TEST REPORT NUMBER CFR1812141

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

Sponsor:	Astra Door Controls Ltd	Mitie Fire Protection
Address:	Unit 4 Astra Business Centre Roman Way Preston PR2 5AP	Unit 19, The Courtyard, Roman Way Coleshill Birmingham B46 1HQ
Date of test:	14th December 2018	

Results:

Test duration:	36 minutes (discontinued at the request of the sponsor)
Integrity:	35 minutes
Insulation	34 minutes

Summary of test specimen:

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

Leaf size: 1966 x 746 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 12/12/2018. During the 2 days that the specimen was on site, the temperature and relative humidity were recorded to be within the range of 9 to 17°C and 41 to 58% 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 to provide an aperture for the specimen of 2015 mm high x 835 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 sponsors.

1.4 Specimen verification

Cambridge Fire Research carried out a detailed survey of the specimen to verify the information provided by the Sponsors. 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 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.

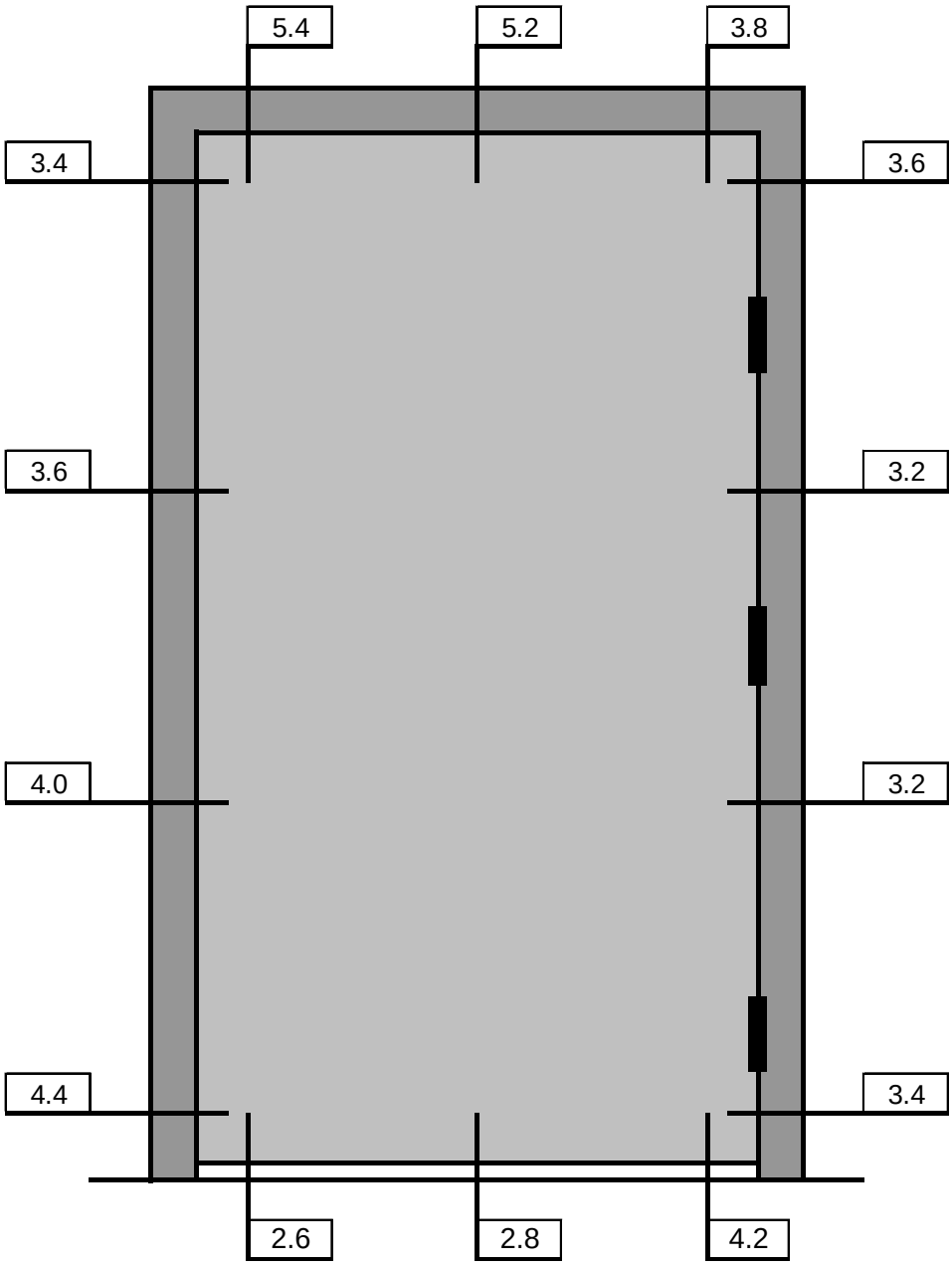
1.6 Specimen selection

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

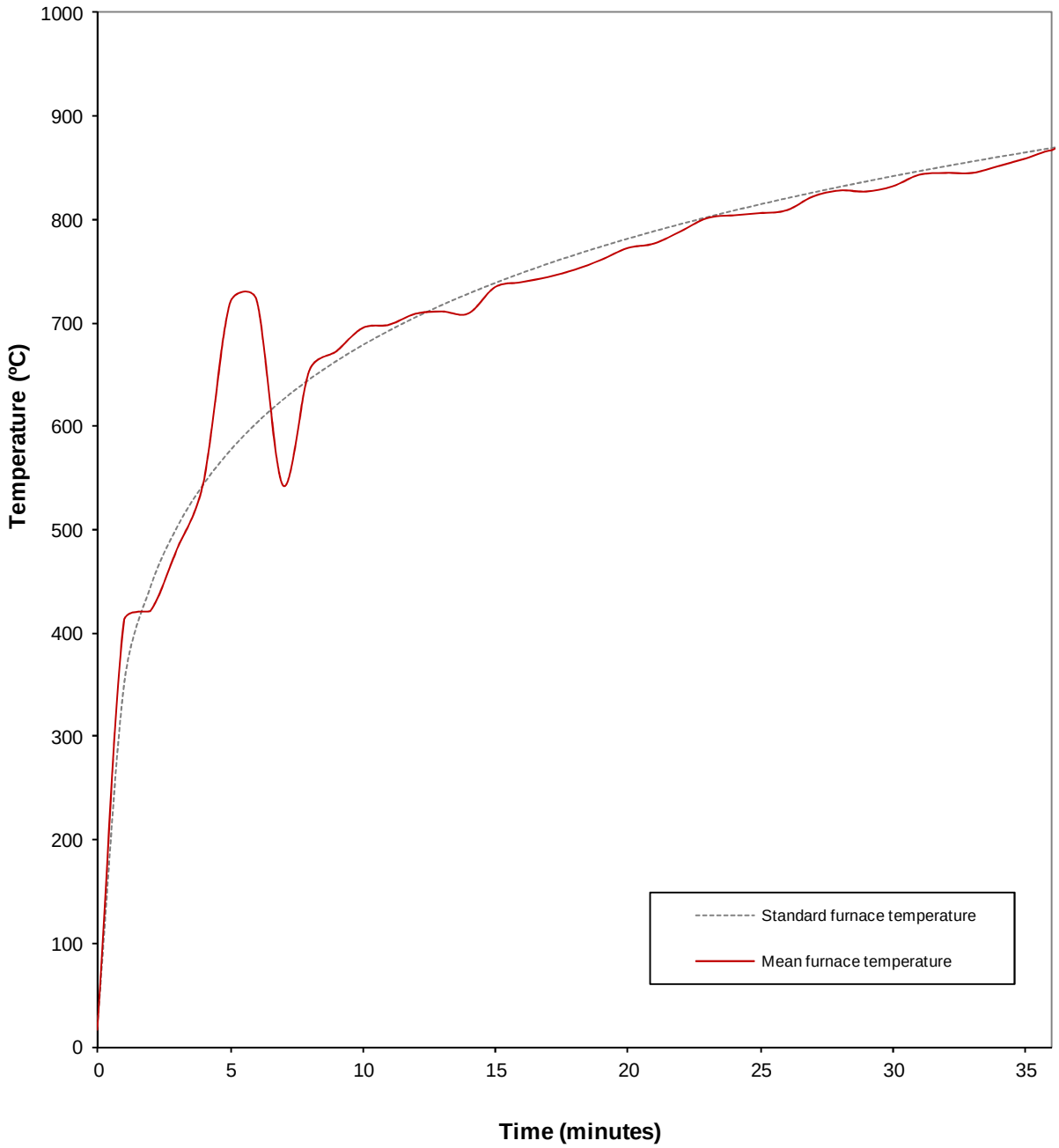
The door opening and closing forces for the leaf were measured in accordance with Fire Test Study Group Resolution No. 63 and the calculated moments are shown in the following table.

Direction	Closing force (N)	Closing moment (Nm)	Opening force (N)	Opening moment (Nm)
Opening towards heating conditions	21.4	12.8	37.3	22.4

3 TEST CONDITIONS, INSTRUMENTATION AND MEASURING

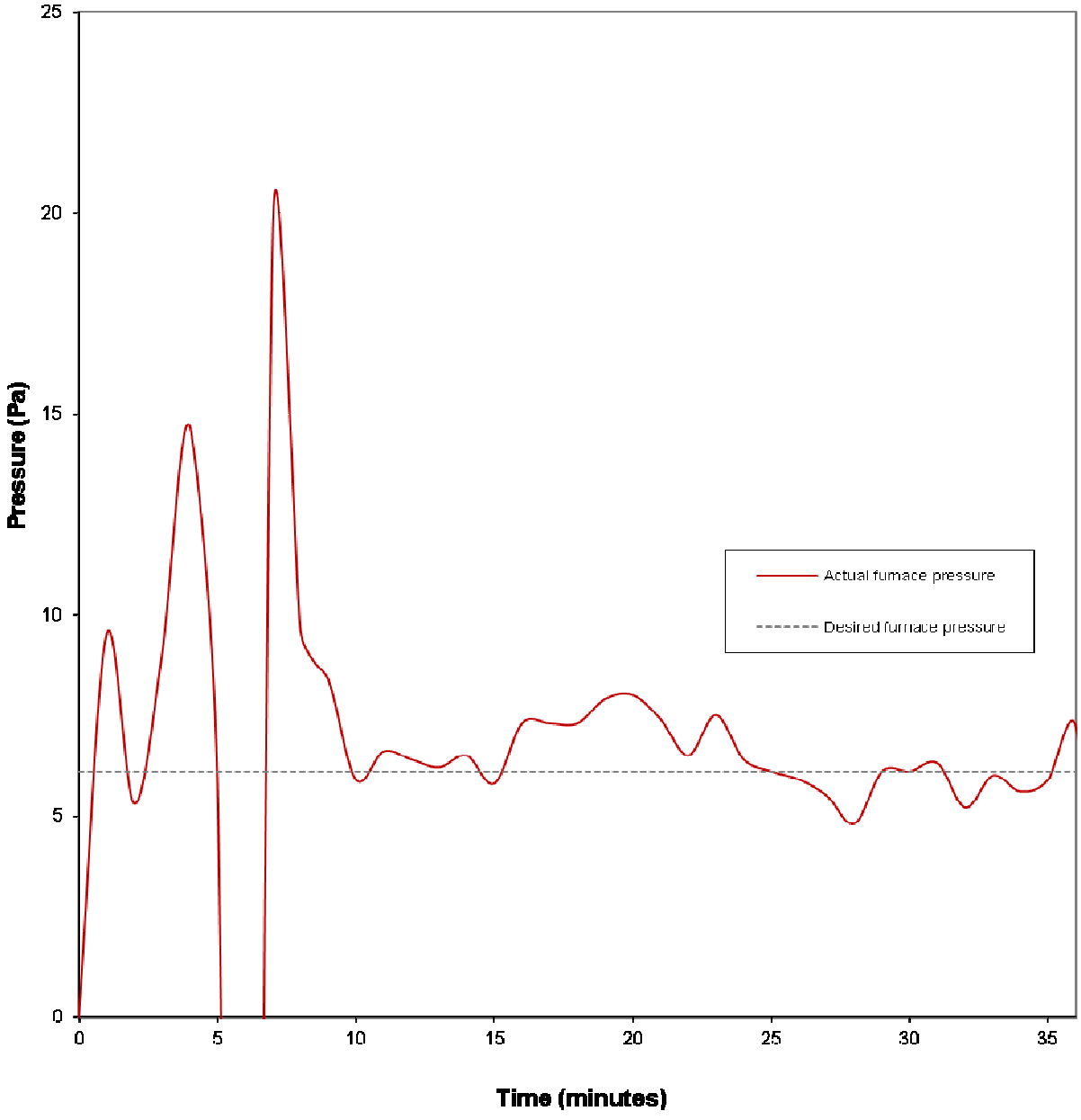
3.1 Furnace temperature

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 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 15°C.
Ambient temperature ranged between 14 to 15°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:

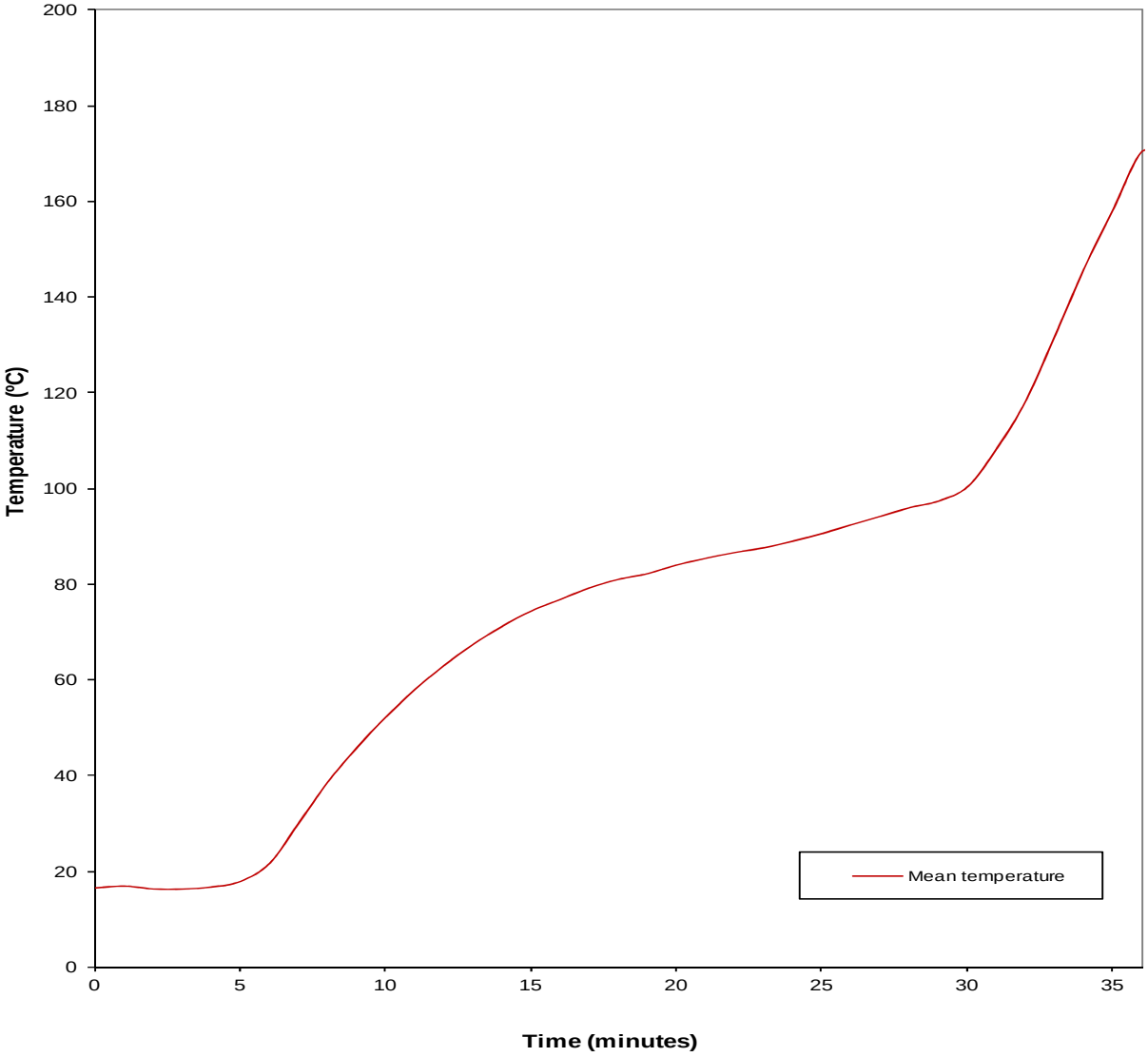
Doorset leaf	Channels 16 to 20	(mean & maximum)
Doorset frame	Channels 21 to 23	(maximum only)

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.

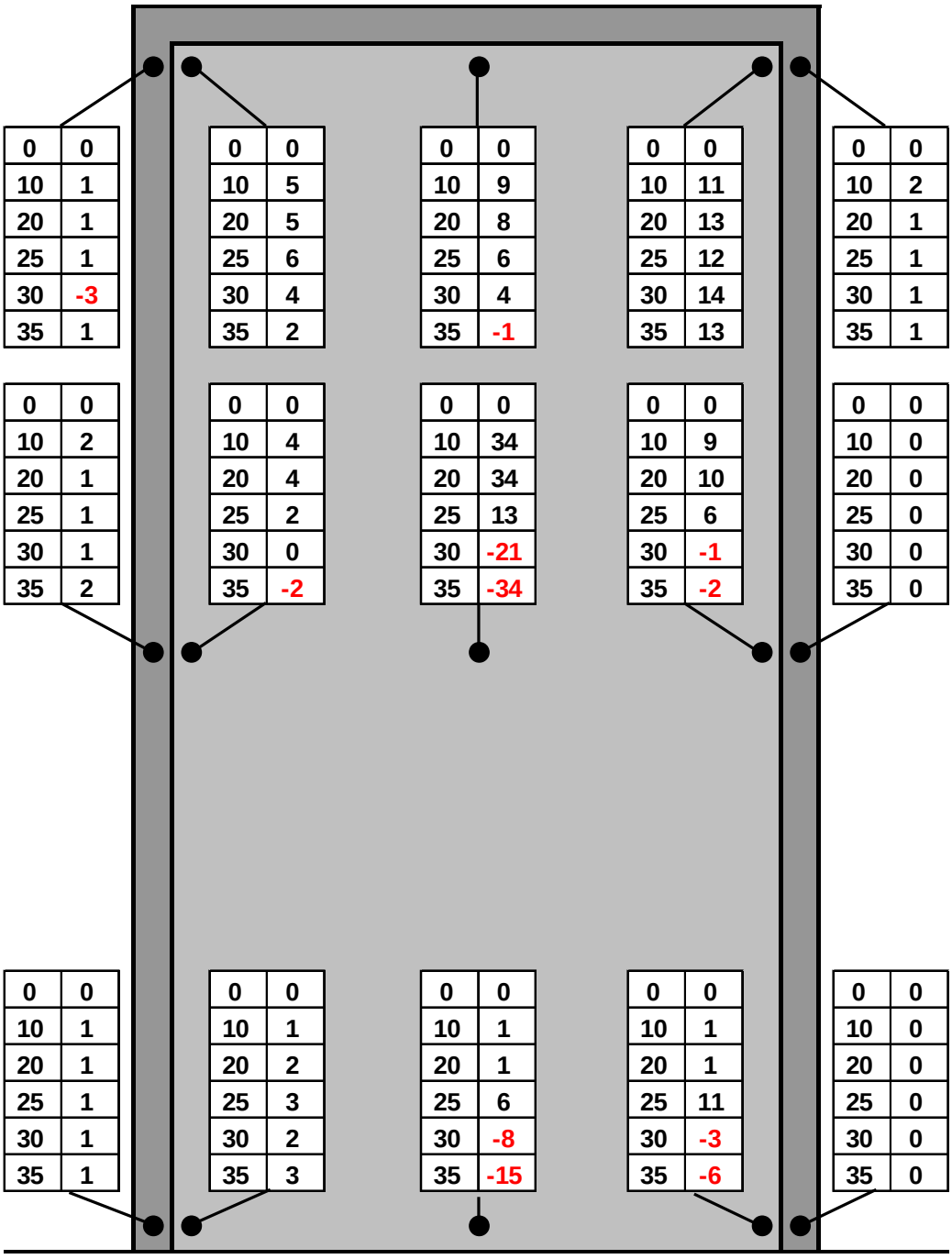
The recorded data of all individual thermocouples is shown in the tables in Appendix 4.

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	U	Start of the test.
05:10	U	Medium smoke/steam is issuing from the head of leaf.
10:00	E	The timber is fissured.
11:20	U	Medium smoke/steam is issuing from the top hinge. The leaf is bowed towards furnace at head of leaf and is straight at threshold.
16:40	E	The handle is missing.
20:40	U	The leaf is dropping, not on the threshold.
24:50	U	Ejected aluminium on the threshold at closing stile.
25:35	U	The facing is blistering.
27:00	E	The majority of the architrave is missing. The core is fissured.
33:14	U	Flashed at closing stile adjacent to latch.
33:44	U	A cotton pad is applied 50mm above latch position, no failure.
34:00		**INSULATION FAILURE** due to thermocouple 16 exceeding maximum temperature criteria.
35:30	U	A cotton pad is applied 50mm above latch.
35:40	U	**INTEGRITY FAILURE** due to ignition of cotton pad.
36:37	U	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. The test results may not be appropriate to situations where the door leaves open away from the heating conditions.

Report prepared by:

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Deputy Head of Testing

Report checked by:

J Moir
Technical Officer

Report issued: **9th April 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	**Frame**	
	Manufacturer:	SCA Timber Supply Ltd.
	No of sides:	3
	Timber:	Softwood
	Corner joints:	Butt jointed and fixed vertically with 2No. Ø4.6 x 75 countersunk steel screws at 42 centres.
	Fixing to supporting construction:	Fixed using Ø5 x 70 countersunk steel screws.
	Hanging jamb	Set at 100, 213, 530, 950, 970, 1396 and 1826 below reveal.
	Closing jamb	Set at 100, 430, 530, 965, 1397, 1824 and 1867 below reveal.
	Overall size (h x w x d):	2005 x 815 x 108
	Cross section size (h x d):	31 x 108
2	**Architrave**	
	Supplier:	Howden Ltd.
	Product code	MOD0821
	Description:	MDF architrave to each face 8 from the frame reveal with mitred corners affixed with pneumatically fired pins (16swg x 53) at 222 to 460 centres.
	Overall size (d x w):	15 x 44 exposed face 15 x 21 unexposed face
3	**Stop**	
	Manufacturer:	SCA Timber Supply Ltd.
	Description:	Softwood butt jointed stops affixed with pneumatically fired pins (16swg x 53) at 225 to 415 centres.
	Overall size (d x w):	25 x 32
4	**Leaf**	
	Manufacturer:	Jeld-Wen UK Ltd
	Description:	A timber stiles and rails flush leaf from Jeld Wen in accordance with their Certifire accreditation CF192, leaf reference A6371404.
	Overall size (h x w x t):	1966 x 746 x 44

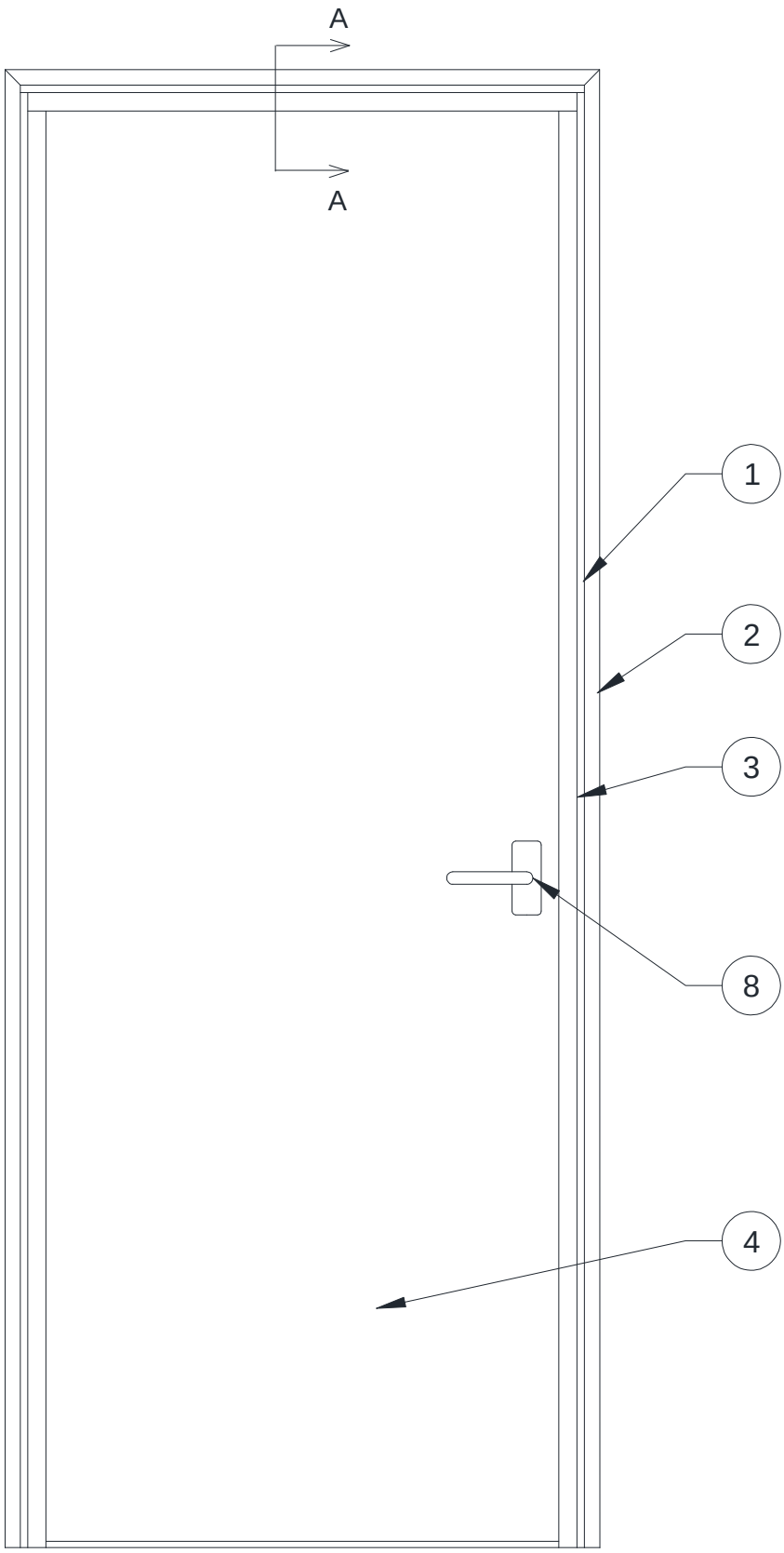
Item	Component	Information
4 cont	Weight (kg):	22.3
	Sub-components	
	Core:	
	Type:	Tube core
	Material:	Chipboard
	Description:	Tube core set inside of the softwood timber stiles and rails.
	Stiles:	
	Material:	Softwood
	Adhesive:	Soudal Pro 45p Ultrafast PU**
	Overall size (h x w x d):	1958 x 32 x 38
	Rails:	
	Description:	Softwood outer rail and chipboard inner rail to top of leaf only, with chipboard at 90° orientation to leaf core.
	Adhesive:	Soudal Pro 45p Ultrafast PU**
	Overall size (h x t):	32 x 38 (outer) 32 x 38 (inner)
	Lipping:	
	Material:	Meranti (red hardwood)
	Reference:	Howden MOD0071
	Adhesive:	Soudal Pro 45p Ultrafast PU**
	Description:	Applied to vertical edges and to leaf bottom.
	Overall size (d x t):	44 x 8 closing stile 44 x 6 hanging stile 44 x 8 leaf bottom
	Facings:	
	Material:	Plywood
	Adhesive:	Soudal Pro 45p Ultrafast PU**
	Description:	Lippings oversail ply facing.
	Overall size (t):	3
5	**Hinges**	
	Supplier:	Frisco UK
	Type:	Ecllipse Grade 11 ball bearing butt hinges
	Material:	Stainless steel
	Number:	3
	Position:	150, 900 and 1650 from top of leaf to top of hinge.
	Blade size (h x d x t):	102 x 30 x 3
	Knuckle size (Ø):	14
	Fixings:	4No. Ø4.8 x 31 countersunk stainless steel screws
6	**Closer**	
	Manufacturer:	Astra Door Controls Ltd
	Part Number:	Astra 4000 series
	Description:	A concealed jamb mounted closer with fully controllable functions positioned at 1042 from the top of the leaf.

Item	Component	Information
6 cont	Overall size: Body (l x Ø): Face plate (h x d x t): Fixings:	 216 x 28 106 x 32 x 3 6No. Ø4.2 x 38 countersunk steel screws per forend.
7	**Latch/Lock** Manufacturer: Type: Spindle height (h): Overall size: Body (h x d x w): Forend (h x d x t): Strike (h x d x w):	 Hoppe (UK) Ltd.** Nickel plated tubular mortice latch 900 from bottom of leaf 20 x 15 x 78 58 x 24 x 1.5 58 x 34 x 1.5 including 27h x 15d tongue
8	**Handleset** Manufacturer: Part Number: Type: Overall size: Backplate (h x w x d): Handle (w x Ø):	 Hoppe (UK) Ltd.** Edinburgh Chrome Latch Aluminium lever handle 103 x 40 x 9 110 x 21 to 14
9	**Intumescent - Frame** Manufacturer: Part number: Description: Overall size (d x t):	 Astroflame** ITS 0005** A graphite based intumescent in a white pvc holder with pile smoke seal, set 15 from the hinge knuckle face and fully interrupted at the hinges, closer and strike. 15 x 4
10	**Intumescent – Latch/lock body** Manufacturer: Part number: Description: Overall size (t):	 Astroflame** ITS 0050** Graphite based intumescent wrapped around latch body. 1
11	**Intumescent – closer body** Manufacturer: Part number: Description: Overall size (t):	 Astroflame** ITS 0050** Graphite based intumescent wrapped around closer body. 1
12	**Intumescent - Hinges** Supplier: Manufacturer: Part number: Description:	 Howdens Joinery Eclipse 14903 (Howdens Joinery part no.: ITS0030) Graphite hinge pad under all blades.

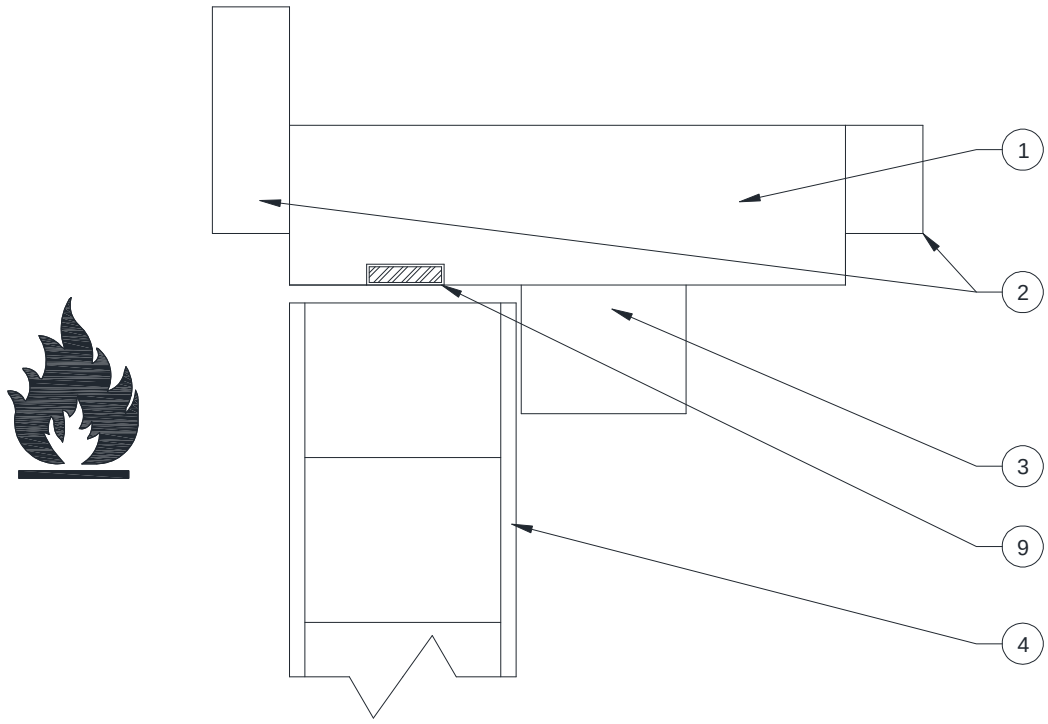
Item	Component	Information
12	Overall size (t):	1
13	**Fire stopping detail** Description:	Gaps between the frame and associated construction were packed with Unifrax Insulfrax S blanket and capped with Pyrocoustic Fire Resistant Sealant on both faces.

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

Appendix 1 Figure 1 –Elevation viewed from unexposed face including hidden detail



Appendix 1 Figure 2 – Section A – A



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 – unexposed face

Photo 2.1.10

Appendix 2.2 During test photos

Photo 2.2.1

Photo 2.2.2

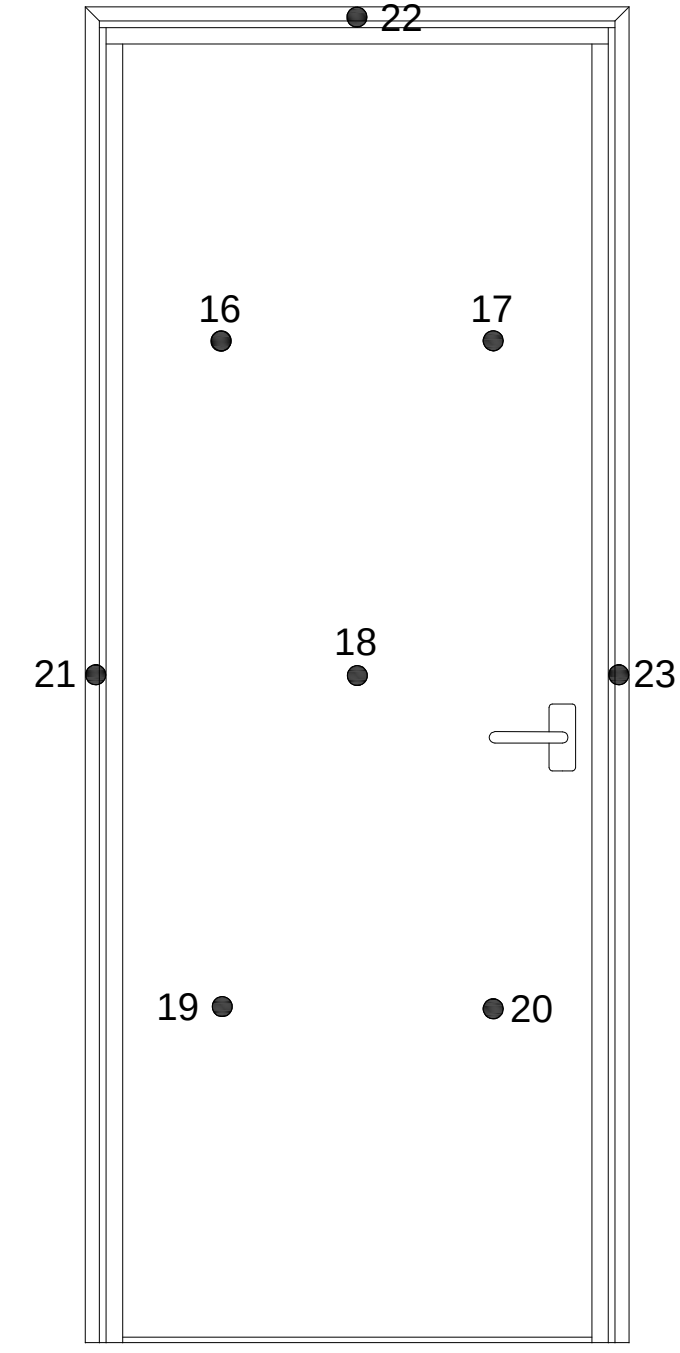
Photo 2.2.3

Photo 2.2.4 - after 36 minutes

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	17	18	16	16	15	16	17	16
1	18	18	17	16	15	16	18	16
2	17	17	16	16	15	16	20	16
3	17	17	16	16	15	15	25	16
4	18	18	16	16	15	15	29	16
5	20	20	16	17	16	15	30	16
6	25	28	18	20	17	15	26	16
7	36	38	22	30	24	16	25	16
8	46	47	29	39	32	16	23	16
9	53	54	35	47	40	15	22	15
10	60	60	41	53	47	15	22	16
11	65	66	47	59	53	15	21	16
12	69	70	52	64	60	15	22	16
13	73	74	56	69	65	15	22	16
14	76	77	60	73	70	16	22	16
15	78	80	64	76	74	16	22	16
16	80	82	67	79	76	16	22	16
17	82	83	71	81	79	16	22	16
18	83	85	74	82	81	16	23	16
19	84	86	76	83	82	16	23	16
20	85	88	79	84	84	16	23	17
21	87	89	80	86	85	16	24	17
22	88	90	82	87	86	16	24	17
23	89	92	82	88	87	16	25	17
24	91	94	83	89	88	17	25	17
25	94	96	84	90	89	17	26	17
26	97	98	85	92	90	17	26	17
27	99	99	85	95	93	17	27	17
28	100	100	86	99	95	17	28	18
29	102	101	87	100	97	18	29	18
30	109	107	88	100	98	18	29	18
31	128	124	89	102	99	18	30	18
32	148	142	91	110	101	19	31	18
33	166	158	93	130	113	19	31	18
34	183	172	95	149	131	20	31	19
35	198	185	96	166	147	20	32	19
36	213	198	97	182	163	20	32	19