TEST REPORT NUMBER CFR1909171

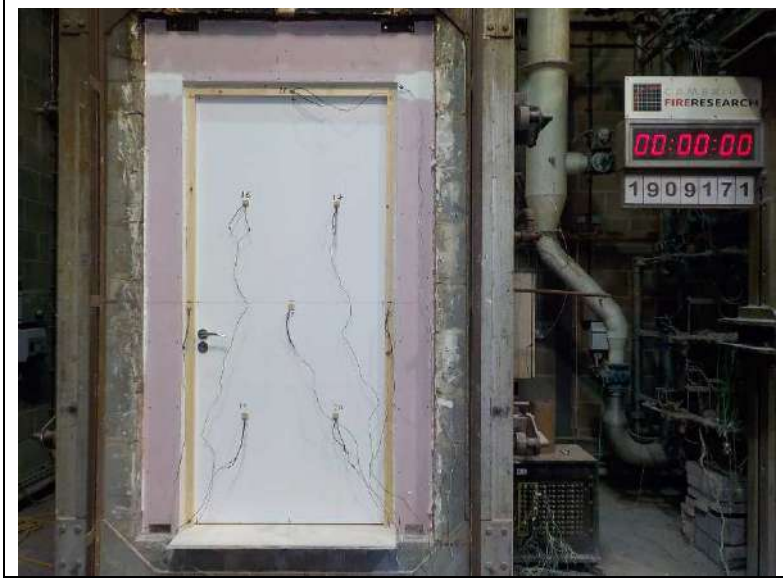
CAMBRIDGE FIRERESEARCH

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

Sponsor:	Astra DC Limited
Address:	Unit 4, Astra business Centre Roman Way Preston PR2 5AP
Date of test:	17th September 2019

Results:

Test duration:	37 minutes (discontinued at the request of the sponsor)
Integrity:	37 minutes (no failure, the test having been discontinued)
Insulation	37 minutes (no failure, the test having been discontinued)



Summary of test specimen:

A single leaf timber doorset, tested opening into the furnace as a latched, insulated doorset.

Leaf size (h x w x d):
2040 x 924 x 44

This test report is only valid when presented in full.

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1 PREPARATION FOR TESTING

1.1 Specimen conditioning

The specimen was received by Cambridge Fire Research on 16/08/2019. During the final 7 days the specimen was on site, the temperature and relative humidity were recorded to be within the range of 16 to 29°C and 34 to 76% respectively.

1.2 Associated construction

Cambridge Fire Research constructed a softwood timber-stud partition, which was clad with 1No.British Gypsum FireLine board of 15mm thickness on the exposed side and 1No. British Gypsum FireLine board of 12.5mm thickness on the unexposed side, this provided an aperture for the specimen of 2090 mm high x 999 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

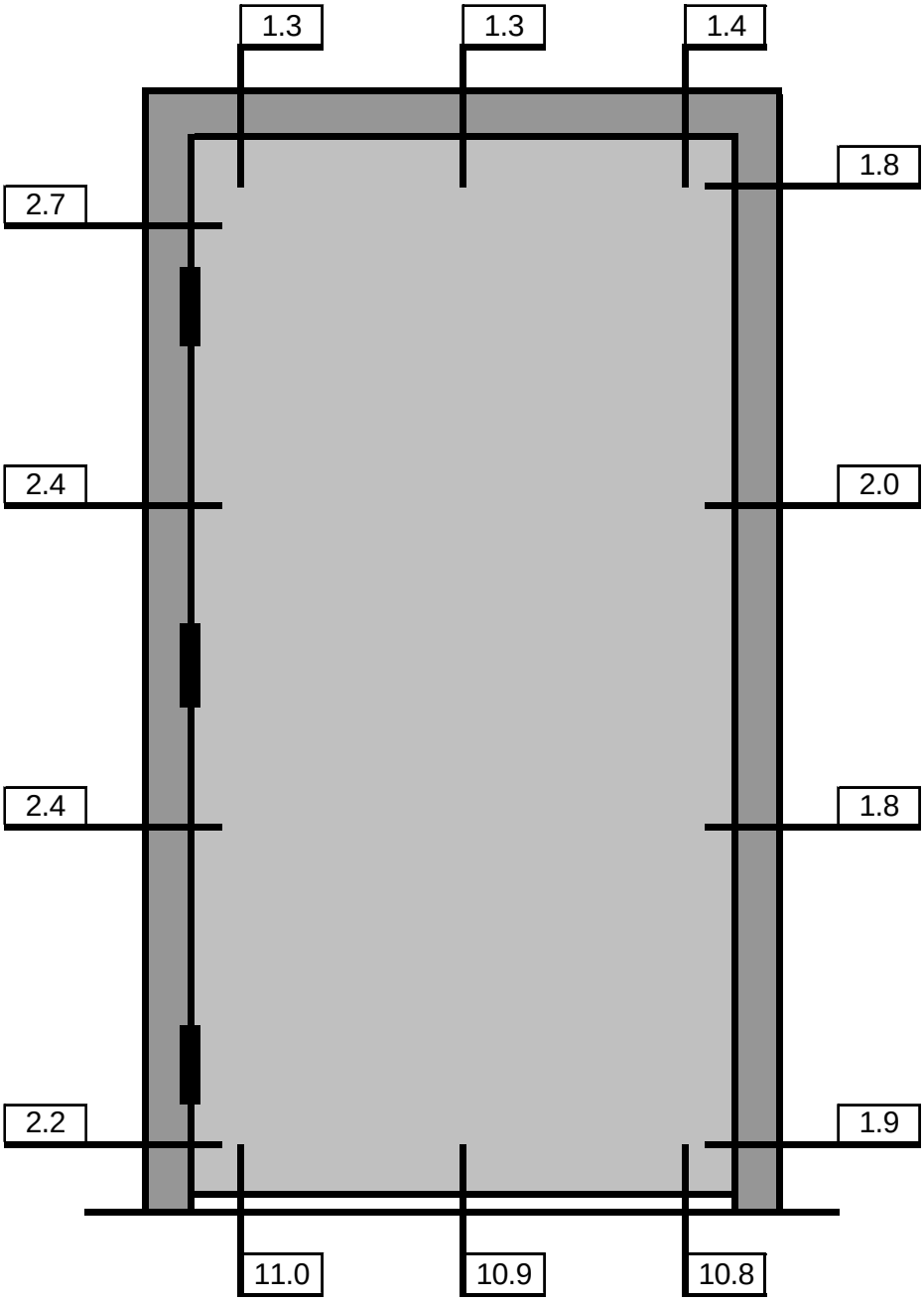
Cambridge Fire Research installed the specimen into the associated construction. The specimen was asymmetrical and fitted such that the door opened towards the heating conditions of the test at the request of the sponsor. The leaf was latched prior to the start of the test.

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

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

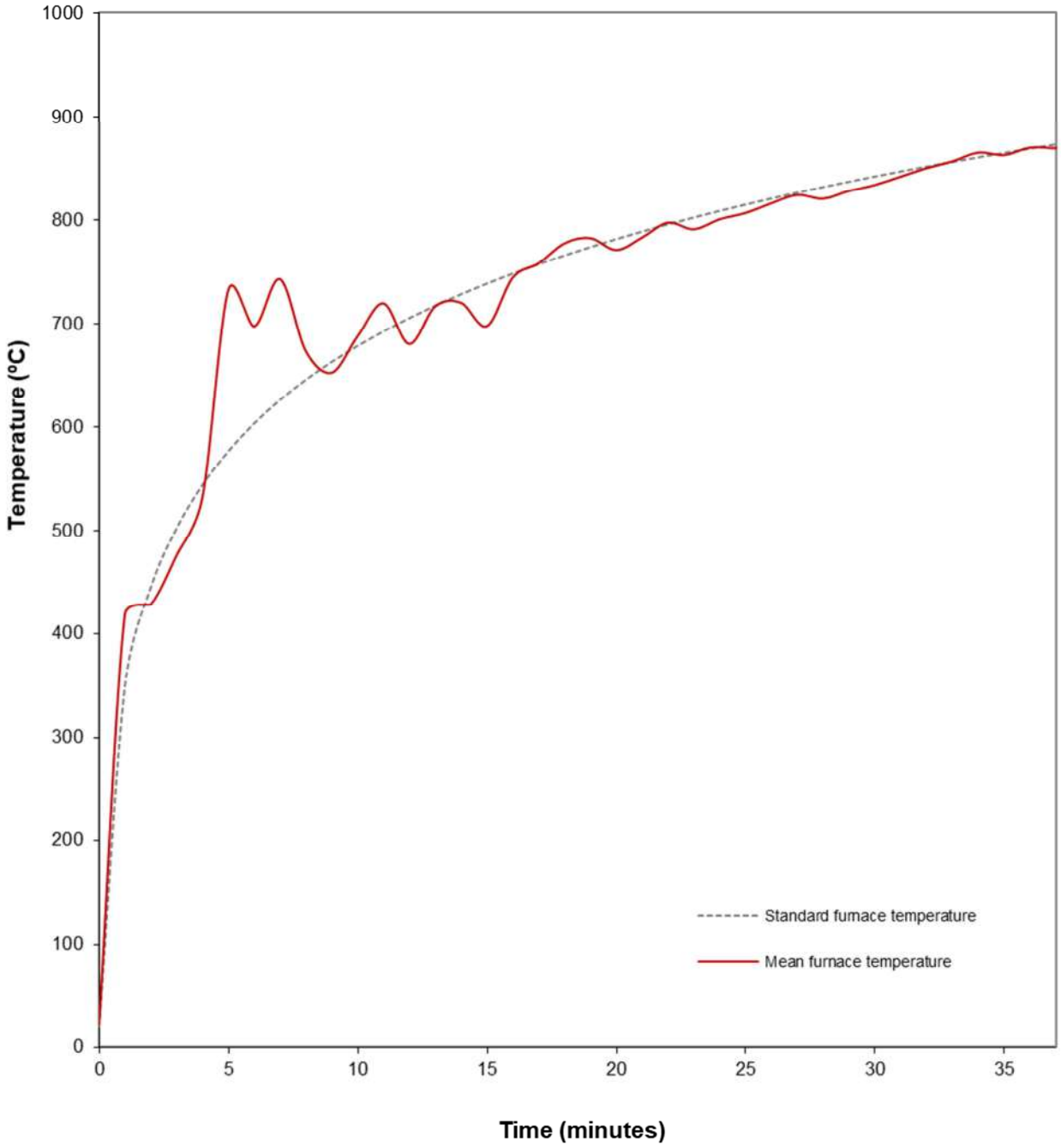
The door opening and closing forces for the leaf were measured in accordance with Fire Test Study Group Resolution No. 63 and the calculated moments are shown in the following table.

Direction	Closing force (N)	Closing moment (Nm)	Opening force (N)	Opening moment (Nm)
Opening towards heating conditions	31.6	23.7	37.1	27.8

3 TEST CONDITIONS, INSTRUMENTATION AND MEASURING

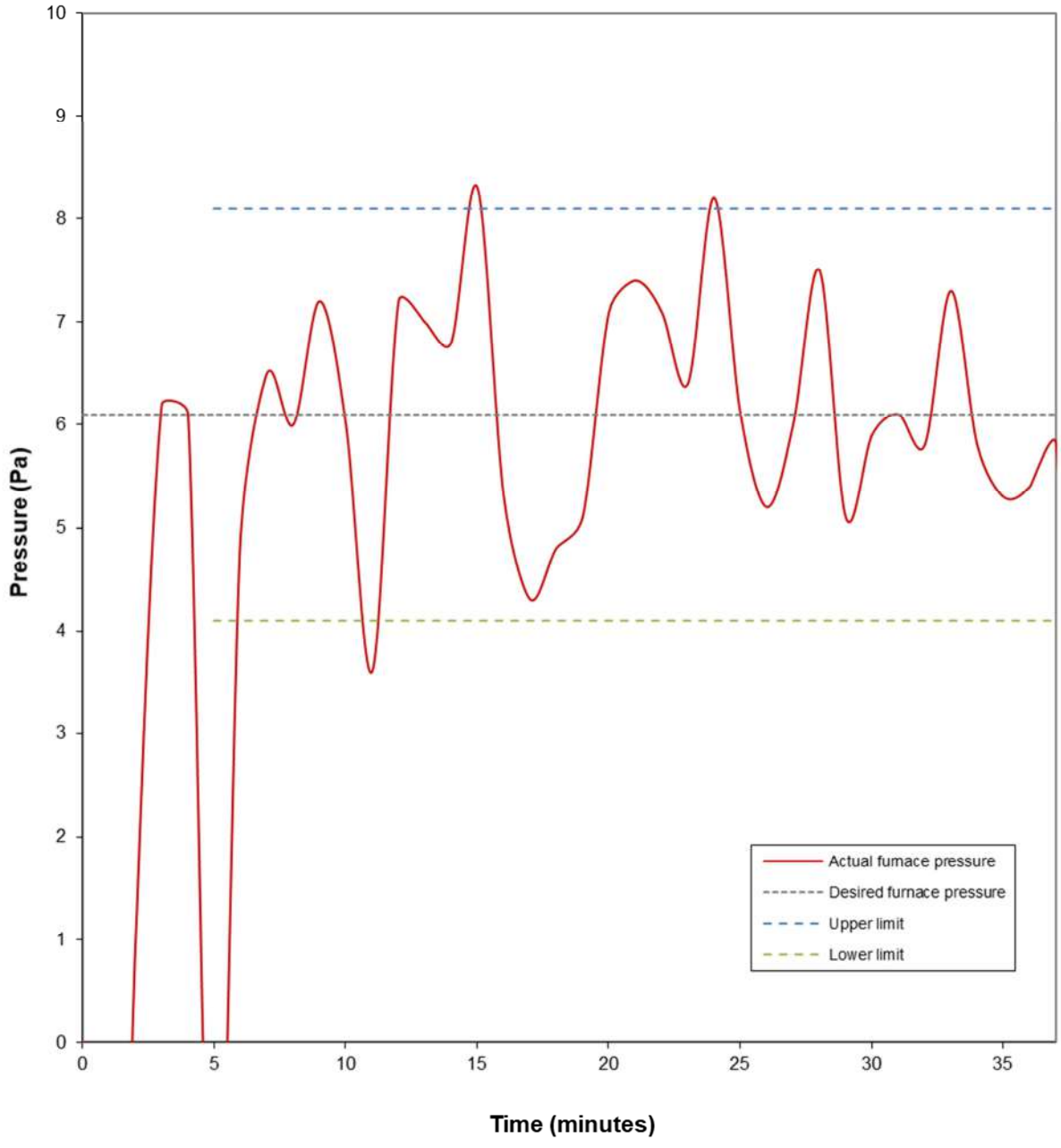
3.1 Furnace temperature

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 4 instantaneous occasions which were considered to be 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 20°C.
Ambient temperature remained at 20°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:

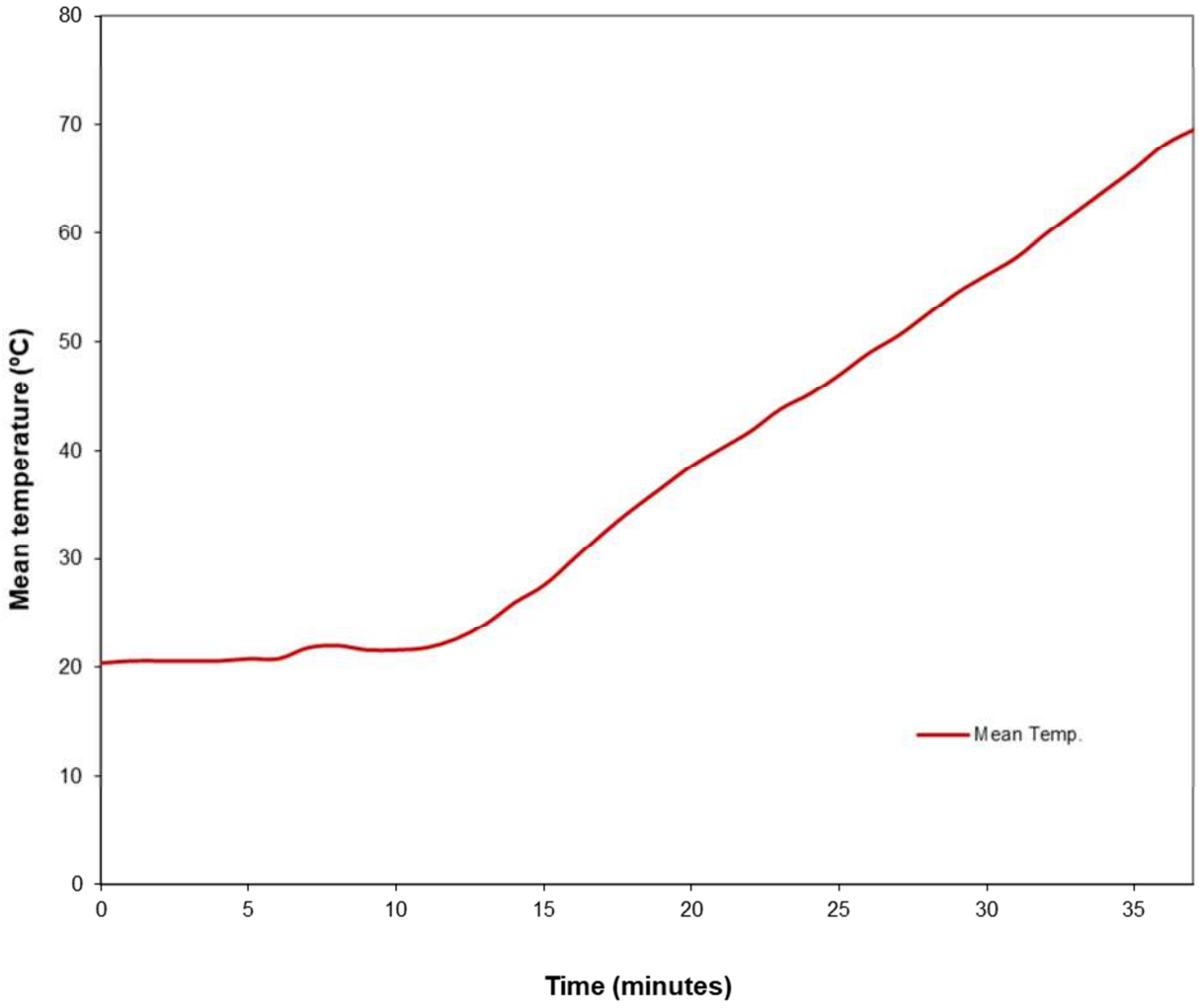
Doorset leaf	Channels 16 to 20	(mean & maximum)
Doorset frame	Channels 21 to 23	(maximum only)

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.

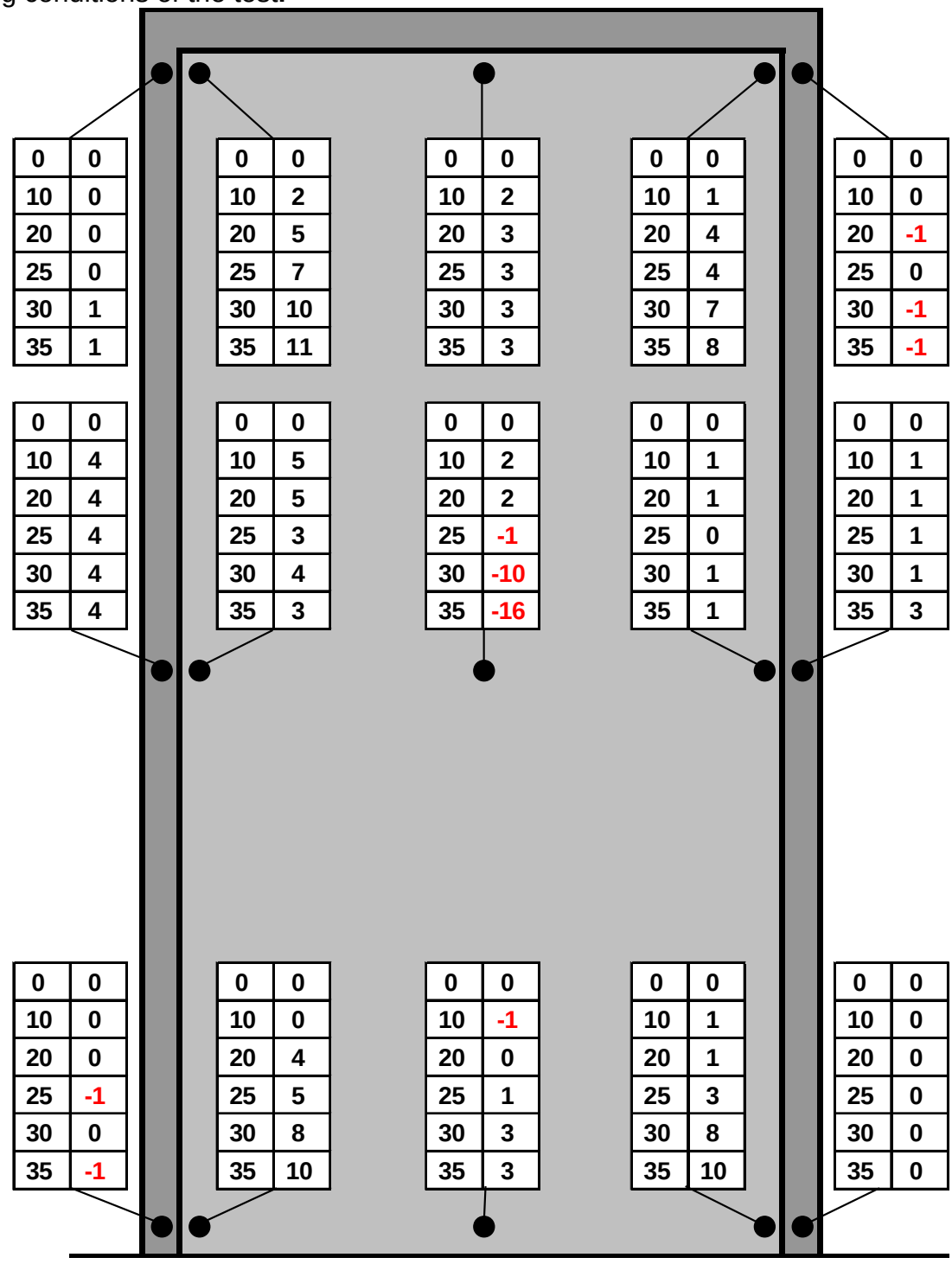
The recorded data of all individual thermocouples is shown in the tables in Appendix 4.

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



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	Medium smoke/steam is issuing at stiles, mid-height and above.
06:20	E	Facing is peeling.
06:40	U	Medium smoke/steam is issuing at top corners of leaf.
07:18	U	Facing is smoke stained on closing stile.
08:06	U	Medium smoke/steam is issuing at eurocylinder.
09:16	E	Core and frame have fissured.
11:00	E	Rose is melting.
16:43	U	Medium smoke/steam is issuing at closing stile nominally 500 up.
17:55	U	Top corners of leaf distorted.
18:02	E	Handle has rotated.
21:52	U	Medium smoke/steam is issuing at top hinge position.
22:10	E	Handle is missing.
23:15	U	Molten aluminium at base of closing stile.
33:55	U	Facing is charring at hanging stile/head corner.
35:18	U	Handle backplate is detaching.
37:17		Test terminated.

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

5 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.

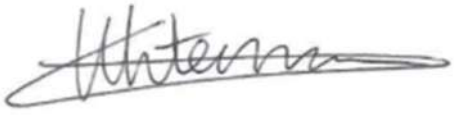
3. The doorset was asymmetrical and was tested such that the door leaf opened towards the heating conditions of the test at the request of the sponsor.

4. The results apply to the specimen(s) as received from the sponsor.

5. Cambridge Fire Research is not responsible for the content of this report where information has been identified (using **) as supplied by the sponsor.

This report is the property of the test sponsor and may not be reproduced or passed to a third party without their prior agreement.

Report prepared by:



G Whiteman
Technical Officer

Report checked by:

T Smith
Technical Officer

Report issued: **14th October 2019**

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

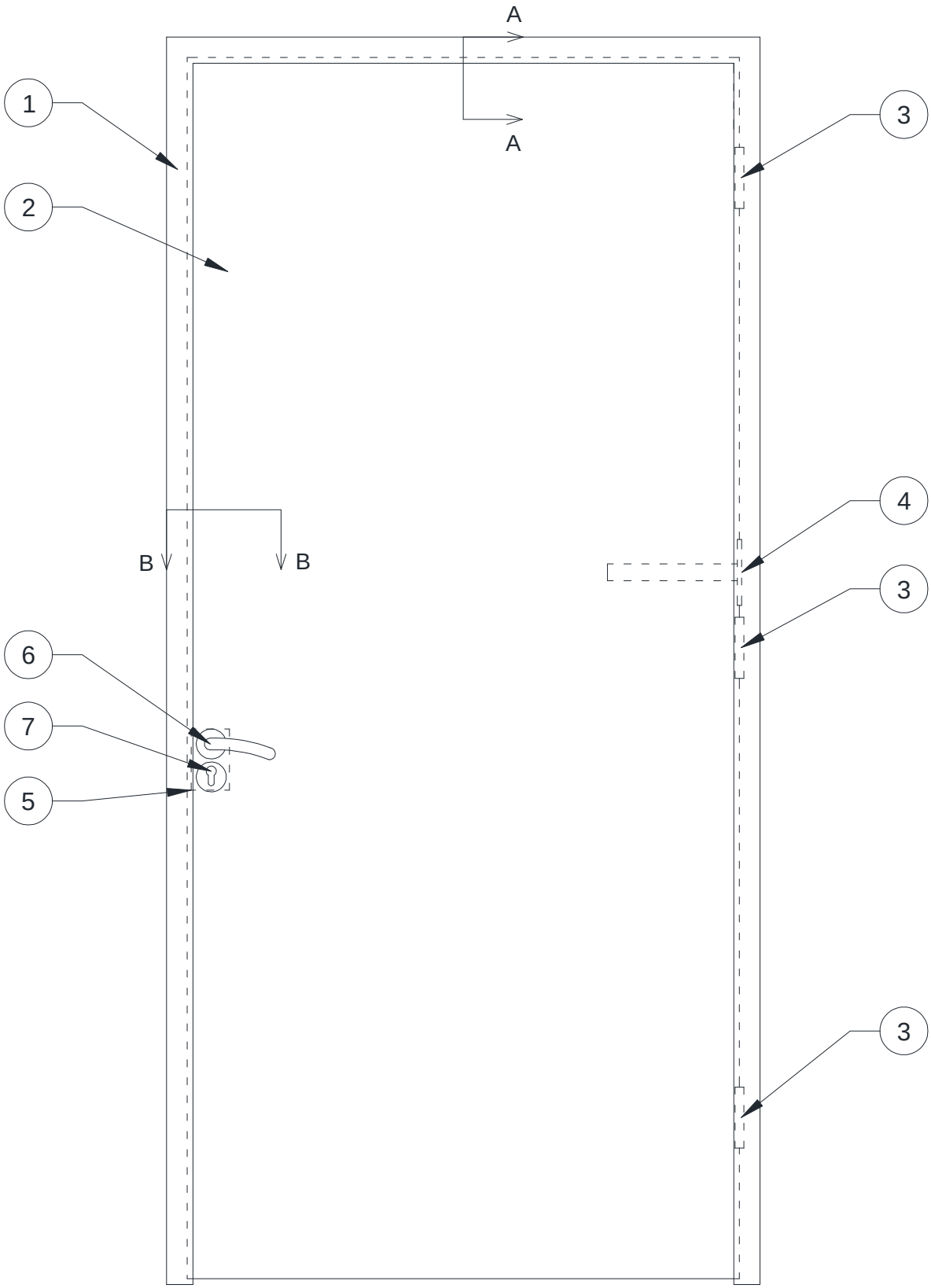
Item	Component	Information
1	**Door frame**	
	Manufacturer:	Shannon Bros Longford Ltd.
	Type:	3 sided with integral stops
	Material:	Softwood – Red Deal**
	Density (kg/m^3):	>440**
	Corner joints:	Butt with mortice and tenon (14h x 15w tenon)
	Fixings:	Fixed vertically using 2No. Ø5 x 100 steel countersunk woodscrews at 40* centres set 17* and 30* from outer frame edge.
	Fixing to supporting construction:	No.10 x 3½" steel countersunk woodscrews set 200 up from bottom of jambs, 140 down from top of jambs and 3No. equispaced.
	Overall size (h x w x d):	2084 x 993 x 80
	Cross section size (h x d):	44 x 80 including stop
	Integral stop (h x d):	12 x 34
2	**Leaf**	
	Manufacturer:	Vicaima Ltd
	Reference:	CF218 A5195845 S/C 496188 510095764 189
	Description:	A timber leaf with stiles and rails.
	Overall size (h x w x t):	2040 x 924 x 44
	Weight (kg):	59.5 including frame and ironmongery
	Sub-components:	
	Core:	
	Type:	Particleboard core
	Thickness (t):	38
	Stiles:	
	Description:	Softwood stiles to both vertical edges.
	Overall size (w x d):	32 x 38
	Rails:	
	Description:	Softwood rails to top and bottom
	Overall size (h x w x d):	30‡ x 38 (outer) 39‡ x 38 (inner)
	Sub-facing:	
	Description:	MDF

Item	Component	Information
2 cont.	Overall size (t):	3
	Facing:	
	Description:	White laminate veneer
	Overall size (t):	0.5
3	**Hinges**	
	Supplier:	Zoo Architectural Hardware
	Type:	Butt hinges with bearings.
	Reference:	ZHSS243RSS** Certifire CF849
	Material:	Stainless steel
	Number:	3
	Location:	Set at 150, 935 and 1720 from the top of the leaf to the top of the blade.
	Blade size (h x w x t):	102 x 30 x 3
	Knuckle size (Ø):	15
	Fixings to frame (Ø x l):	4No Ø4.7 x 32 countersunk stainless steel woodscrews.
	Fixings to leaf (Ø x l):	4No Ø4.7 x 32 countersunk stainless steel woodscrews.
4	**Closer**	
	Manufacturer:	Astra Door Controls Ltd.
	Reference:	Astra 4000 Series concealed door closer**
	Description:	Steel body concealed closer
	Location:	Hanging stile, 805 below leaf head.
	Fixings to leaf:	6No. Ø 4.0 x 38 stainless steel countersunk screws
	Fixings to frame:	6No. Ø 4.0 x 29 brass countersunk screws
	Overall size:	
	Body (Ø x l):	28‡ x 217‡
	Leaf forend: (h x d x t):	110 x 32 x 3.5‡
	Frame forend: (h x d x t):	110 x 32 x 3.5‡
5	**Latch/Lock**	
	Manufacturer:	Zoo Architectural Hardware
	Type:	Reversible bolt contract range
	Reference:	ECS364**
	Description:	Steel lever mortice lock, steel strike, plastic strike box.
	Height of spindle:	900
	Overall size:	
	Body (h x w x d):	102 x 64 x 14
	Fixings (Ø x l):	2No. Ø4 x 25 steel countersunk screws.
	Forend (h x d x t):	155 x 22 x 2
	Strike plate (h x w x d x t):	115 x 14 x 40 x 1.5 (including a 115h tongue)
	Fixings (Ø x l):	2No. Ø4 x 25 steel countersunk screws

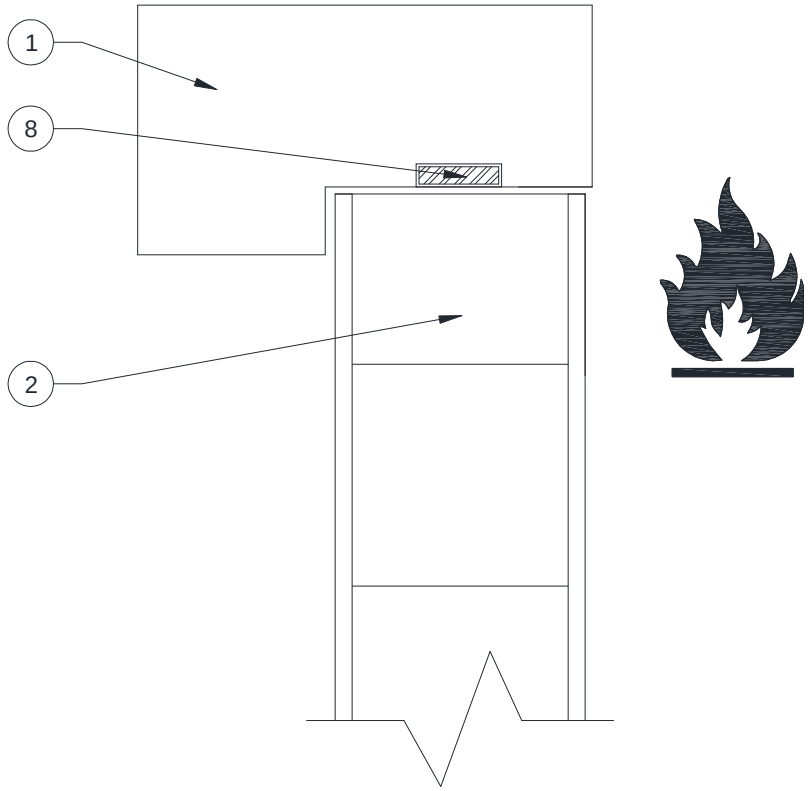
Item	Component	Information
6	**Handleset** Supplier: Part Number: Description: Overall size: Handle (l x Ø): Rose (Ø x d): Rose cover (Ø x d x t):	 Zoo Architectural Hardware ZPZ210CP A low melting point alloy lever handle with steel components affixed to leaf through rose positioned to suit latch. 129 x 20 to twisted ovular 20 x 11 47 x 7 50 x 8 x 1.8
7	**Escutcheon** Manufacturer: Reference: Description: Overall size (Ø x d x t): Cover (Ø x d x t): Fixings (Ø x l):	 Zoo Architectural hardware ZPZ002CP** Low melting point alloy escutcheon affixed to both faces 48 x 8 50 x 8 x 1 2No. Ø2.3 x 19 stainless steel countersunk screws.
8	**Intumescent - Frame** Supplier: Reference: Approval: Description: Overall size (h x d):	 Pyroplex Limited Rigid box Certifire CF355 A graphite based intumescent strip in PVC holder with self-adhesive set in the groove in frame reveal 13.5 from the hinge knuckle face fully interrupted by closer, hinges and strike. 15 x 4
9	**Fire stopping detail** Description:	 Gaps between the frame and the supporting construction were packed with Unifrax Insulfrax LTX blanket and capped with Firewise intumescent & acoustic acrylic sealant.

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

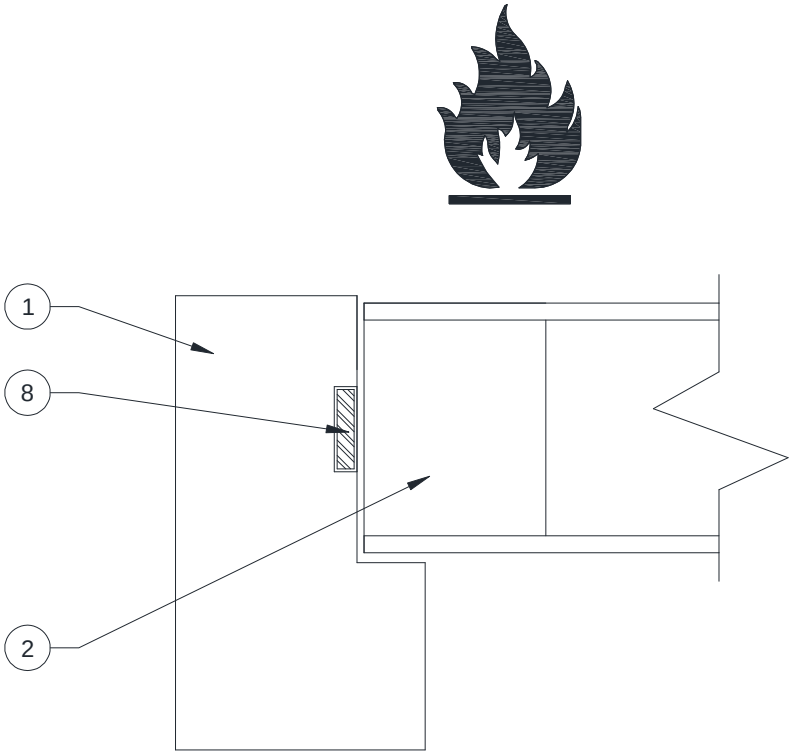
Appendix 1 Figure 1 – Elevation viewed from unexposed face (inc. hidden detail)



Appendix 1 Figure 2 – Section A – A



Appendix 1 Figure 2 – 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 2.1.9

Photo 2.1.10

Photo 2.1.11

Appendix 2.2 During test photos

Photo 2.2.1

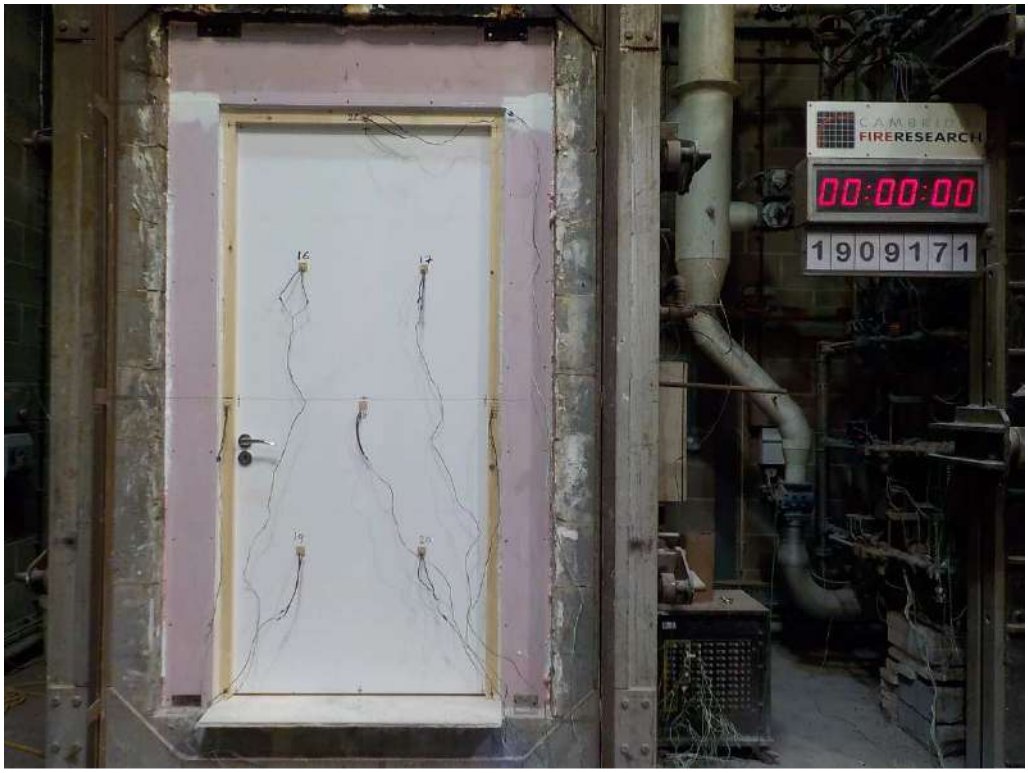


Photo 2.2.2

Photo 2.2.3

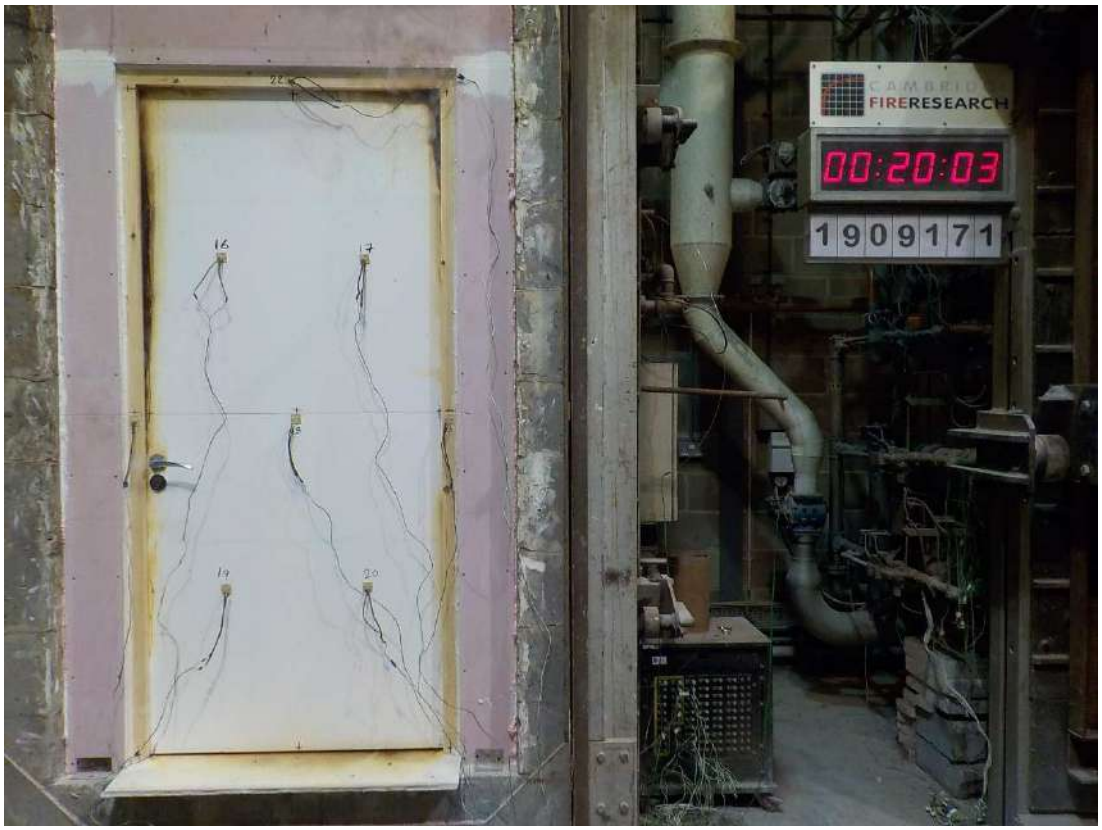


Photo 2.2.4

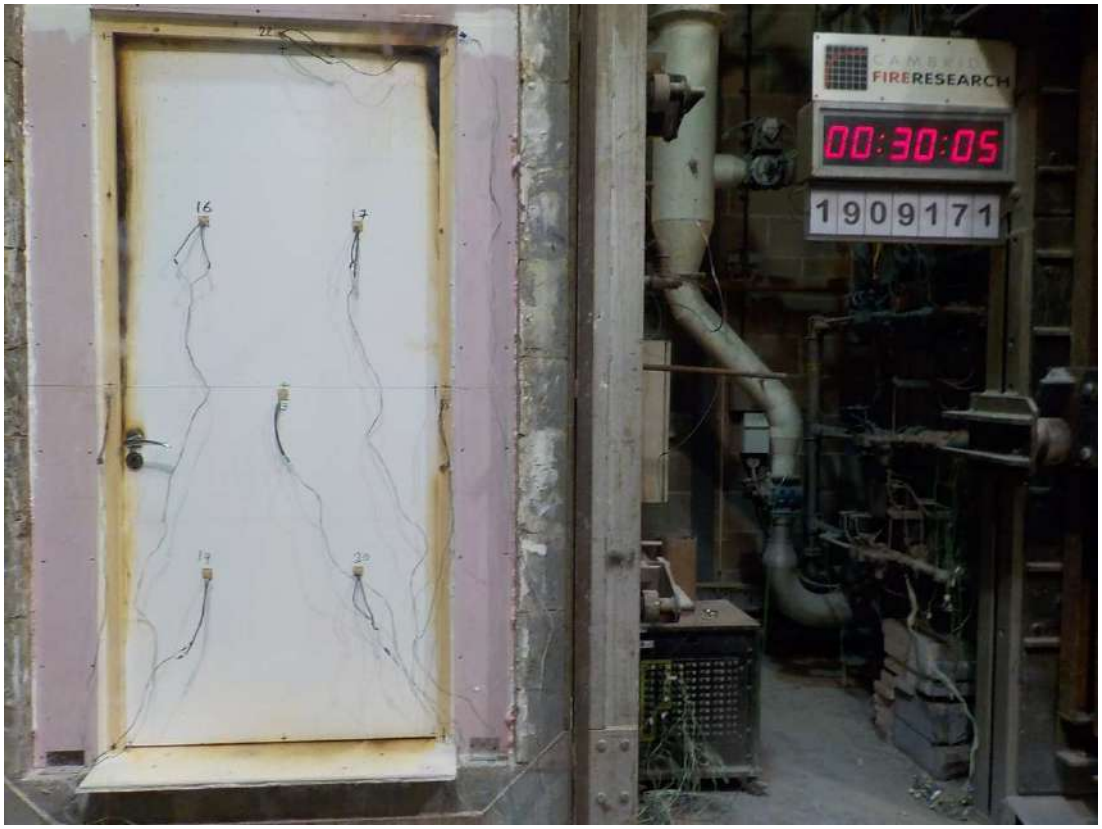
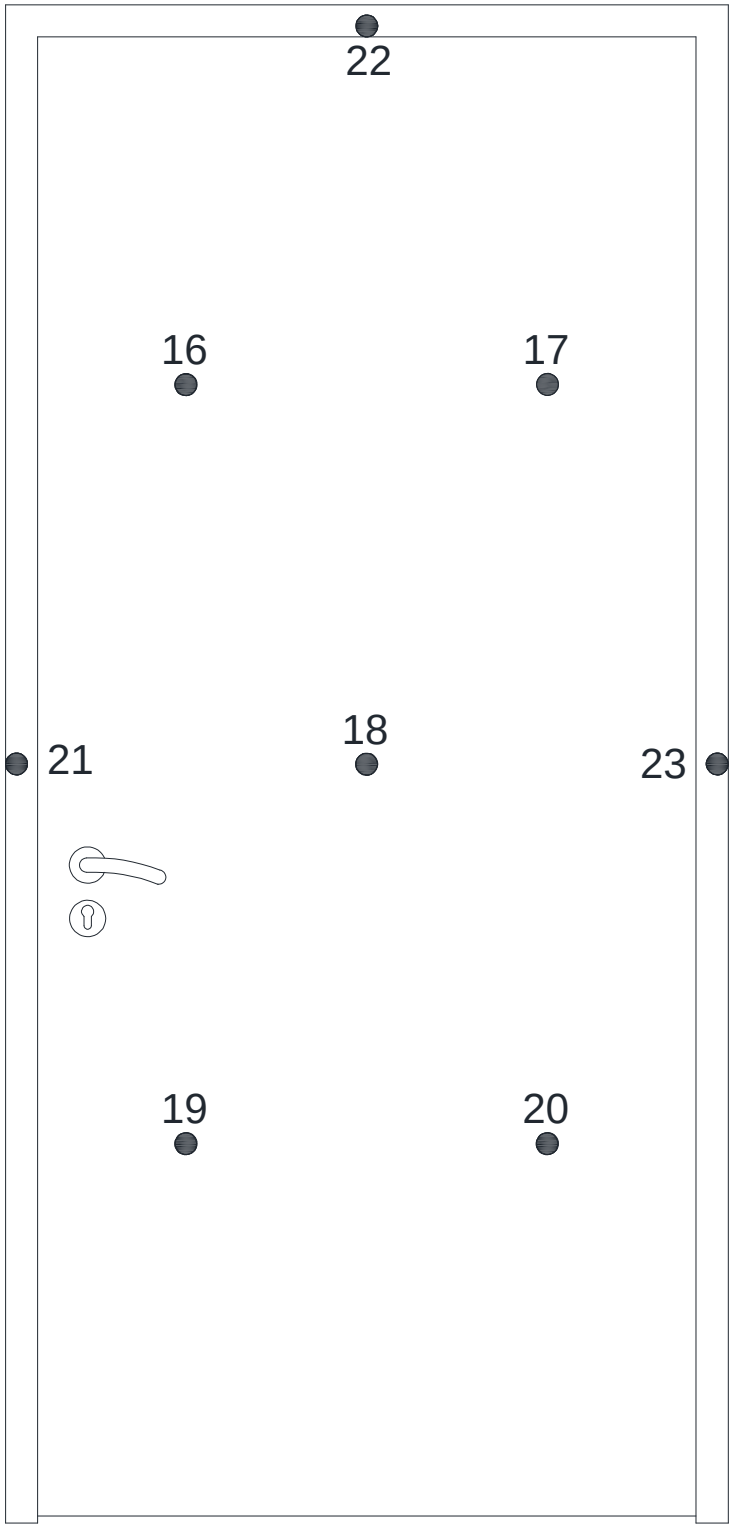


Photo 2.2.5

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	T/C 16	T/C 17	T/C 18	T/C 19	T/C 20	T/C 21	T/C 22	T/C 23
min	˚C	˚C	˚C	˚C	˚C	˚C	˚C	˚C
0	21	21	20	20	20	20	20	20
1	21	21	21	20	20	20	20	20
2	21	21	21	20	20	20	20	20
3	21	21	21	20	20	20	20	20
4	21	21	21	20	20	20	21	20
5	21	21	21	21	20	22	21	20
6	21	21	21	21	20	21	21	20
7	22	21	22	23	21	22	22	20
8	23	21	22	23	21	22	22	21
9	22	22	21	22	21	22	21	20
10	22	22	21	22	21	21	21	20
11	22	24	21	21	21	21	21	20
12	22	26	22	22	21	21	22	20
13	24	29	23	22	22	22	22	20
14	26	31	24	25	24	22	23	20
15	28	33	24	27	26	21	23	20
16	31	35	25	30	29	22	24	20
17	34	37	27	33	31	23	25	21
18	37	39	28	35	34	23	26	21
19	39	41	29	37	37	23	26	21
20	41	43	31	39	39	23	27	21
21	42	45	33	40	41	23	28	21
22	44	46	35	42	42	23	28	21
23	46	48	37	44	44	23	29	22
24	47	49	39	45	46	24	30	22
25	49	51	41	47	47	24	31	22
26	51	53	44	48	49	24	32	23
27	52	55	46	50	50	24	33	23
28	54	56	49	52	52	25	34	24
29	55	58	52	54	54	25	35	24
30	57	60	54	55	55	25	36	24
31	58	61	56	57	57	25	36	25
32	60	63	59	59	59	26	37	25
33	62	65	62	61	60	26	38	26
34	64	67	64	63	62	26	39	26
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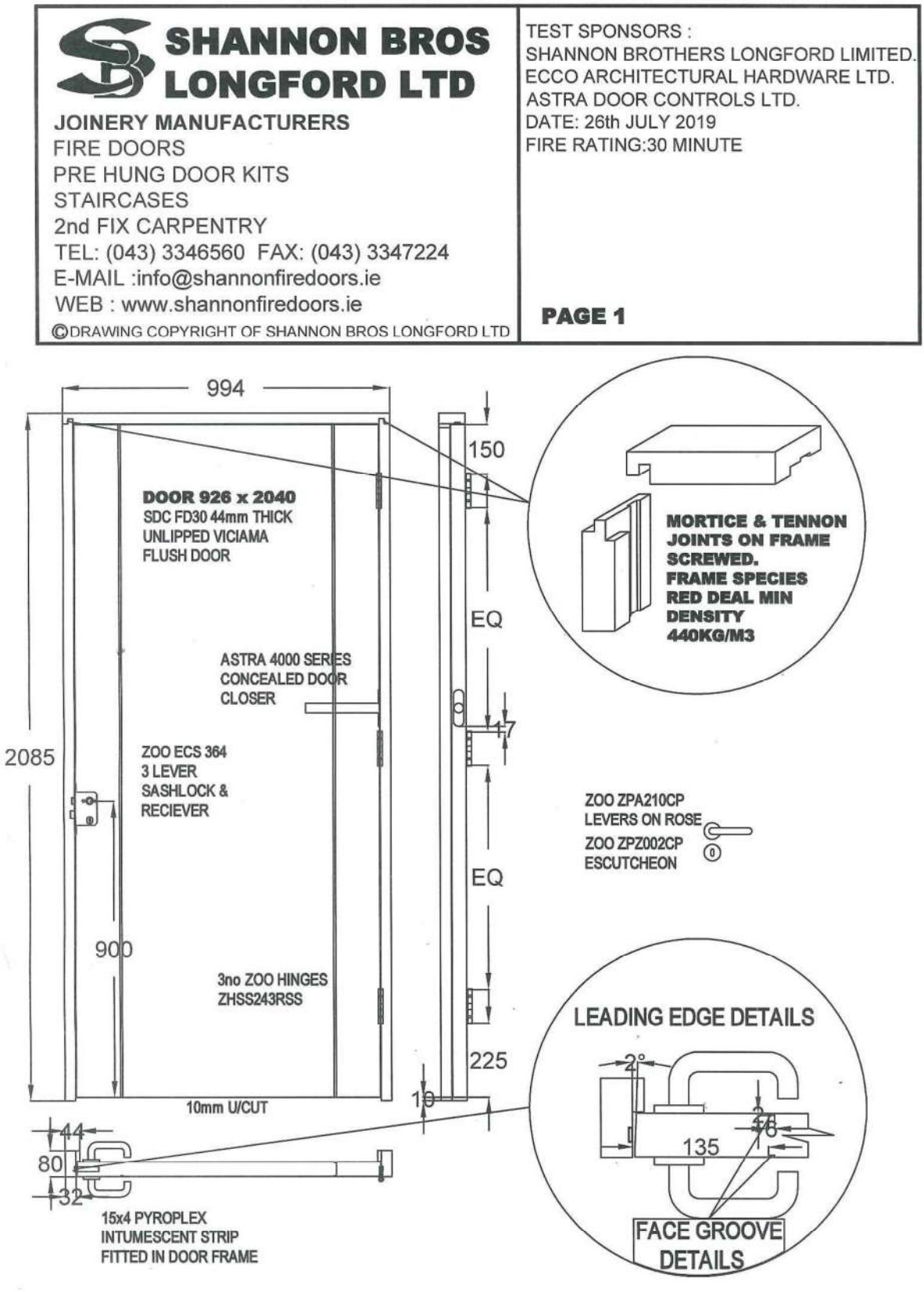
APPENDIX 5 SPONSOR SUPPLIED DRAWING