test report

Title:

The fire resistance performance of two fully insulated, single-acting, single-leaf doorsets, in accordance with BS 476: Part 22: Clause 6.

WF Report No:

159515

Prepared for:

Astroflame (Fire seals) Limited.
Unit 8 IO Centre
Stephenson Road
Segensworth
Fareham
PO15 5RU

Date:

19th September 2007

Notified Body No:

0833

UKAS TESTING
0249

warringtonfire
global safety
TESTING

Summary

Objective

To determine the fire resistance performance of two specimens of fully insulated, single-acting, single-leaf doorsets, fitted with Astroflame 'Astro Strip FS' when tested in accordance with BS 476: Part 22: 1987.

Sponsors

Astroflame (Fireseals) Ltd, Unit 8 IO Centre, Stephenson Road, Segensworth, Fareham, PO15 5RU

Summary of Tested Specimen

For the purposes of the test the doorsets were referenced 'A and B'.

Doorset A was referenced CF 240 and had overall dimensions of 2090 mm high by 1000 mm wide and incorporated a door leaf of overall dimensions of 2045 mm high by 926 mm wide by 44 mm thick. The door leaf comprised a graduated density chipboard core with 3 mm thick medium density fibreboard (MDF) facings and hardwood lippings to the head and vertical edges. The leaf was hung within a softwood frame on three Royde and Tucker hinges referenced 'Hi-Load 102'. The door leaf incorporated an Astroflame intumescent seal of nominal dimensions 10 mm by 4 mm referenced 'Astro Strip FO'.

Doorset B was referenced CF 160 and had overall dimensions of 2080 mm high by 1000 mm wide and incorporated a door leaf of overall dimensions of 2038 mm high by 925 mm wide by 44 mm thick. The door leaf comprised Flaxboard core, a softwood perimeter framework comprising whitewood stiles and rails, 3 mm thick medium density fibreboard (MDF) facings and hardwood lippings to the vertical edges. The leaf was hung within a softwood frame on three Royde and Tucker hinges referenced 'Hi-Load 102'. The door leaf incorporated an Astroflame intumescent seal of nominal size 10 mm by 4 mm referenced 'Astro Strip FS'.

The door leaves were orientated such that they opened towards the heating conditions of the test. The doorsets included a surface mounted overhead door closer on their exposed face and a mortice latch which was positioned at the approximate mid-height of each doorset. Each doorset was rendered unlatched for the test duration.

Test Results:	**Doorset A**	**Doorset B**
Integrity	38 minutes	35 minutes
Insulation	38 minutes	35 minutes

The test was discontinued after a period of 40 minutes.

Date of Test

21st November 2006

Signatories

Responsible Officer
N. Howard*
Testing Officer

Approved
S. Hankey*
Technical Consultant

* For and on behalf of Bodycote **warrington**fire .

Report Issued

Date : 19th September 2007

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Test Procedure

Introduction

The doorsets were of a fully insulated construction and the test was therefore conducted in accordance with Clause 6 of BS 476: Part 22: 1987 'Methods for determination of the fire resistance of non-loadbearing elements of construction'. This test report should be read in conjunction with that Standard and with BS 476: Part 20: 1987, 'Methods for determination of the fire resistance of elements of construction (general principles)'.

The specimens were judged on their ability to comply with the performance criteria for integrity and insulation, as required by BS 476: Part 22: 1987, Clause 6.

Fire Test Study Group / EGOLF

Certain aspects of some fire test specifications are open to different interpretations. The Fire Test Study Group and EGOLF have identified a number of such areas and have agreed Resolutions, which define common agreement of interpretations between fire test laboratories, which are members of the Groups. Where such Resolutions are applicable to this test they have been followed.

Instruction To Test

The test was conducted on the 21st November 2006 on behalf of Astroflame (Fire seals) Ltd.

Mr. S. West a representative of Astroflame (Fire seals) Ltd witnessed the test.

Test Specimen Construction

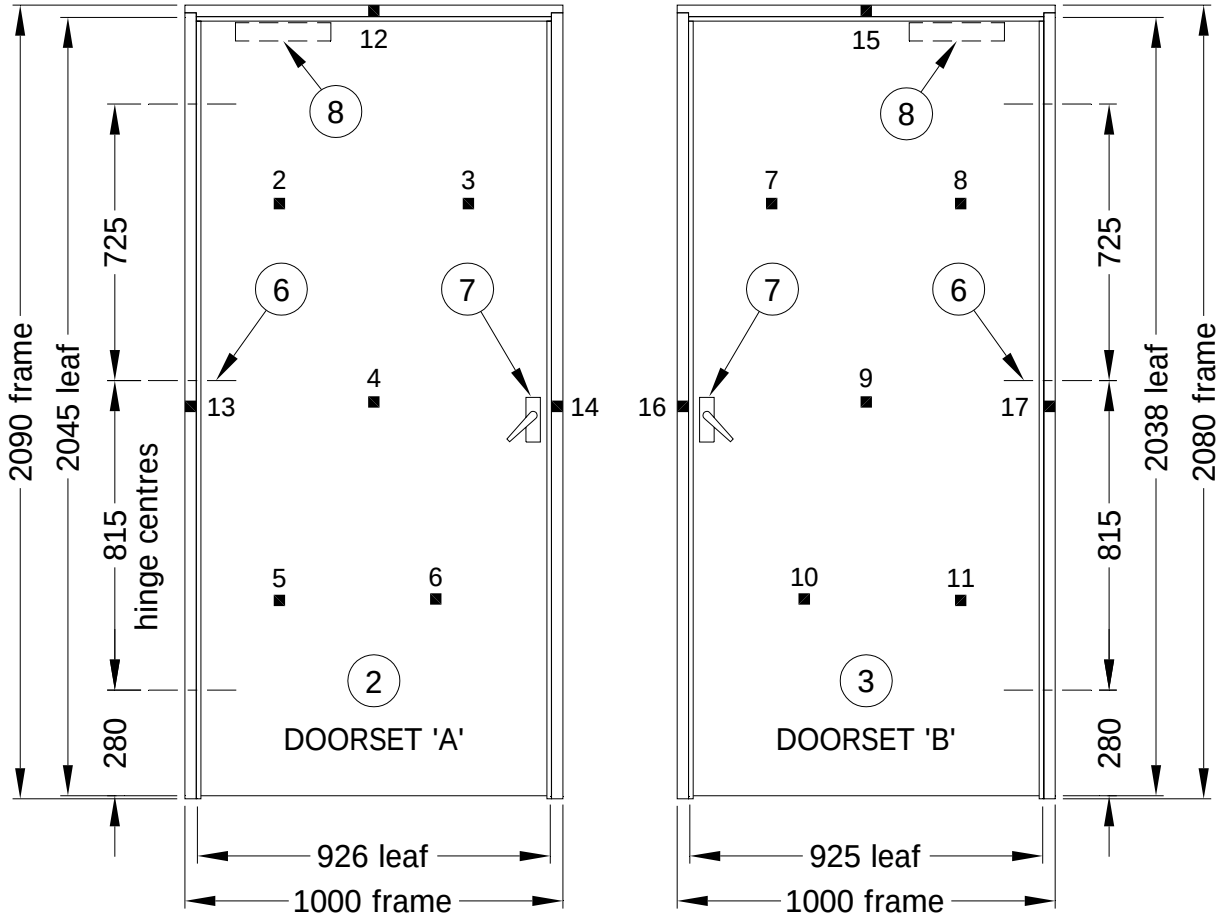
A comprehensive description of the test construction is given in the Schedule of Components. The description is based on a detailed survey of the specimen and information supplied by the sponsor of the test.

Installation

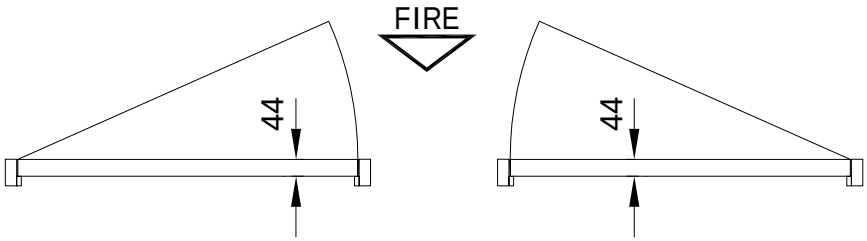
The doorsets were mounted within an aperture provided in a masonry wall construction such that the door leaves opened towards the heating conditions of the test. A representative of Bodycote **warringtonfire** conducted the installation of the doorsets on the 20th November 2006.

Test Specimen

Figure 1- Elevation of Test Specimen and Unexposed Face Thermocouples

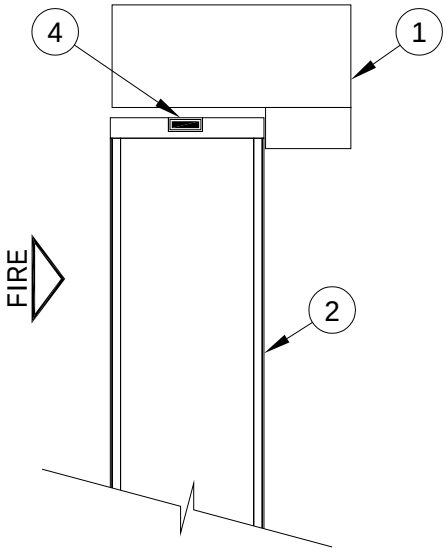


■ Positions of thermocouples

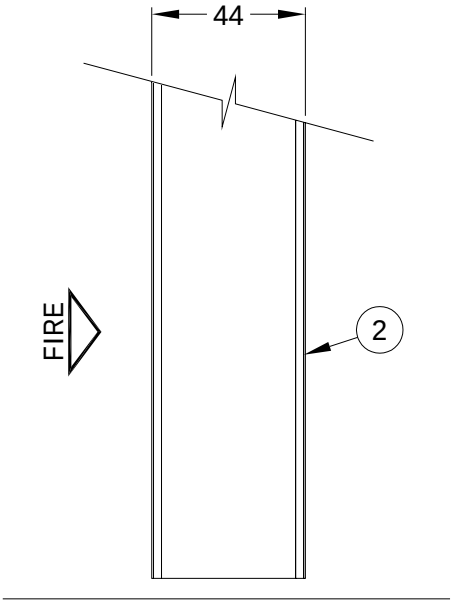


Do not scale. All dimensions are in mm

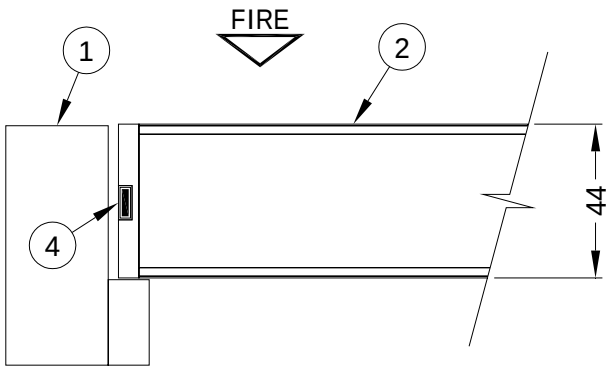
Figure 2 – Details of Doorset 'A'



TYPICAL SECTION
THROUGH HEAD



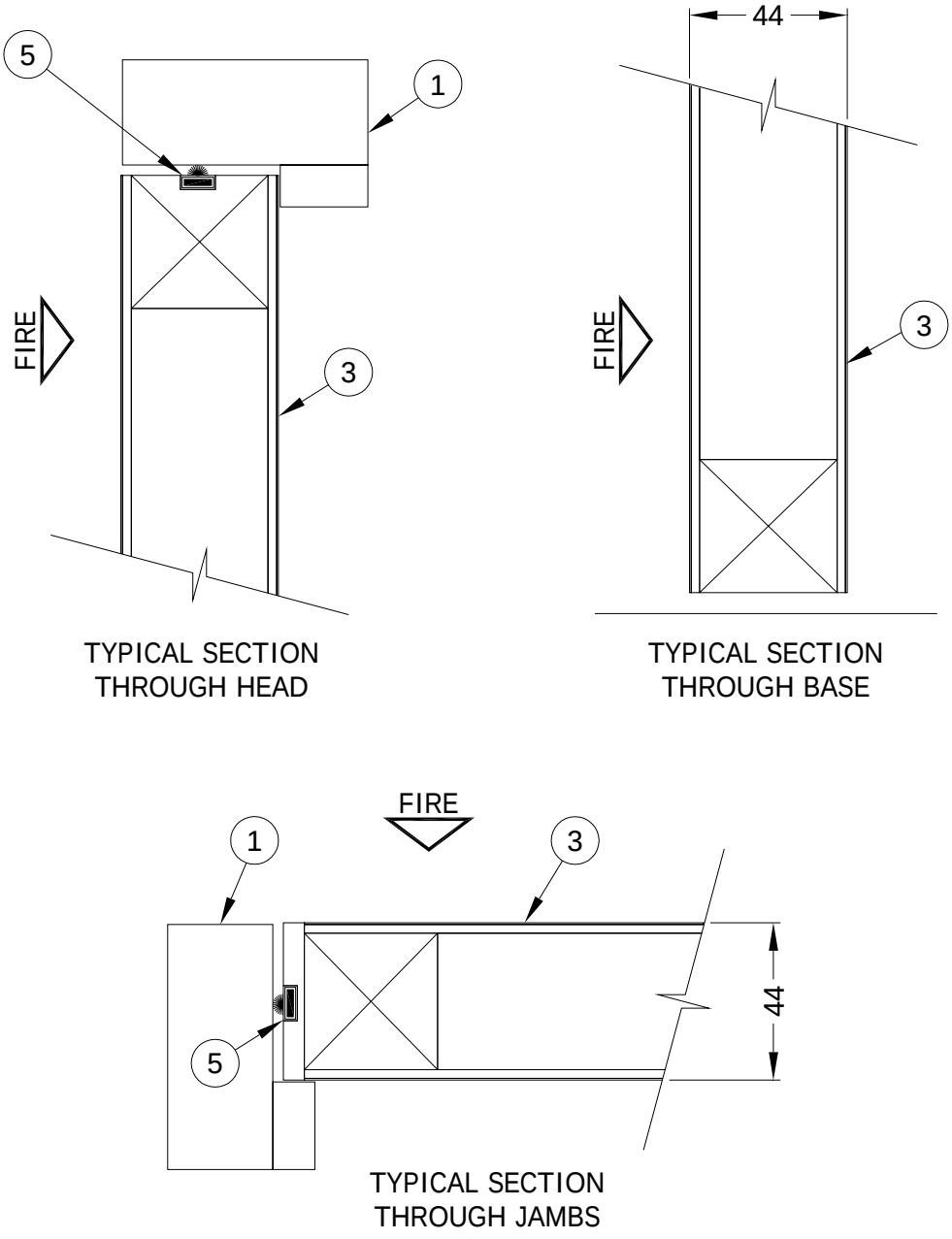
TYPICAL SECTION
THROUGH BASE



TYPICAL SECTION
THROUGH JAMBS

Do not scale. All dimensions are in mm

Figure 3 – Details of Doorset 'B'



Do not scale. All dimensions are in mm

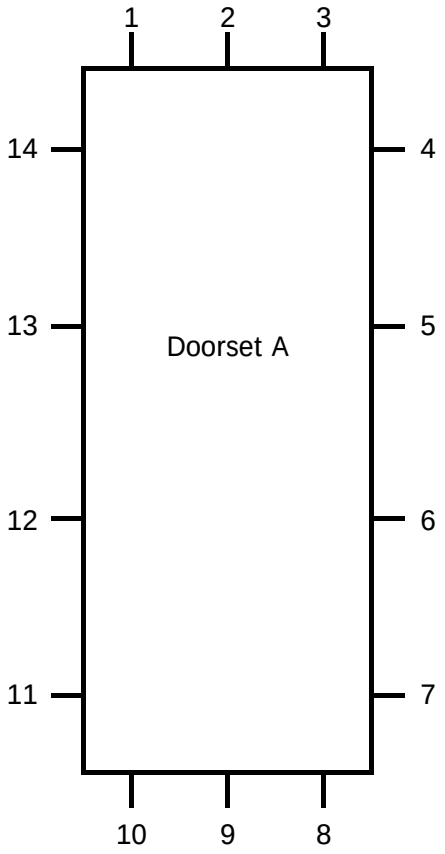
Schedule of Components

(Refer to Figures 1 to 3)
(All values are nominal unless stated otherwise)
(All other details are as stated by the sponsor)

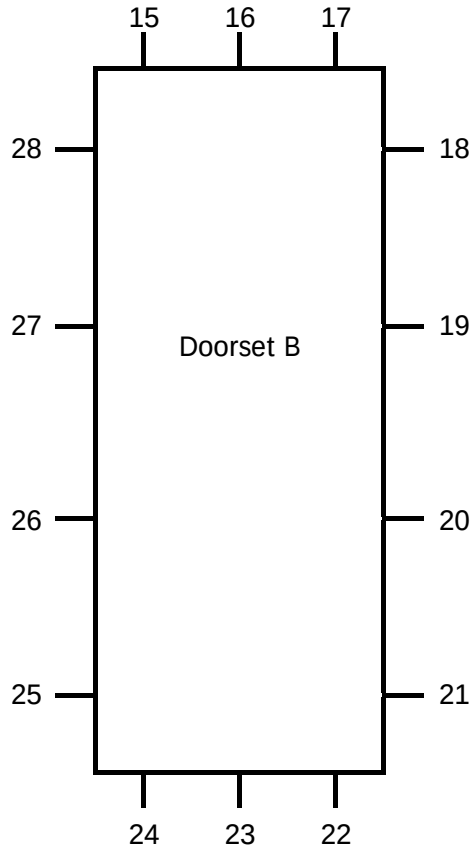
Item		Description
1. Door Frame		
Material	:	Pine, softwood
Density	:	568 kg/m^3
Overall section size	:	69 mm x 35 mm, with 25 mm x 12 mm planted stop
Jambs to head jointing method	:	Stub mortice & screwed, using 75 mm long x 4 mm diameter countersunk head drywall screws
Fixing method to masonry surround	:	Screwed
Details of Screws		
i. type	:	Countersunk head woodscrews into plastics plugs
ii. overall size	:	100 mm long x 5.4 mm diameter
iii. centres	:	4 no. along the closing jamb, 6 no. along the hinged jamb approximately 100 mm above and below each hinge
2. Door Leaf 'A'		
Manufacturer	:	Premdor Crosby Ltd.
Certifire reference and label number	:	CF 240, A087725
Construction		
i. core	:	Graduated density chipboard 38 mm thick
ii. faces	:	Veneer faced MDF, 3 mm thick
iii. lippings	:	6 mm thick hardwood, to vertical edges and top edge
3. Door Leaf 'B'		
Manufacturer	:	Jeld Wen UK Ltd.
Certifire reference and label number	:	CF 160, A1374315
Construction		
i. stiles and rails	:	Softwood 32 mm x 38 mm
ii. core	:	Flaxboard 38 mm thick
iii. faces	:	Veneer faced medium density fibreboard (MDF), 3 mm thick
iv. lippings	:	Hardwood 8 mm thick, to vertical edges only
4. Door Leaf 'A' Intumescent Seal		
Manufacturer	:	Astroflame (Fireseals) Ltd.
Material	:	Graphite insert in a polyvinyl chloride, PVC, carrier
Reference	:	Astrostrip FO
Overall size	:	10 mm x 4 mm, carrier
Fitting method	:	Self adhered into a groove located centrally in the vertical edges and top edge of each leaf. The seals were interrupted at the latch forend and hinge positions

Item		Description
5. Door Leaf 'B' Intumescent Seal		
Manufacturer	:	Astroflame (Fireseals) Ltd.
Material	:	Graphite insert in a polyvinyl chloride, PVC, carrier with brush seal.
Reference	:	Astrostrip FS
Overall size	:	10 mm x 4 mm, carrier
Fitting method	:	Self adhered into a groove located centrally in the vertical edges and top edge of each leaf. The seals were interrupted at the latch forend and hinge positions
6. Hinges		
Manufacturer	:	Royde & Tucker Ltd
Reference	:	H 102-FR-BZP
Primary material	:	Bright zinc plated steel
Size		
i. knuckle	:	104 mm long by 13.7 mm diameter
ii. blades	:	100 mm long by 35 mm wide by 3 mm thick
Fixings		
i. type	:	Countersunk head wood screws
ii. material	:	Steel
iii. sizes	:	29 mm long by 5.1 mm diameter
iv. number off per blade	:	5 off
v. maximum distance of fixing screws from face of door leaf	:	26 mm
Bedding material	:	None
7. Latch		
Manufacturer	:	Magnet
Reference	:	Br 63 mm tubular mortice latch
Material	:	Steel
Overall size		
i. fore plate	:	58 mm x 25 mm
ii. strike plate	:	57 mm x 21 mm
iii. casing	:	21 mm x 14 mm x 64 mm long
iv. latch bolt	:	14.5 mm x 10.9 mm with 8 mm throw
Operation of latch	:	Disengaged
Fixing method	:	Screwed
Bedding material	:	None
Lever handles		
i. manufacturer	:	Magnet
ii. material	:	Brass
iii. overall size	:	102 mm long x 17 mm diameter tapering to 13 mm, complete with 117 mm x 38 mm backing plate
8. Overhead Door Closer		
Manufacturer	:	Dorma
Reference	:	TS73V
Fitting	:	Exposed face of each doorset
Maximum opening moment		
i. doorset A	:	41 Nm
ii. doorset B	:	55 Nm
Maximum closer moment		
i. doorset A	:	25 Nm
ii. doorset B	:	20 Nm

Doorset Clearance Gaps



View from unexposed face



View from unexposed face

Door Ref.	Gap Dimension in mm at Positions													
A	1	2	3	4	5	6	7	8*	9*	10*	11	12	13	14
	3.6	2.8	2.8	3.2	3.4	3.6	3.9	6.0	5.8	5.3	3.3	3.0	3.6	4.2
B	15	16	17	18	19	20	21	22*	23*	24*	25	26	27	28
	3.0	1.4	2.8	3.4	3.1	3.3	3.3	6.2	5.7	5.5	3.2	3.1	3.5	3.7
A	Mean		3.4		Maximum			3.9		Minimum			2.8	
B	Mean		3.7		Maximum			3.7		Minimum			1.4	

* Dimension not included in calculations
# Gap not measured

DO NOT SCALE
ALL DIMENSIONS ARE IN mm

Instrumentation

General

The instrumentation was provided in accordance with the requirements of the Standard.

Furnace

The furnace was controlled so that its mean temperature complied with the requirements of BS 476: Part 20: 1987, Clause 3.1. using six mineral insulated thermocouples distributed over a plane 100 mm from the surface of the test construction.

Thermocouple Allocation

Thermocouples were provided to monitor the unexposed surface of the specimen and the output of all instrumentation was recorded at no less than one minute intervals as follows:

Thermocouples 2 to 6 Doorset A and 7 to 11 Doorset B

At five positions on each doorset, one approximately at the centre and one at approximately the centre of each quarter section of the doorset.

Thermocouples 12 to 14 Doorset A and 15 to 17 Doorset B

At three positions at the approximate centre of each frame member.

The locations and reference numbers of the various unexposed surface thermocouples are shown in Figure 1.

Roving Thermocouple

A roving thermocouple was available to measure temperatures on the unexposed surface of the specimen at any position, which might appear to be hotter than the temperatures indicated by the fixed thermocouples.

Integrity Criteria

Cotton pads and gap gauges were available to evaluate the impermeability of the specimen to hot gases.

Furnace Pressure

After the first five minutes of testing and for the remainder of the test, the furnace atmospheric pressure was controlled so that it complied with the requirements of BS 476: Part 20: 1987, Clause 3.2.2. The calculated pressure differential relative to the laboratory atmosphere at the top of the doorsets was 8.3 (±2) Pa.

Test Observations

Time		All observations are from the unexposed face unless noted otherwise.
mins	secs	The ambient air temperature in the vicinity of the test construction was 11ºC at the start of the test with a maximum variation of +1ºC during the test.
00	00	**The test commences.**
02	45	Slight smoke release is evident from the top hinge position of Doorset A.
03	30	Slight smoke release is evident from the top hinge position of Doorset B.
04	30	The smoke release to each doorset increases in volume.
06	00	Smoke release is evident from the latch position of each doorset.
06	30	Both doorsets have ignited on the exposed surface which creates large amounts of flaming within the furnace chamber.
08	00	The exposed facing of each doorset has fallen away into the furnace chamber.
09	00	Doorset A visibly distorts over its entire surface area.
12	00	The smoke release to Doorset A increases from the head of the leaf.
16	20	A black discolouration is evident from the top hinge position of Doorset A & B.
17	00	Distortion is evident to the bottom left corner of door leaf B.
19	30	The leaves of each doorset have fallen onto the threshold position.
22	00	A black discolouration is evident to the top corners of Doorset B.
28	50	Intermittent flames are evident from the latch position of Doorset A.
32	00	An area of burn through to the bottom hinge position of Doorset A is evident..
33	00	An area of burn through is evident to the extreme bottom left of Doorset B, flickers of flame issue from this position.

Time		
mins	**secs**	
35	**30**	An area of glowing is evident to the top left hand corner of the door leaf B. A cotton pad is applied and ignites. **Integrity failure of Doorset B is deemed to occur.**
37	**00**	Burn through is evident to the top hinge position of Doorset B.
37	**50**	Sustained flames issue from the area of burn through to Doorset B at its bottom left hand position.
38	**30**	Sustained flames issue from the head of Doorset A. **Integrity failure of Doorset A is deemed to occur.**
40	**00**	**The test is discontinued at the request of the sponsor.**

Test Photographs

The exposed face of the doorset prior to testing

The unexposed face of the doorsets prior to testing

The unexposed face of the doorsets after 10 minutes of testing

The unexposed face of the doorsets after 20 minutes of testing

The unexposed face of the doorsets after 30 minutes of testing

The unexposed face of the doorsets after 39 minutes of testing

The exposed face of the doorsets immediately after testing

Temperature and Deflection Data

Mean Furnace Temperature, Together With The Temperature/Time Relationship Specified In The Standard

Time Mins	Specified Furnace Temperature Deg. C	Actual Furnace Temperature Deg. C
0	20	20
2	445	456
4	544	554
6	603	678
8	646	693
10	678	688
12	706	709
14	728	712
16	748	746
18	766	763
20	781	782
22	796	801
24	809	821
26	820	813
28	832	833
30	842	848
32	852	850
34	860	854
36	869	878
38	877	880
40	885	876

Individual And Mean Temperatures Recorded On The Unexposed Surface Of Doorset A

Time Mins	T/C Number 2 Deg. C	T/C Number 3 Deg. C	T/C Number 4 Deg. C	T/C Number 5 Deg. C	T/C Number 6 Deg. C	Mean Temperature Deg. C
0	15	15	15	16	16	15
2	15	15	15	16	16	15
4	15	15	15	15	16	15
6	15	15	15	15	16	15
8	15	15	15	15	16	15
10	16	15	16	16	16	16
12	17	16	17	16	17	17
14	18	17	19	18	19	18
16	20	19	21	20	21	20
18	22	21	24	23	24	23
20	25	24	27	25	27	26
22	28	27	30	28	30	29
24	32	30	33	32	33	32
26	36	34	37	35	37	36
28	39	38	41	39	41	40
30	43	42	45	43	44	43
32	47	46	48	47	47	47
34	51	50	52	50	51	51
36	55	54	56	54	54	55
38	60	58	61	59	58	59
40	64	63	65	64	63	64

Individual And Mean Temperatures Recorded On The Unexposed Surface Of Doorset B

Time Mins	T/C Number 7 Deg. C	T/C Number 8 Deg. C	T/C Number 9 Deg. C	T/C Number 10 Deg. C	T/C Number 11 Deg. C	Mean Temperature Deg. C
0	16	16	16	15	16	16
2	16	16	16	15	16	16
4	16	16	16	15	16	16
6	16	16	16	15	15	16
8	16	16	16	15	15	16
10	17	16	16	16	16	16
12	21	18	19	20	18	19
14	25	21	22	24	21	23
16	30	25	26	29	25	27
18	34	30	30	34	28	31
20	38	34	35	38	33	36
22	42	38	38	42	38	40
24	46	42	42	46	43	44
26	49	46	46	50	48	48
28	53	49	50	54	53	52
30	56	53	54	57	57	55
32	60	57	58	61	62	60
34	64	60	62	65	66	63
36	67	64	66	69	70	67
38	71	67	70	73	74	71
40	74	71	73	77	78	75

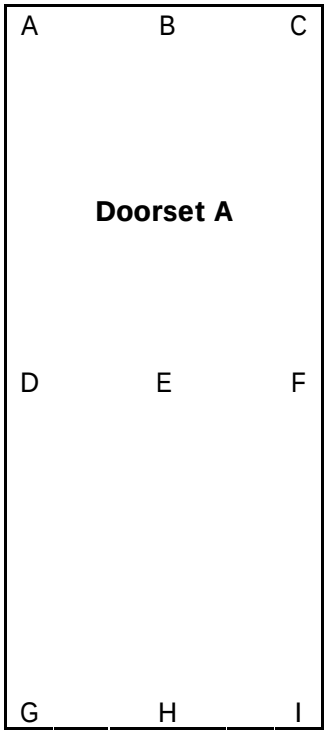
Individual Temperatures Recorded On The Frame of Doorset A

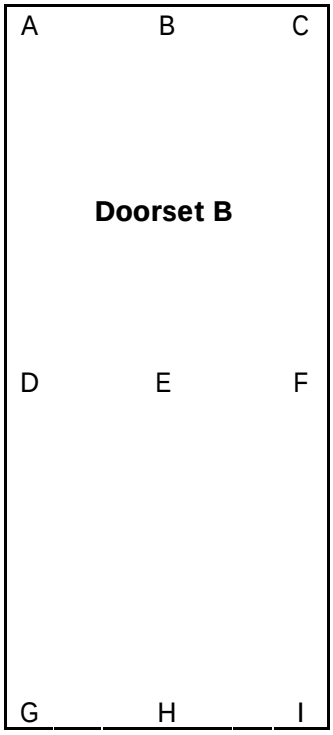
Time Mins	T/C Number 12 Deg. C	T/C Number 13 Deg. C	T/C Number 14 Deg. C
0	16	16	16
2	16	16	16
4	16	16	16
6	16	16	16
8	16	16	16
10	16	16	16
12	16	16	16
14	27	16	16
16	26	16	17
18	25	17	18
20	27	17	18
22	28	18	19
24	28	19	20
26	28	20	21
28	29	22	22
30	29	23	24
32	31	25	26
34	32	27	28
36	34	29	30
38	36	31	33
40	84	33	36

Individual Temperatures Recorded On The Frame of Doorset B

Time Mins	T/C Number 15 Deg. C	T/C Number 16 Deg. C	T/C Number 17 Deg. C
0	13	13	12
2	13	13	12
4	13	13	12
6	13	13	12
8	13	13	12
10	13	13	12
12	13	13	12
14	13	14	12
16	14	14	13
18	15	15	14
20	16	15	14
22	18	16	15
24	19	17	16
26	21	18	18
28	22	19	20
30	24	20	21
32	26	22	23
34	28	23	25
36	30	25	27
38	32	27	30
40	34	31	33

Deflection Of The Door Leaves During The Test



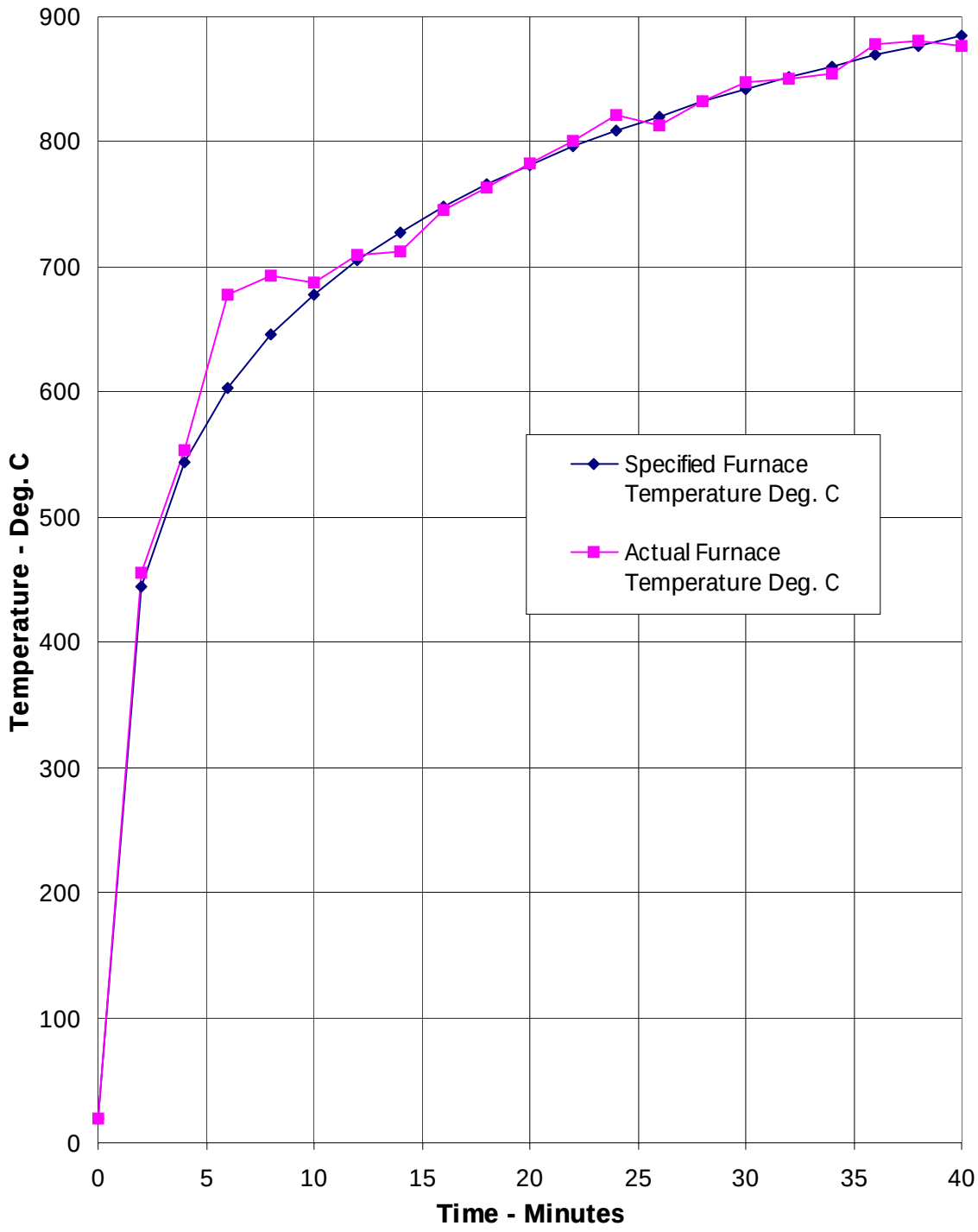


Doorset A									
Deflections – mm									
TIME mins	A	B	C	D	E	F	G	H	I
5	-2	0	0	-1	19	1	2	1	0
10	0	0	2	0	25	4	6	3	-1
15	1	0	1	1	24	5	6	2	0
20	2	0	1	1	14	3	6	2	0
25	-1	-2	-1	-1	-6	1	5	2	0
30	0	-1	0	0	-4	1	5	2	0

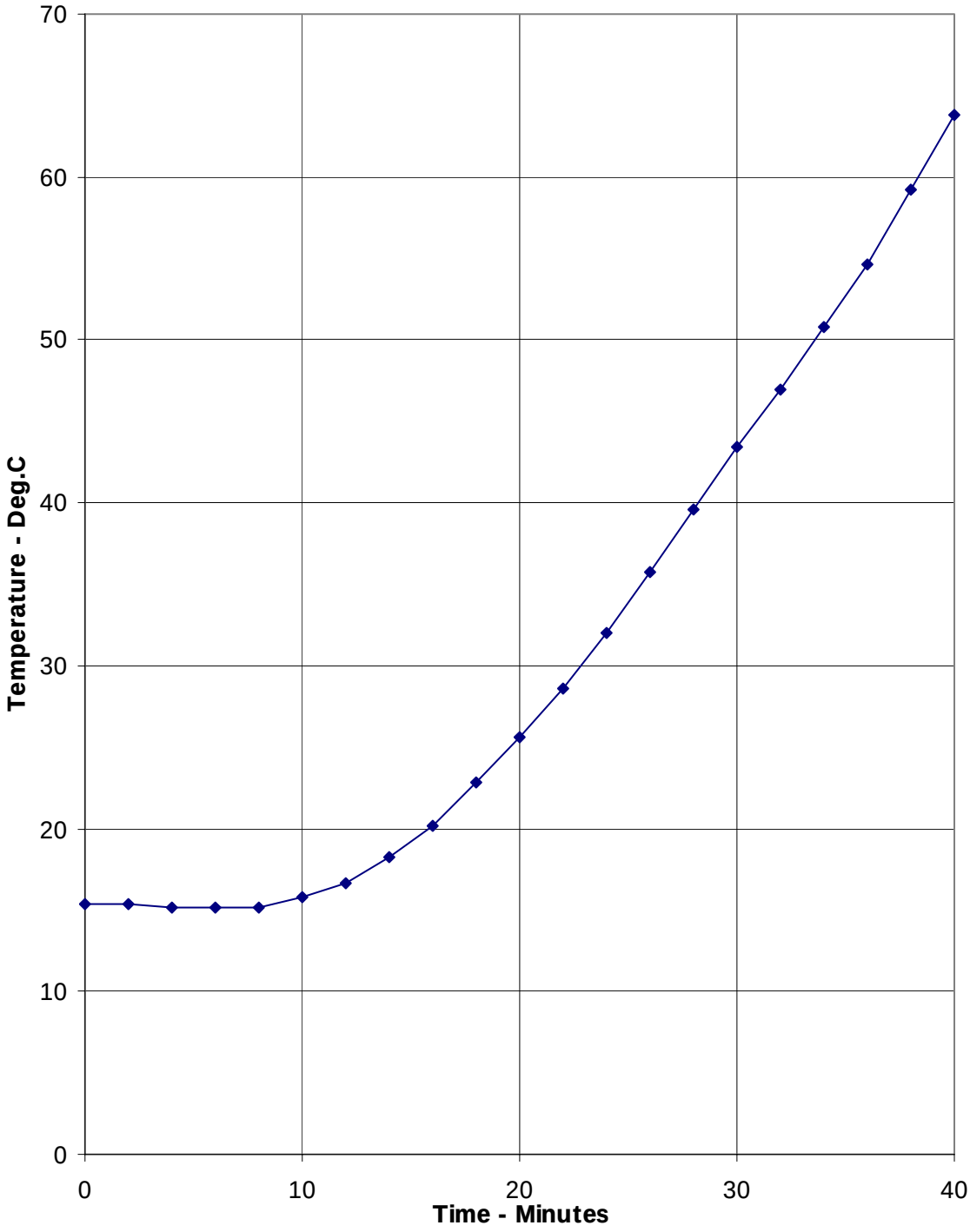
Doorset B									
Deflections – mm									
TIME mins	A	B	C	D	E	F	G	H	I
5	3	3	1	3	20	2	6	4	1
10	5	3	3	4	25	3	8	6	6
15	4	4	2	5	20	4	11	8	7
20	3	4	3	5	9	2	10	7	5
25	3	3	3	5	-3	0	7	4	5
30	4	3	3	7	-4	2	4	1	5

Positive values indicate movement towards the furnace
* Measurements discontinued due to unsafe conditions

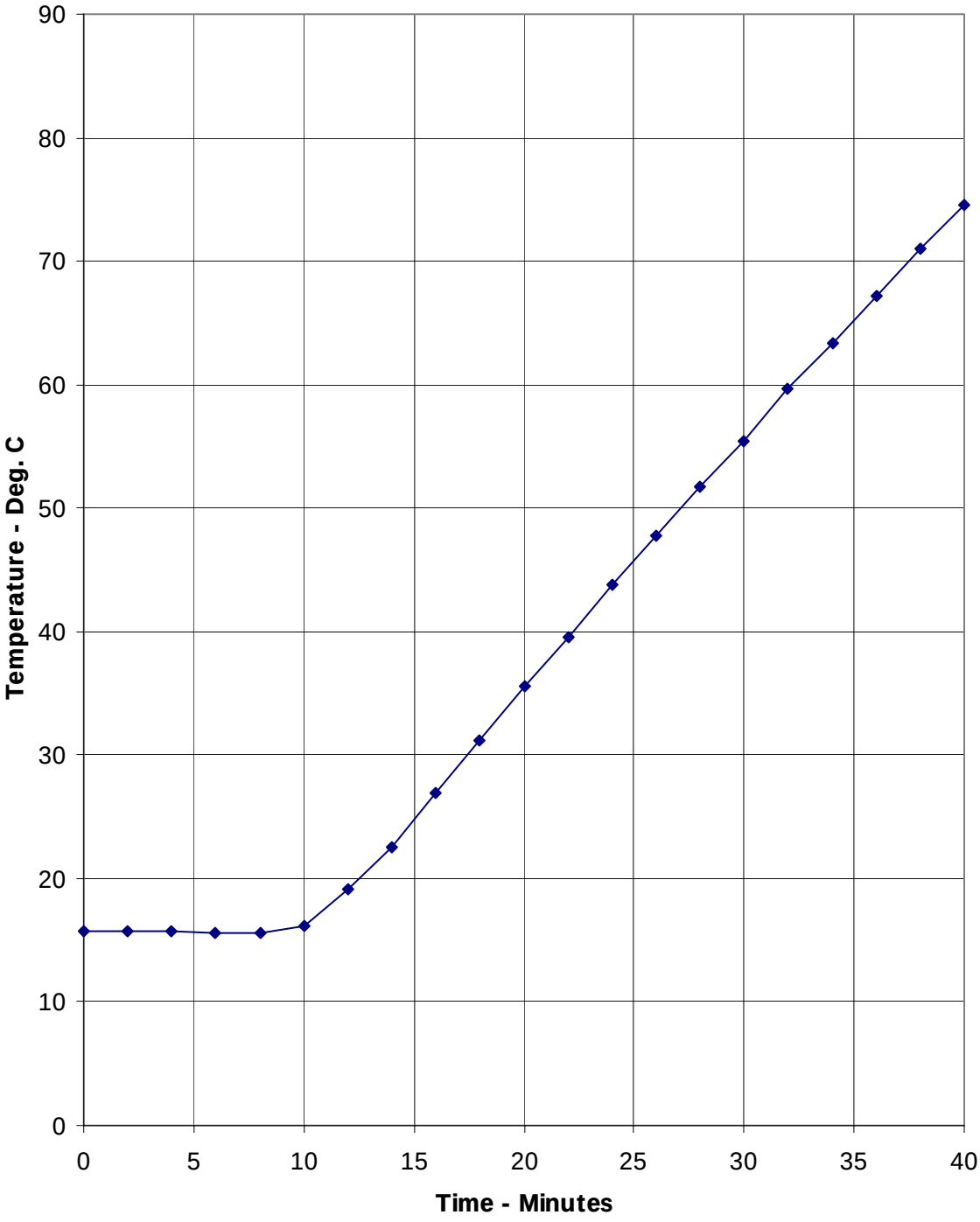
Graph Showing Mean Furnace Temperature, Together With The Temperature/Time Relationship Specified In The Standard



Graph Showing Mean Temperatures Recorded On The Unexposed Surface Of Doorset A



Graph Showing Mean Temperatures Recorded On The Unexposed Surface Of Doorset B



Performance Criteria and Test Results

Integrity

It is required that there is no collapse of the specimens, no sustained flaming on the unexposed surface and no loss of impermeability. These requirements were satisfied for a period of 38 minutes by Doorset A and 35 minutes Doorset B, failure at these times was due to sustained flaming on the unexposed surface of each doorset.

Insulation

It is required that the mean temperature rise of the unexposed surface shall not be greater than 140°C and that the maximum temperature rise shall not be greater than 180°C. Insulation failure also occurs simultaneously with integrity failure. These requirements were satisfied for a period of 38 minutes for Doorset A and 35 minutes Doorset B after which times integrity failure occurred.

Ongoing Implications

Limitations

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.

The test results relate only to the specimen tested. Appendix A of BS 476: Part 20: 1987 provides guidance information on the application of fire resistance tests and the interpretation of test data. Application of the result to doorsets of different dimensions or supported other than by a masonry wall or incorporating different components should be the subject of a design appraisal.

The tested assemblies were asymmetrical and were tested such that the door leaves opened towards the heating conditions of the test. The test results may not be appropriate to situations where the door leaf opens away from the heating conditions.

Review

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 five years old should be considered by the user. The laboratory that issued the report 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.

Conclusions

Evaluation against objective

Two specimens of fully insulated, single-acting, single-leaf doorsets, mounted within a masonry wall have been subjected to a fire resistance test in accordance with BS 476: Part 22: 1987, Clause 6.

The evaluation of the doorsets against the requirements of BS 476: Part 22: 1987, Clause 6 showed that it satisfied the requirements the periods stated below:

Test Results:	Doorset A	Doorset B
Integrity	38 minutes	35 minutes
Insulation	38 minutes	35 minutes

The test was discontinued after a period of 40 minutes.

Bodycote warringtonfire • Head Office • Holmesfield Road • Warrington • Cheshire • WA1 2DS • United Kingdom
Tel: +44 (0) 1925 655 116 • Fax: +44 (0) 1925 655 419 • Email: Info@warringtonfire.net • Website: www.warringtonfire.net