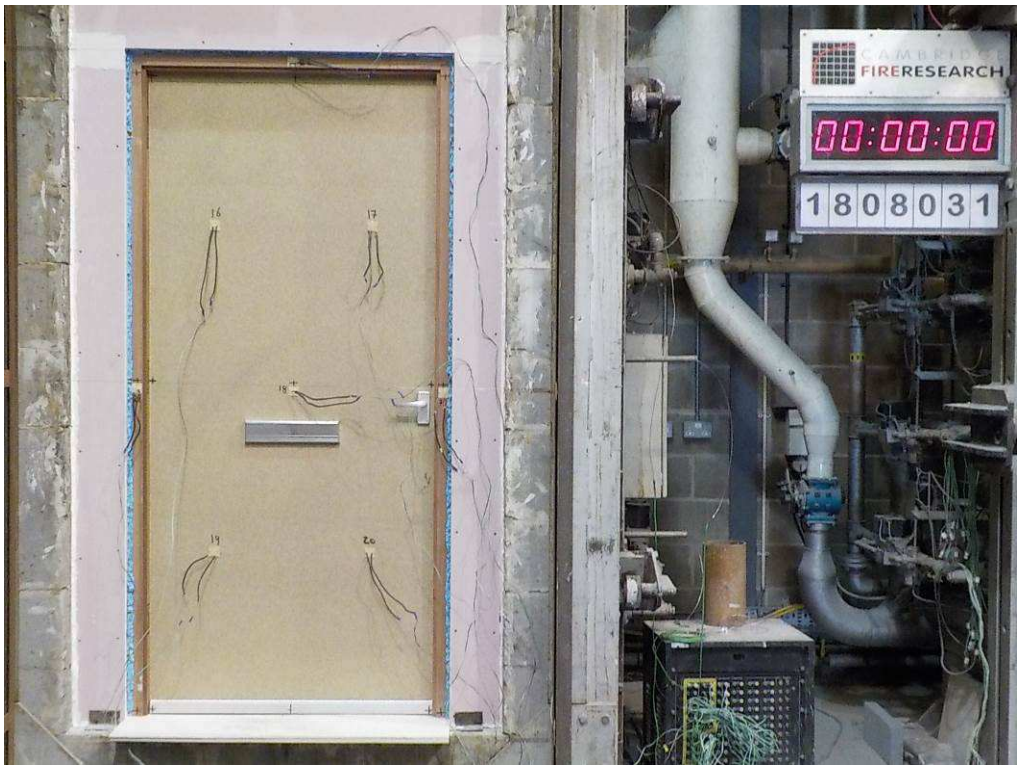


Photo 2.2.2

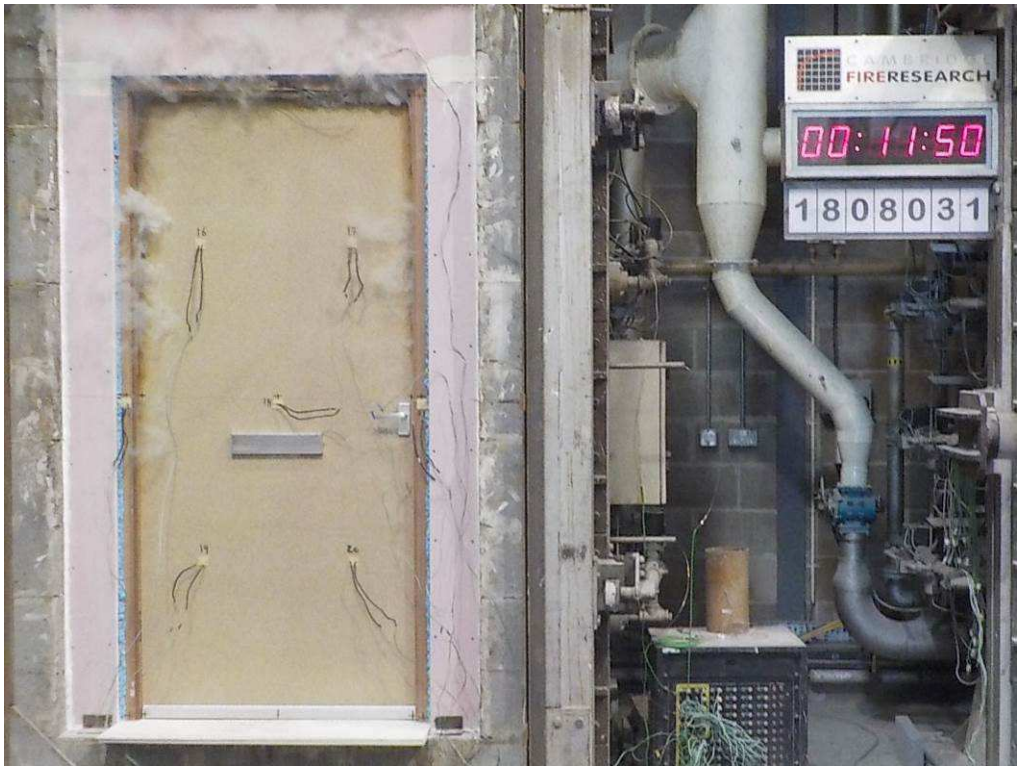


Photo 2.2.3

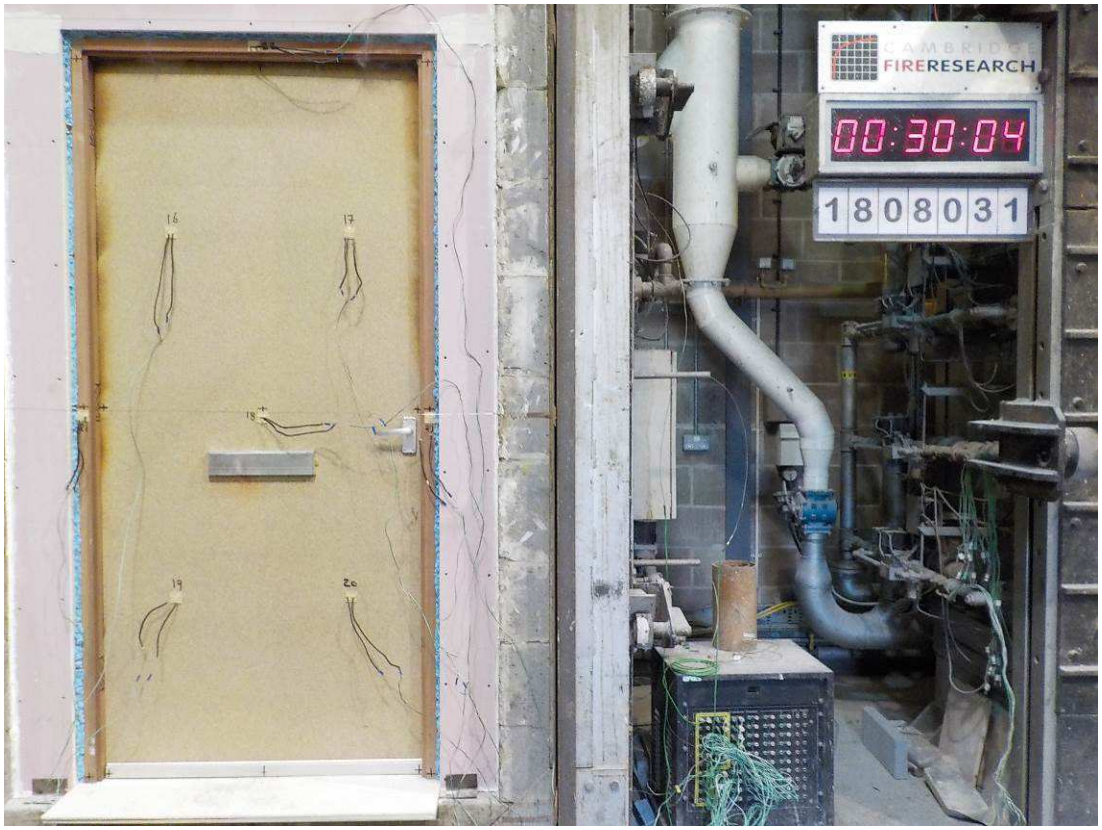


Photo 2.2.4 – after 34 minutes

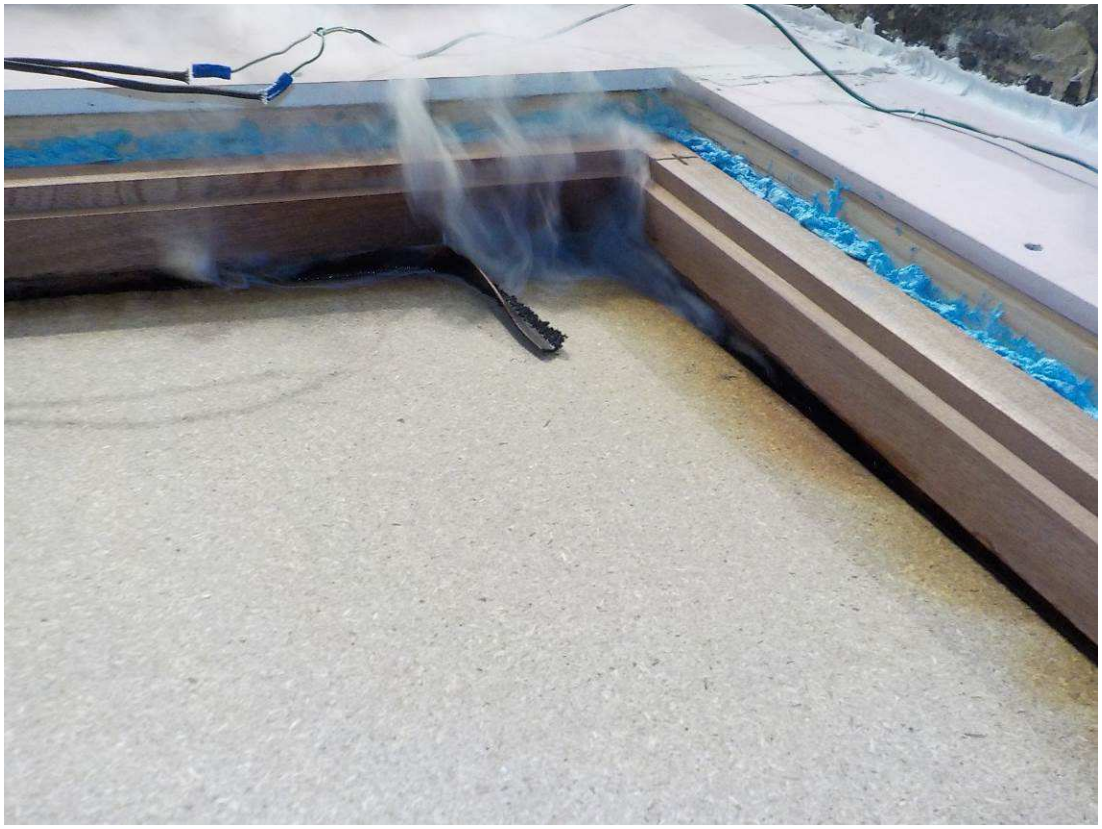


Photo 2.2.5

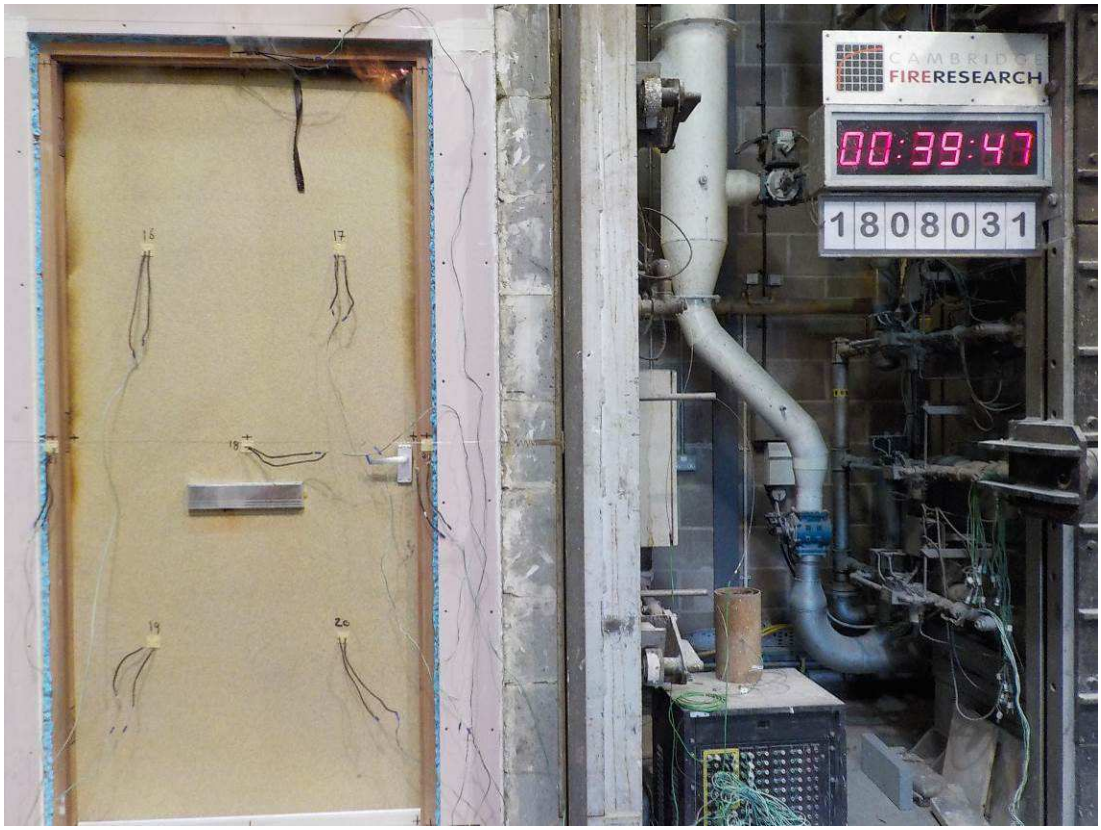


Photo 2.2.6 – after 40 minutes

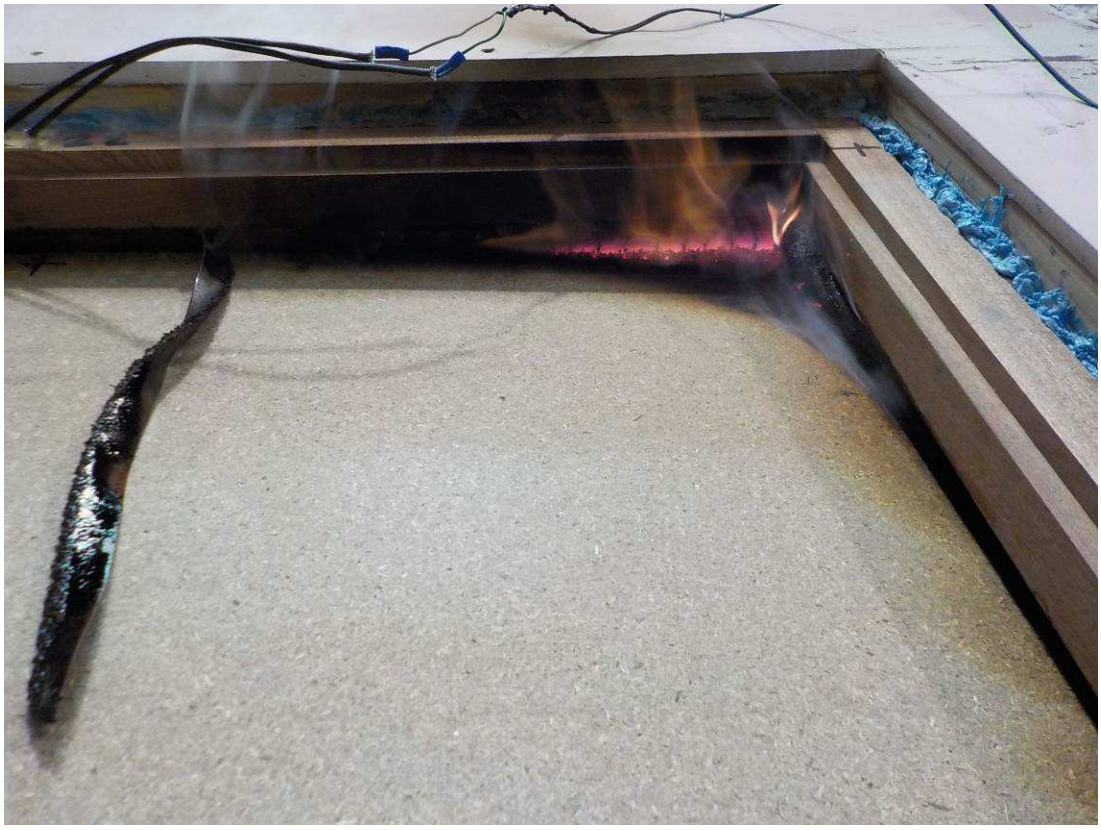


Photo 2.2.7

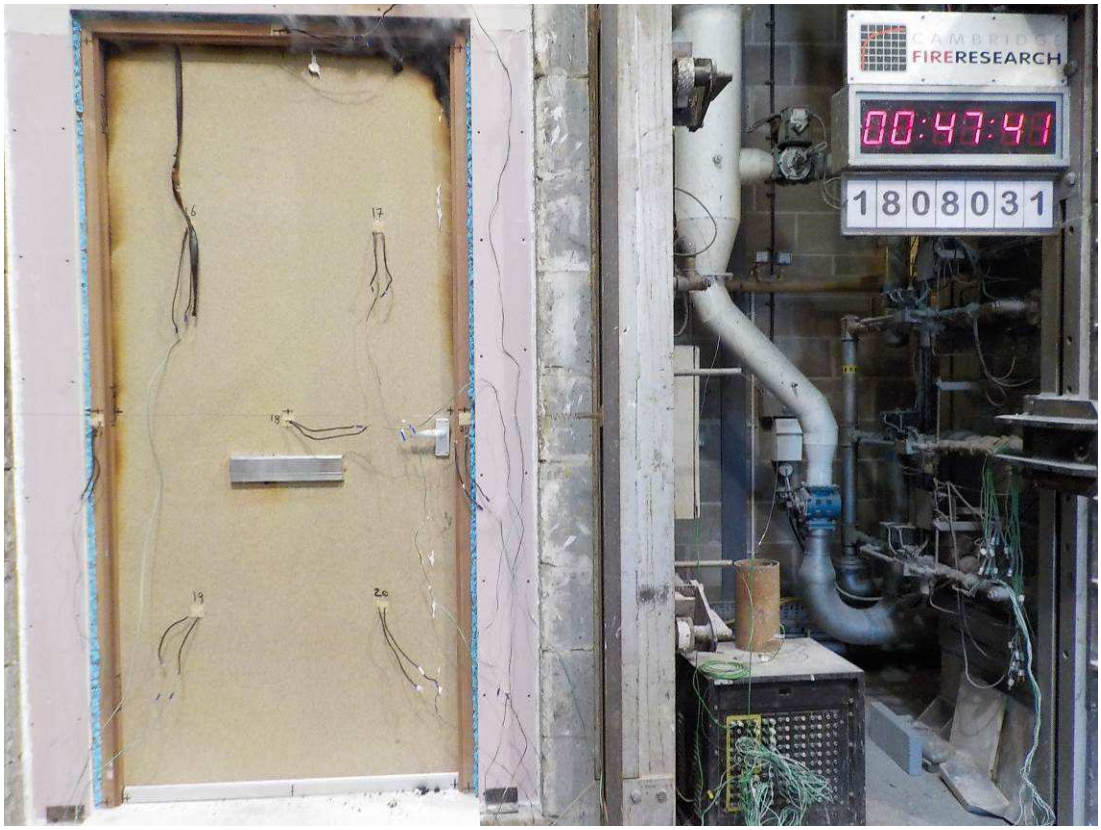
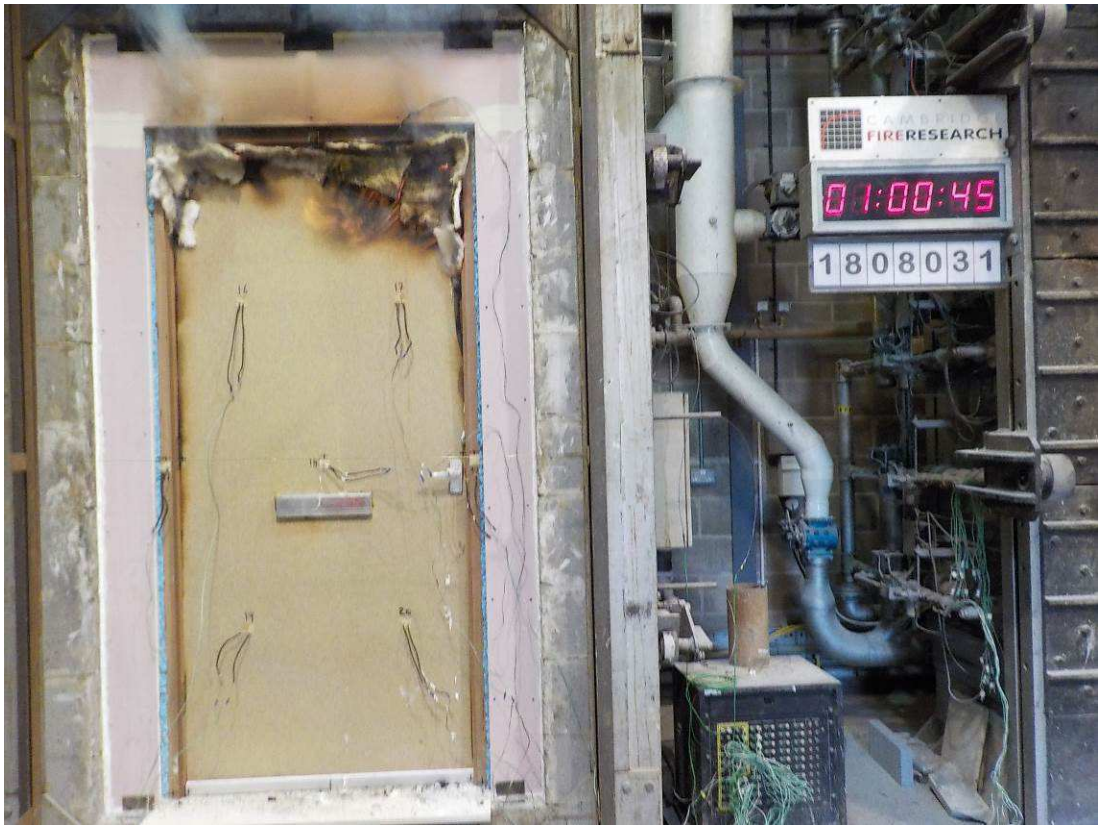
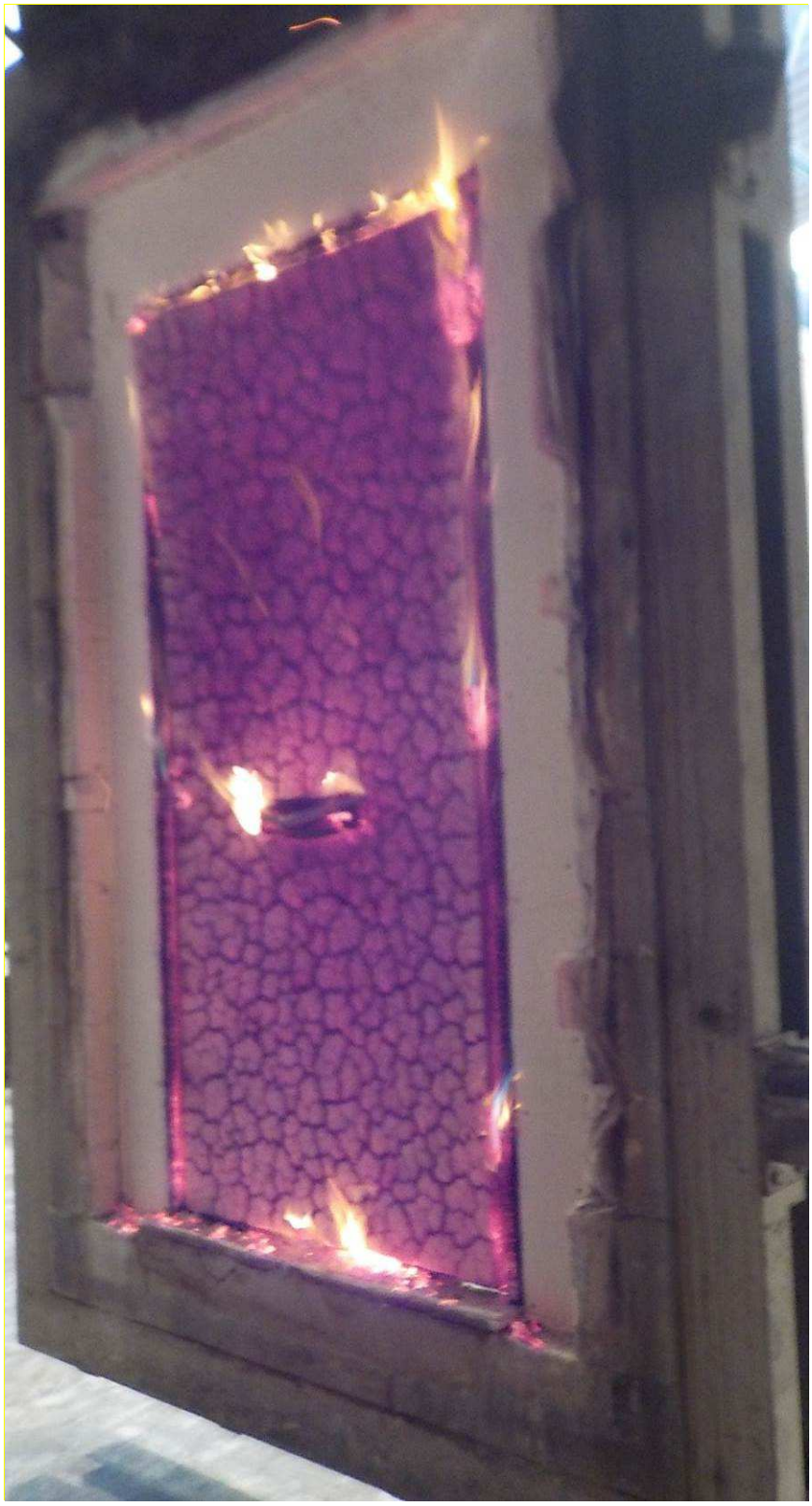


Photo 2.2.8

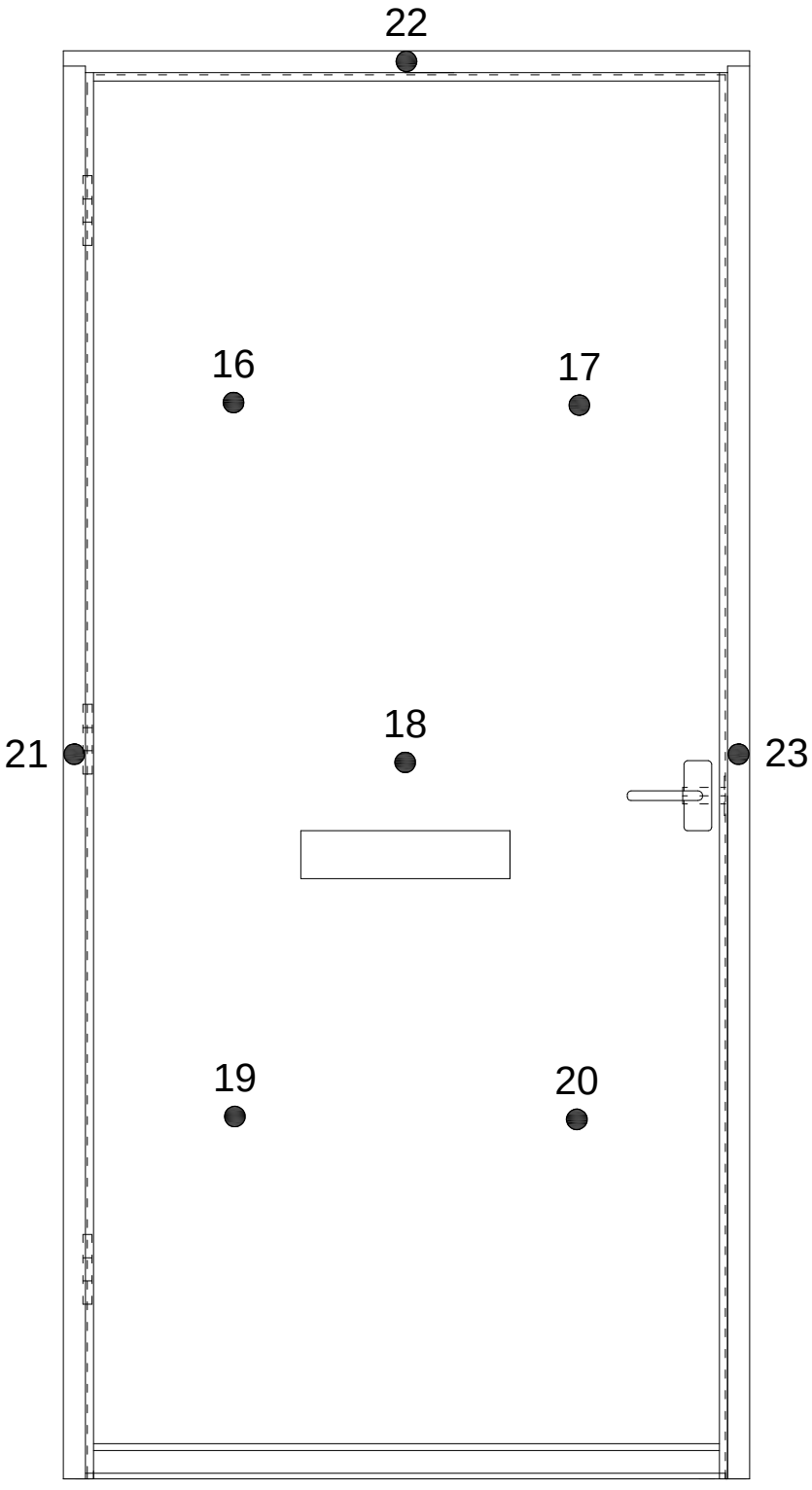


Appendix 2.3 Post-test photos

Photo 2.3.1



APPENDIX 3 POSITIONING OF INSTRUMENTATION



● Unexposed face specimen thermocouple

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APPENDIX 4 RECORDED THERMOCOUPLE DATA

Time	Chan 16	Chan 17	Chan 18	Chan 19	Chan 20	Chan 21	Chan 22	Chan 23
min	°C	°C	°C	°C	°C	°C	°C	°C
0	27	28	27	27	27	27	27	27
1	28	28	27	27	27	27	27	27
2	28	28	27	27	27	27	27	27
3	28	28	27	27	27	27	28	27
4	27	28	27	27	27	27	29	27
5	27	28	27	27	27	27	30	27
6	28	28	27	27	27	27	30	27
7	28	29	27	27	27	28	30	27
8	28	28	28	27	27	28	30	27
9	28	28	28	27	27	28	30	27
10	28	28	28	28	27	28	31	27
11	28	28	28	28	27	28	30	27
12	28	28	28	28	27	28	31	27
13	28	28	28	28	27	28	32	27
14	28	28	28	28	27	28	32	27
15	28	28	29	28	27	28	32	27
16	29	28	29	28	28	28	32	27
17	29	29	30	28	28	28	31	27
18	30	29	32	28	28	28	31	28
19	31	30	33	29	29	28	31	27
20	32	30	35	29	30	28	32	28
21	34	31	37	30	30	28	32	27
22	36	33	40	30	32	28	32	28
23	39	34	42	31	33	28	32	28
24	42	35	46	32	35	28	32	27
25	44	38	50	34	37	28	32	28
26	48	40	53	35	39	28	32	28
27	51	42	56	37	42	28	32	28
28	54	45	58	39	44	28	32	28
29	56	48	60	41	47	29	32	28
30	59	49	63	43	49	29	33	28
31	62	52	64	45	52	30	33	28
32	63	54	66	47	54	29	34	28
33	65	55	67	49	55	29	34	28
34	66	57	68	51	57	30	35	28
35	67	59	68	53	59	30	36	29
36	68	60	69	55	60	30	37	29
37	69	62	70	57	62	31	39	29
38	70	63	71	59	62	31	40	29
39	70	63	70	59	63	31	40	29
40	71	65	71	61	64	32	*	29
41	71	65	71	62	65	32	*	30
42	72	66	71	63	66	32	48	30
43	72	67	72	64	67	33	52	30
44	72	68	72	65	67	33	48	30
45	73	68	72	66	68	34	38	30

Time	Chan 16	Chan 17	Chan 18	Chan 19	Chan 20	Chan 21	Chan 22	Chan 23
min	°C	°C	°C	°C	°C	°C	°C	°C
46	73	69	72	67	68	34	39	30
47	73	70	73	67	69	34	41	31
48	74	70	73	68	69	34	43	31
49	74	70	73	68	69	35	45	31
50	74	71	73	69	70	35	43	31
51	75	71	74	70	71	35	47	31
52	75	72	74	70	71	36	50	32
53	76	73	75	71	71	36	67	32
54	76	73	75	71	72	36	53	33
55	76	74	74	72	72	36	55	33
56	77	74	74	65	72	36	107	33
57	76	74	75	58	73	37	112	33
58	75	73	75	56	73	37	121	34
59	75	67	75	55	73	37	112	34
60	75	63	76	55	74	38	134	34
61	76	62	76	55	74	38	148	35

* Thermocouple malfunction