test report

Bodycote

Title:

The fire resistance performance of a single-acting, double-leaf doorset incorporating various items of building hardware in accordance with
BS EN 1634-1: 2000

Report No:

168410

Prepared for:

Newstar Door Controls Limited
Unit A2
Imperial Business Estate
Gravesend
Kent
DA11 0DL

Date: 8th February 2008

Notified Body No:

0833

UKAS TESTING
0249

warringtonfire
global safety
TESTING

Summary

Objective	To determine the fire resistance performance of a single-acting, double-leaf doorset, incorporating various items of building hardware, mounted within a low-density rigid supporting construction in accordance with BS EN 1634-1: 2000.
Test Sponsor	**Newstar Door Controls Limited,** Unit A2, Imperial Business Estate, Gravesend, Kent, DA11 0DL.
Summary of Tested Specimen	The doorset A was of overall dimensions 2080 mm high by 1010 mm wide and included a door leaf of overall dimensions 2040 mm high by 946 mm wide by 44 mm thick comprising softwood stiles and rails, a flaxboard core, non-combustible board sub-facings, MDF facings and hardwood lippings on the vertical edges. The leaf was hung within a hardwood frame on three steel hinges. The doorset was fitted with a surface mounted overhead door closer referenced 'C77B size EN3 hydraulic door closer' mounted on the exposed face in projecting arm configuration. The doorset was mounted such that it opened towards the heating conditions of the test.
Test Results:	

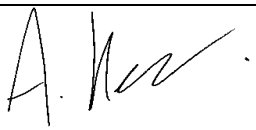
Integrity performance	Sustained flaming	28 minutes
	Gap gauge	33 minutes*
	Cotton Pad	27 minutes
Insulation performance		28 minutes

* The test duration. The test was discontinued after a period of 33 minutes.

Date of Test	19th November 2007

Signatories

Responsible Officer
N. Howard*
Testing Officer



Approved
A. Kearns
Technical Manager

Head of testing Department
S. Hankey
Operations Manager

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

Report Issued

Date : 8th February 2008

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Test Procedure

Introduction

The doorsets are required to provide a fire separating function and were therefore tested in accordance with BS EN 1634-1: 2000 'Fire resistance tests for doors and shutter assemblies - Part 1: Fire doors and shutters'. This test report should be read in conjunction with that Standard and with BS EN 1363-1: 1999, 'Fire resistance tests - Part 1: General requirements' and BS EN 1363-2: 1999, 'Fire resistance tests - Part 2: Alternative and additional procedures'.

The specimens were judged on their ability to comply with the performance criteria for integrity and insulation, as required by BS EN 1634-1: 2000.

The specific purpose of the test was to evaluate the effects of the inclusion of various items of building hardware into a previously tested doorset construction. Because of this, no direct field of application for the doorsets are included in this report.

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 19th November 2007 on behalf of Newstar Door Controls Limited, the sponsor of 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.

The doorsets' installation and test preparation took place in the test laboratory between the 14th and 19th November 2007.

Sampling

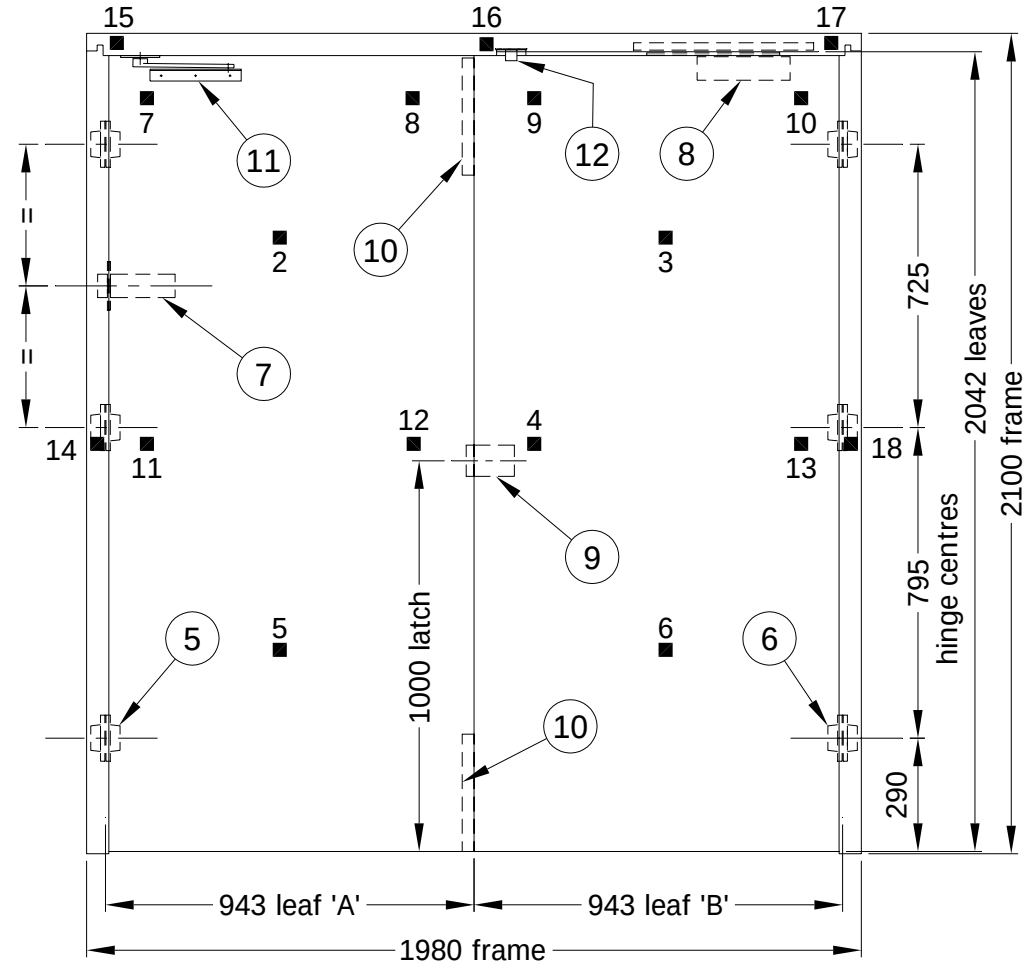
Bodycote **warringtonfire** was not involved in any selection or sampling procedures of the building hardware.

CONDITIONING

The specimens' storage, construction, and test preparation took place in the test laboratory over a total, combined time of 6 days. Throughout this period of time both the temperature and the humidity of the laboratory were measured and recorded as being within a range of from 11°C to 20°C and 37% to 77% respectively.

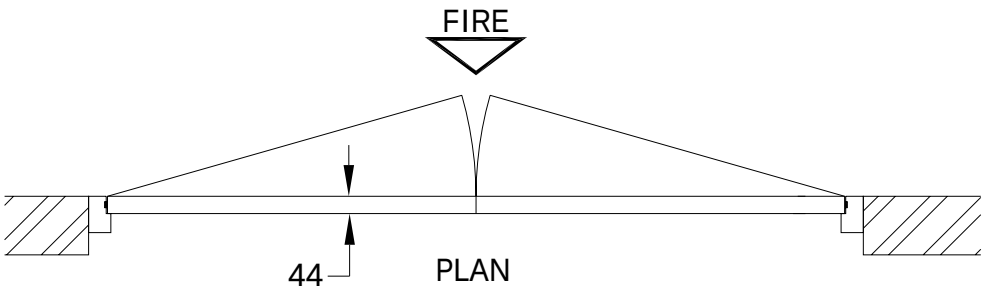
Test Specimen

Figure 1- General Elevation of Test Specimen and Unexposed Face Thermocouples



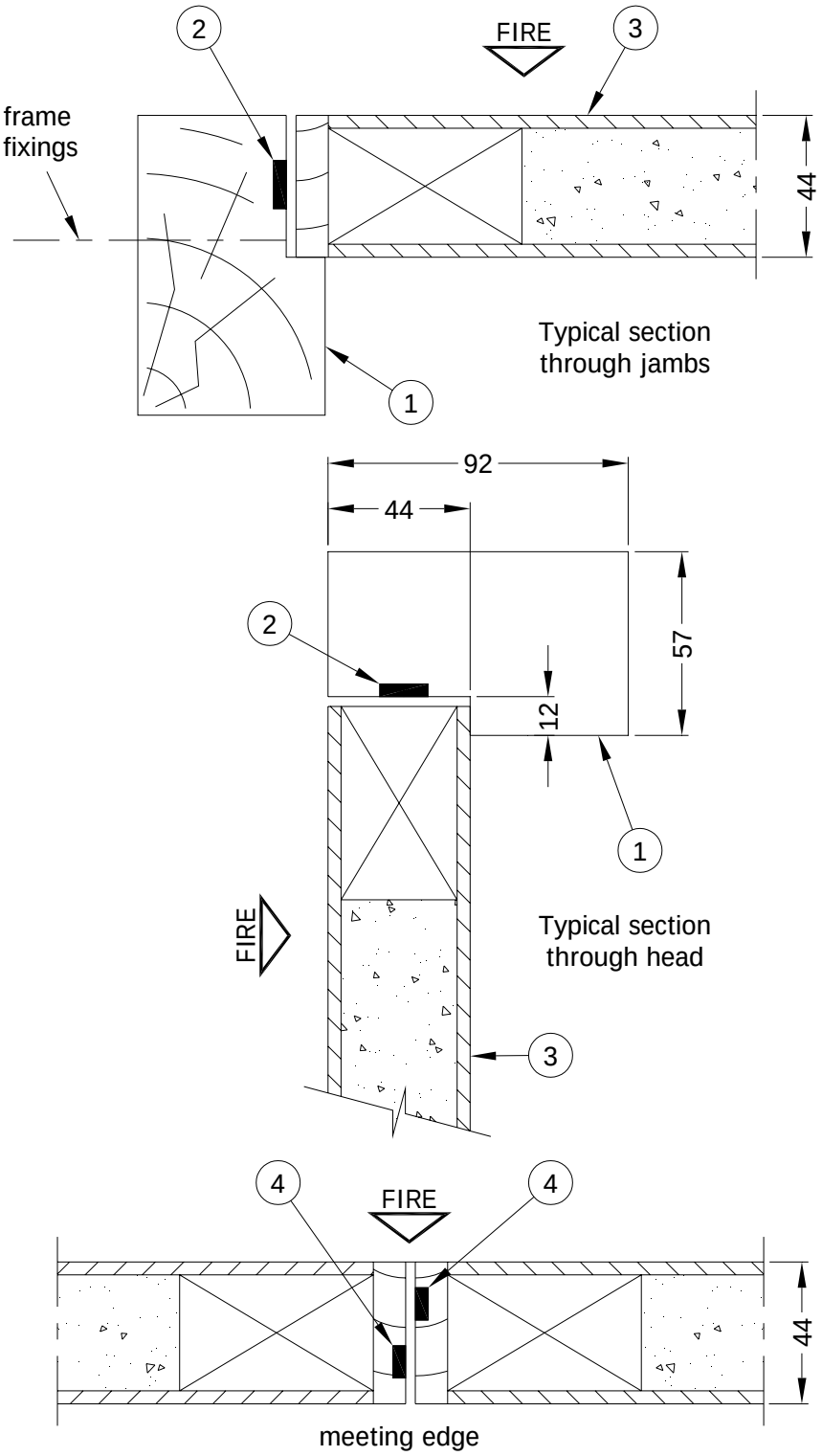
GENERAL ELEVATION
OF UNEXPOSED FACE

■ Positions of thermocouples.



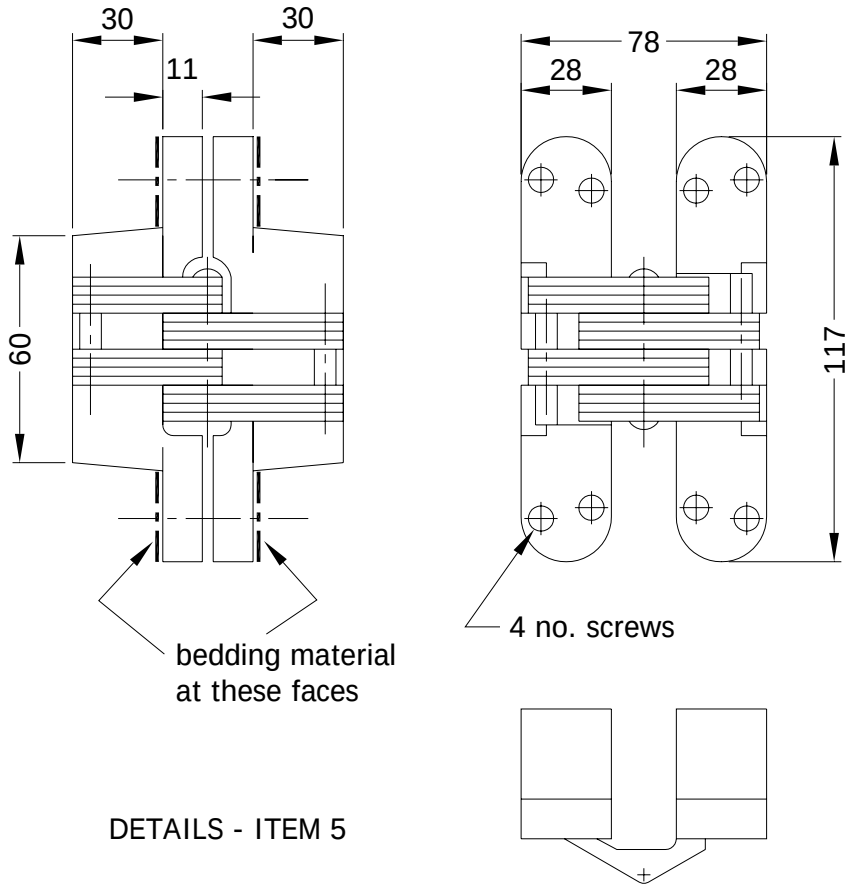
Do not scale. All dimensions are in mm

Figure 2 – Typical Details of Doorset



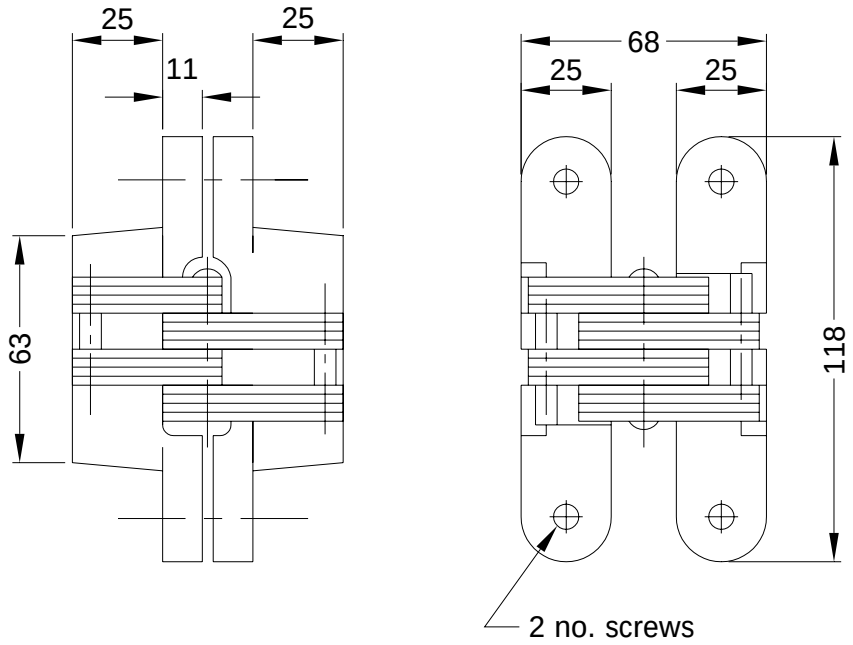
Do not scale. All dimensions are in mm

Figure 3 – Hinge Details for Door Leaf 'A'

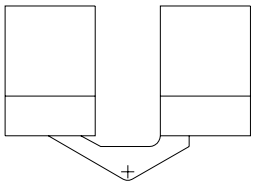


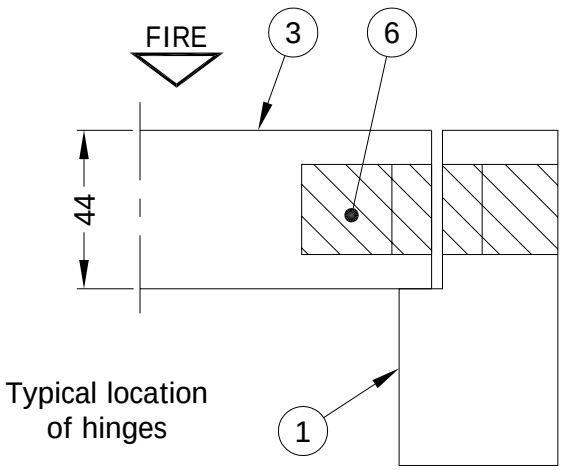
Do not scale. All dimensions are in mm

Figure 4 – Hinge Details for Door Leaf 'B'



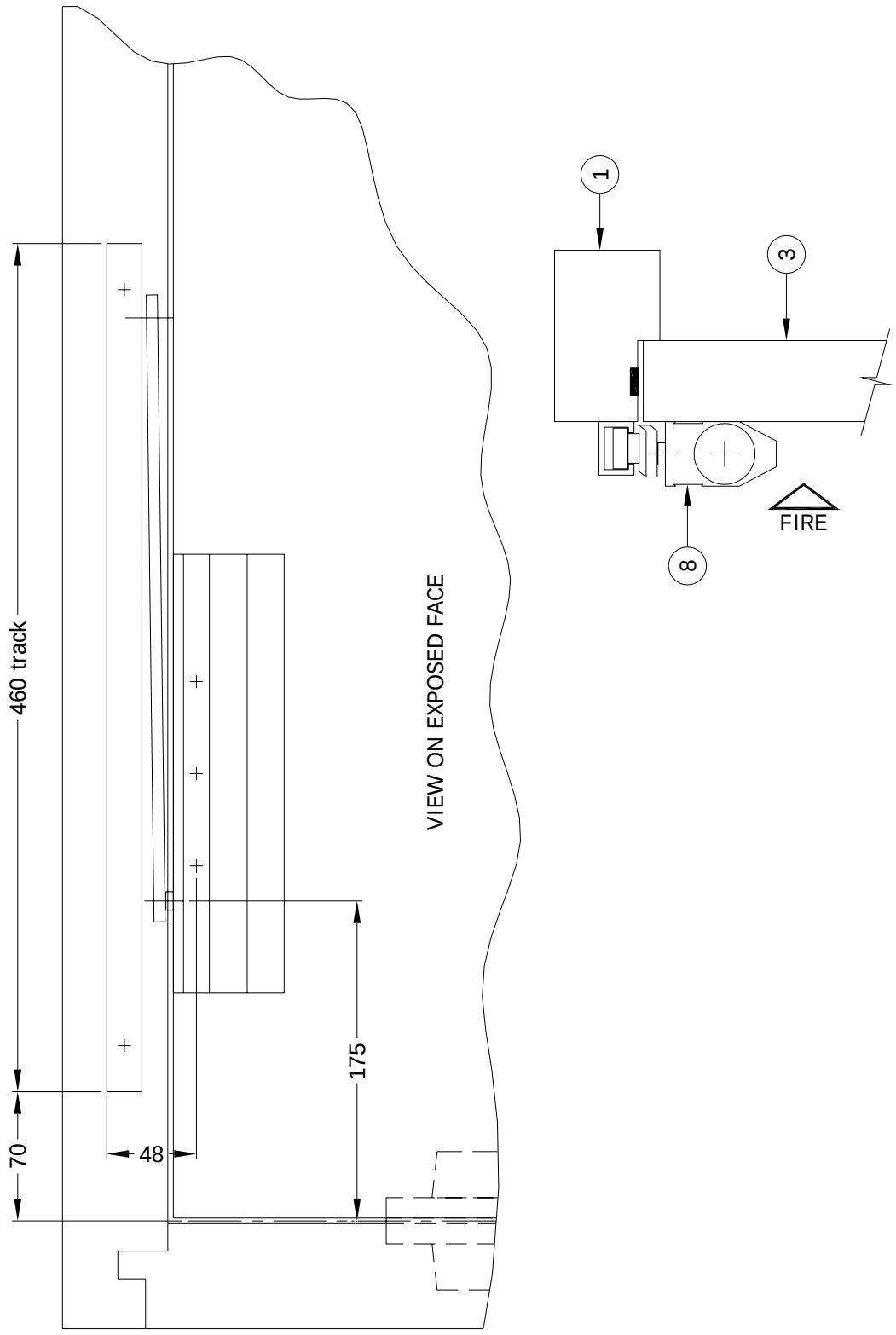
DETAILS - ITEM 6





Do not scale. All dimensions are in mm

Figure 5 – Details of Overhead Door Closer (item 8)



Do not scale. All dimensions are in mm

Schedule of Components

(Refer to Figures 1 to 5)
(All values are nominal unless stated otherwise)
(All other details are as stated by the sponsor)

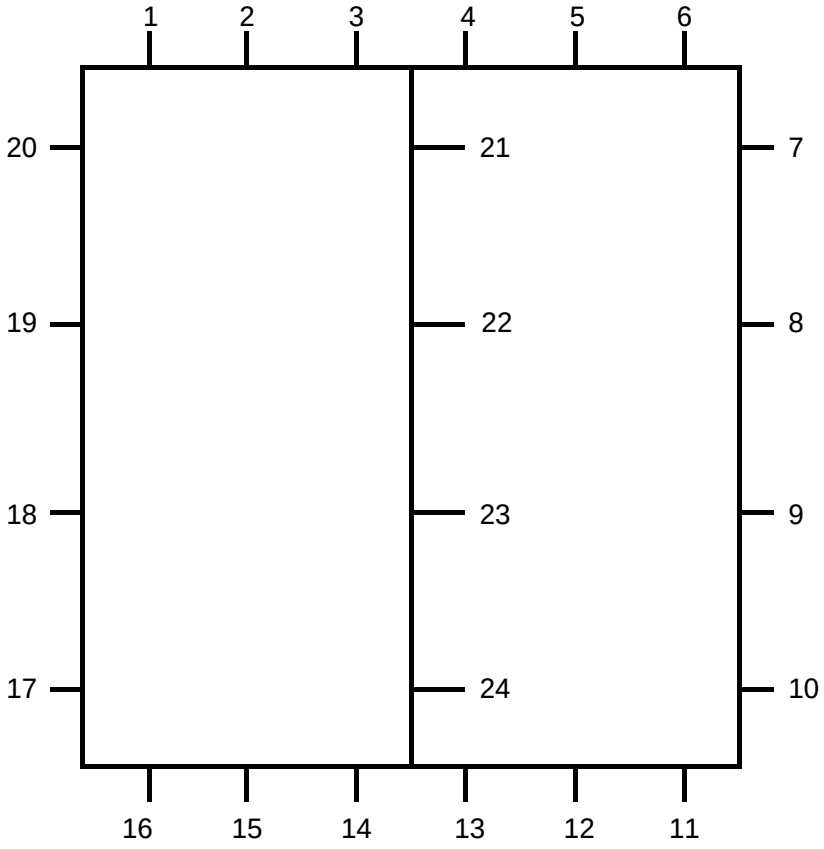
Item		Description
1. Door Frame Jambs and Head		
Material	:	Softwood, species unknown
Overall section size	:	92 mm x 57 mm with a 12 mm deep rebate
Jambs to head jointing method	:	Mortice and tenon joint & screwed using 2 no. countersunk head steel screws per joint.
Fixing method to masonry		
i. type	:	Countersunk head steel screws into plastic plugs
ii. overall size	:	100 mm long x 5.6 mm (No.12) diameter
iii. spacing	:	6 no. screws along each jamb (2 no. screws at 180 mm centres about each hinge position).
2. Door Frame Intumescent Seal		
Manufacturer	:	Intumescent Seals Limited
Material	:	Graphite based intumescent in polyvinyl chloride, PVC, carrier.
Overall section size	:	15 mm wide x 4 mm deep carrier (colour brown)
Fitting method	:	Self adhered within a groove along the jambs and head section of the frame. The seal was interrupted at the hinges and top flush bolt plate.
3. Door Leaf		
Manufacturer	:	Noberne Doors Ltd.
Reference	:	Series 2 solidcore flush door
Construction		
i. stiles and rails	:	Softwood, 60 mm x 36 mm
ii. core	:	Flaxboard, 36 mm thick
iii. outer faces	:	Medium Density Fibreboard, 4 mm thick
iv. lippings	:	Hardwood, 10 mm thick to vertical edges only
4. Door Leaf Intumescent Seal		
Manufacturer	:	Intumescent Seals Limited
Material	:	Graphite based intumescent in polyvinyl chloride, PVC, carrier.
Overall section size	:	10 mm wide x 4 mm deep carrier (colour brown)
Fitting method	:	Self adhered within a groove along the meeting edge of each door leaf. The seal was continuous along door leaf ‘A’ and was interrupted at the latch forend on door leaf ‘B’.

Item		Description
5. Concealed Hinges – Door Leaf 'A'		
Manufacturer	:	New Star Door Controls Ltd.
Code number	:	CH28115
Material	:	Zinc diecast
Quantity	:	3 no. hinges
Overall Sizes	:	See Figure 3
Details of Fixings		
i. type	:	Countersunk head woodscrews
ii. material	:	Stainless steel
5. continued		
iii. size	:	32 mm long x 4.8 mm diameter
iv. number off per blade	:	4 no. screws
Details of Bedding material		
i. manufacturer	:	Lorient Polyproducts Limited
ii. reference	:	Interdens
iii. thickness	:	1 mm
iv. location	:	See Figure 3
6. Concealed Hinges – Door Leaf 'B'		
Manufacturer	:	New Star Door Controls Ltd.
Code number	:	CH25117
Material	:	Zinc diecast
Quantity	:	3 no. hinges
Overall Sizes	:	See Figure 4
Details of Fixings		
i. type	:	Countersunk head woodscrews
ii. material	:	Stainless steel
iii. size	:	32 mm long x 5.4 mm diameter
iv. number off per blade	:	2 no. screws
Bedding material	:	None
7. Concealed Door Closer – Door Leaf 'A'		
Manufacturer	:	New Star Door Controls Ltd.
Reference	:	Barymatic
Code number	:	B1.SCP
Type	:	Adjustable speed hydraulic jamb closer
Material		
i. body	:	Aluminium
ii. forend plate	:	Brass
Overall Sizes		
i. body	:	170 mm long
ii. forend plate	:	123 mm x 25 mm
Location	:	Fitted within hinged edge of door leaf
Fixing method	:	25 mm long x 3.5 mm diameter steel screws
Details of Bedding material		
i. reference	:	Barymatic intumescent pack (as supplied with closer)
ii. material	:	Graphite based
iii. thickness	:	1 mm
iv. location	:	Fitted around closer body and beneath forend plate
Maximum opening moments (measured by Bodycote **Warrington**fire)	:	24 Newton metres (Nm)

Item		Description
8. Overhead Door Closer – Door Leaf 'B'		
Manufacturer	:	New Star Door Controls Ltd.
Code number	:	SL-144.PAA
Type	:	Surface track arm closer
Material		
i. body	:	Aluminium
ii. track	:	Aluminium
iii. closer arm	:	Steel
iv. slider	:	Plastic/brass insert
Overall Sizes		
i. body	:	238 mm long x 60 mm high x 35 mm deep
ii. track	:	460 mm long x 29 mm wide x 19 mm deep channel
Location	:	Exposed face of door leaf
Details of Fixings		
i. body to door leaf	:	50 mm long x 4.8 mm diameter steel screws
ii. track to door frame	:	15 mm long x 4.8 mm diameter steel screws
Maximum opening moments (measured by **Bodycote Warringtonfire**)	:	40 Newton metres (Nm)
9. Surface Mounted Door Lock		
Manufacturer	:	New Star Door Controls Ltd.
Type	:	Rim deadlock
Code number	:	FB1.R
Material		
i. casing	:	Mild steel
ii. forend	:	Stainless steel
iii. strike box	:	Stainless steel
Overall sizes		
i. casing	:	103 mm x 80 mm x 17 mm
ii. forend	:	80 mm x 43 mm x 2.5 mm thick
iii. strike box	:	80 mm x 20 mm x 20 mm x 1.5 mm thick, with a 67 mm x 25 mm fixing plate.
Fixing method		
i. lock case to door leaf 'B'	:	20 mm long x 4 mm diameter stainless steel screws
ii. strike box to door leaf 'A'	:	20 mm long x 4 mm diameter stainless steel screws
Operation of lock	:	Disengaged
10. Top and Bottom Flush Bolts		
Manufacturer	:	New Star Door Controls Ltd.
Code number	:	FB300.SSS
Material	:	Stainless steel
Overall size	:	300 mm long
Location	:	Fitted within closing edge of door leaf 'A'
Fixing method	:	22 mm long x 3 mm diameter stainless steel screws
Operation of bolts	:	Disengaged

Item		Description
11. Surface Limiting Stay		
Manufacturer	:	New Star Door Controls Ltd.
Code number	:	930001
Material		
i. angle bracket	:	Mild steel
ii. armset	:	Zinc diecast
Overall sizes		
i. angle bracket	:	30 mm x 38 mm x 3 mm thick x 233 mm long
Location	:	Unexposed face of door leaf 'A'
Fixing method	:	30 mm long x 4.8 mm diameter steel screws
12. Heavy Duty Emergency Release		
Manufacturer	:	New Star Door Controls Ltd.
Code number	:	C-7-C
Material	:	Stainless steel
Fixing method	:	Fixed to door frame using 4 no. 20 mm long x 4 mm diameter steel screws.

Doorset clearance gaps



View from unexposed face

Gap Dimension in mm at Position											
1	2	3	4	5	6	7	8	9	10	11*	12*
1.3	1.6	1.7	3.6	3.2	3.5	4.0	3.4	3.0	2.0	6.2	7.7
13*	14*	15*	16*	17	18	19	20	21	22	23	24
8.1	7.3	9.9	8.2	1.3	2.2	1.2	1.3	2.0	1.6	1.8	2.9
Mean		2.3		Maximum		4.0		Minimum		1.2	

Gap Between Face of Leaf and Doorstop in mm at Position											
1	2	3	4	5	6	7	8	9	10	11#	12#
3.6	3.3	3.3	2.1	2.2	2.8	3.6	3.4	3.9	3.1	-	-
13#	14#	15#	16#	17	18	19	20	21	22	23	24
-	-	-	-	2.6	2.8	1.9	2.8	2.5	3.0	2.7	3.3
Mean		2.9		Maximum		3.9		Minimum		1.9	

* Dimension not included in calculations
# Gap not measured

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 EN 1363-1: 1999 Clause 5.1 using six plate thermometers, distributed over a plane 100 mm from the surface of the test construction.

General

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.

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 integrity of the specimen.

Furnace Pressure

The furnace atmospheric pressure was controlled so that it complied with the requirements of BS EN 1363-1: 1999. Clause 5.2. The calculated pressure differential relative to the laboratory atmosphere at the top of the specimens was 13.6 (±3) 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 14°C at the start of the test with a maximum variation of -1°C during the test.
00	**00**	**The test commences.**
01	**00**	Large volumes of smoke release are evident from the top half of the doorset.
03	**00**	The smoke release previously mentioned increases in volume.
05	**00**	The exposed surface of the doorset ignites creating large amounts of flaming within the furnace chamber.
10	**00**	The smoke release mentioned at 5 minutes lessens slightly.
12	**00**	The smoke release is now confined to the central hinge positions and right side of the head of the right door leaf.
17	**00**	The right side door leaf begins to visibly distort away from the furnace chamber at its meeting edge position particularly at the threshold.
20	**00**	The doorset continues to satisfy the insulation and integrity criteria of the test.
25	**00**	Intermittent flames issue from the extreme top right corner of the doorset. An area of glowing is evident coincident with the top hinge position of the right side door leaf. A cotton pad is applied but fails to ignite.
27	**30**	A cotton wool pad is applied to the glowing at the top right hand corner of the doorset and ignites. **Cotton Pad integrity failure is deemed to occur**
28	**30**	Sustained flames issue from the top right hand corner of the doorset. **Sustained flame integrity failure is deemed to occur.**
30	**00**	Sustained flames issue from the head of the meeting edge of the doorset. Molten aluminium seeps from the left central hinge position. An area of glowing is evident from the lock position of the doorset.
32	**00**	Slight glowing is evident from the central hinges of the doorset. An area of burn through is evident from the meeting edge adjacent to the lower flush bolt.
33	**00**	**The test is discontinued.**

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	24
1	349	285
2	445	530
3	502	509
4	544	553
5	576	601
6	603	621
7	626	622
8	646	630
9	663	649
10	678	669
11	693	684
12	706	703
13	717	714
14	728	727
15	739	755
16	748	764
17	757	772
18	766	778
19	774	785
20	781	793
21	789	801
22	796	810
23	802	812
24	809	814
25	815	818
26	820	824
27	826	831
28	832	835
29	837	839
30	842	842
31	847	847
32	852	852
33	856	850

Individual and mean temperatures recorded on the unexposed surface of the Doorset

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

Individual temperatures recorded on the unexposed surface of the Doorset

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	T/C Number 12 Deg. C	T/C Number 13 Deg. C
0	17	19	19	18	19	19	14
1	17	19	19	19	19	19	14
2	18	19	19	22	19	19	14
3	18	19	19	27	19	19	14
4	21	22	19	39	19	20	*
5	23	22	19	43	19	21	
6	23	21	20	47	19	20	
7	24	21	20	48	19	20	
8	24	22	21	45	20	21	
9	26	24	23	44	21	23	
10	30	27	25	40	23	26	
11	33	30	28	37	24	29	
12	36	33	31	36	26	31	14
13	38	35	33	35	28	33	15
14	41	38	35	35	30	35	17
15	44	40	37	36	33	37	18
16	47	42	39	36	36	38	20
17	49	43	40	37	38	40	21
18	51	46	42	38	41	41	23
19	53	47	43	40	44	43	24
20	55	49	45	41	47	45	26
21	57	51	47	43	49	46	28
22	58	53	49	48	52	48	29
23	60	54	50	50	54	50	31
24	61	56	52	56	56	51	33
25	62	57	54	71	58	53	34
26	63	59	56	67	60	55	36
27	64	61	58	74	61	57	38
28	65	62	60	92	63	58	39
29	66	64	62	95	65	60	41
30	67	66	64	97	66	61	42
31	68	68	63	79	68	62	40
32	69	68	62	72	69	64	41
33	71	69	63	70	71	65	45

* Thermocouple malfunction

Individual temperatures recorded on the unexposed surface of the frame

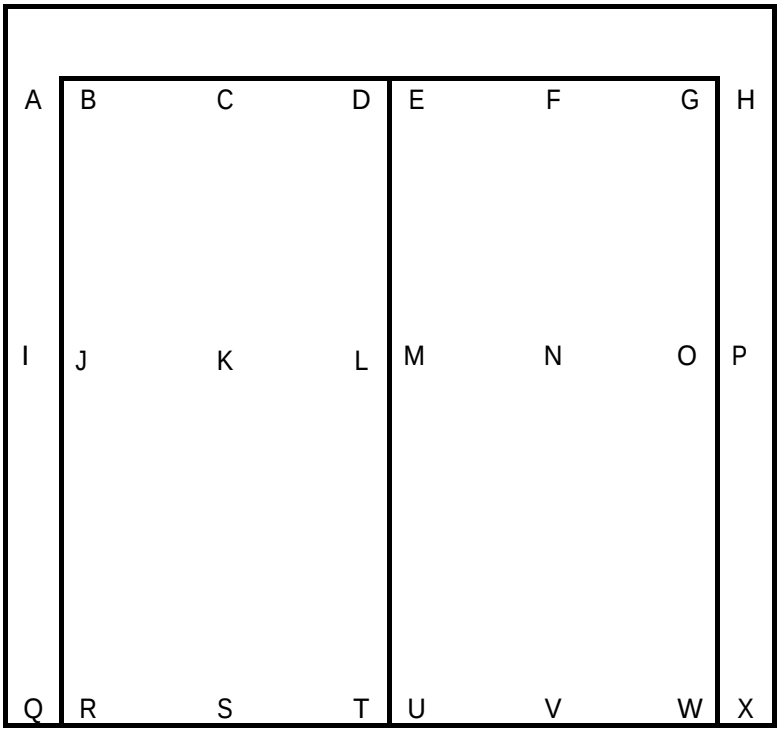
Time Mins	T/C Number 14 Deg. C	T/C Number 15 Deg. C	T/C Number 16 Deg. C	T/C Number 17 Deg. C	T/C Number 18 Deg. C
0	18	14	14	14	14
1	18	14	14	14	14
2	18	18	16	18	14
3	18	21	18	21	14
4	18	26	24	30	14
5	18	28	27	36	14
6	18	29	28	36	16
7	18	30	29	36	15
8	18	30	30	36	15
9	18	29	31	36	15
10	18	29	30	36	15
11	18	29	30	35	15
12	18	27	29	36	15
13	18	25	30	36	15
14	19	24	31	37	15
15	19	23	31	37	16
16	19	23	31	37	16
17	19	23	30	37	16
18	19	23	29	37	16
19	20	23	29	37	17
20	20	23	29	38	17
21	21	24	29	38	17
22	21	25	30	38	18
23	22	26	32	43	18
24	22	26	34	47	19
25	23	27	35	49	19
26	23	28	37	58	20
27	24	29	38	67	20
28	24	31	40	74	21
29	25	33	42	94	21
30	25	35	43	141	22
31	26	38	51	108	22
32	*	*	*	*	*
33					

Specimen hosed with water

Furnace pressure recorded at the head of the doorset during the test

Time Mins	Recorded Pressure Pascals
0	0.0
1	1.5
2	1.0
3	6.9
4	14.2
5	14.0
6	14.5
7	14.3
8	11.8
9	14.4
10	14.5
11	13.9
12	14.0
13	14.3
14	13.7
15	14.0
16	13.8
17	13.8
18	14.1
19	13.9
20	14.1
21	14.1
22	14.3
23	13.9
24	12.9
25	12.9
26	13.5
27	13.3
28	13.6
29	13.7
30	13.6
31	14.2
32	14.5
33	13.9

Horizontal deflections of the door leaves



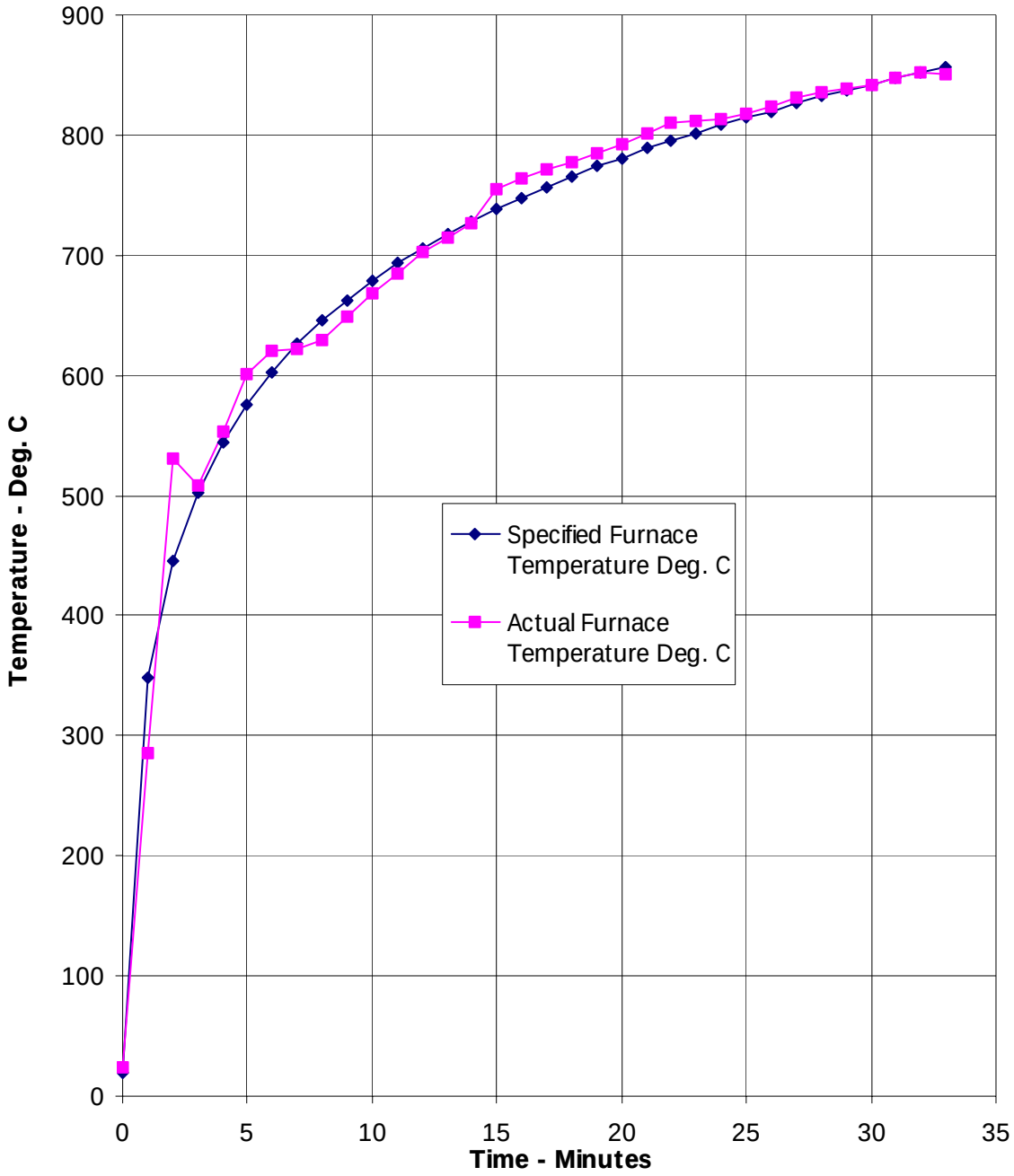
Positive values indicate movement towards the furnace

Deflections – mm															
TIME mins	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	3	0	-1	0	0	1	0	-1	-2	-1	-2	-4	0	-1	-1
10	0	2	0	0	1	2	1	0	0	-2	-2	-6	-7	-3	-1	-1
15	0	2	0	3	3	2	5	2	-1	-1	-4	-10	-16	8	-1	0
20	1	8	1	4	3	2	5	1	1	3	-15	-23	-17	-18	238	0

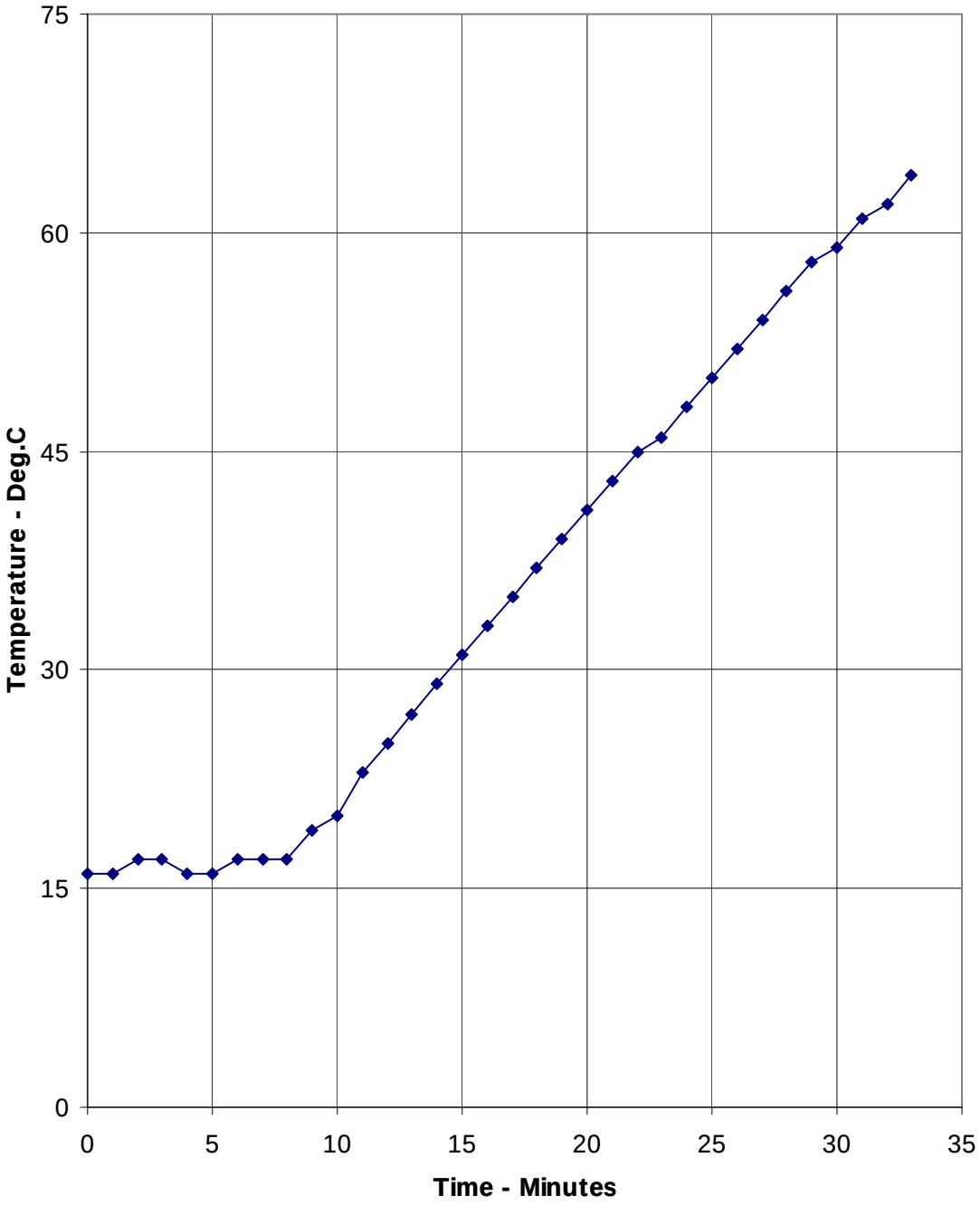
Deflections - mm								
TIME mins	Q	R	S	T	U	V	W	X
0	0	0	0	0	0	0	0	0
5	-1	-1	-1	1	-2	-1	-1	-2
10	-1	0	-3	-2	-4	-2	-1	-1
15	-1	2	-4	-2	-9	-7	-2	0
20	0	5	-10	-5	-16	-9	6	0

Positive values indicate movement towards the furnace

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 the Doorset



Performance Criteria and Test Results

Integrity

It is required that the specimen retains its separating function, without either causing ignition of a cotton pad when applied, or permitting the penetration of a gap gauge as specified in BS EN 1634-1: 2000, or resulting in sustained flaming on the unexposed surface. These requirements were satisfied for the periods shown below:

Sustained flaming	28 minutes
Gap gauge	33 minutes*
Cotton pad	27 minutes

Insulation

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 (except on the door frame, where the maximum temperature rise shall not exceed 360°C). Insulation failure also occurs simultaneously with integrity failure as specified in BS EN 1634-1: 2000. These requirements were satisfied for a period of 28 minutes after which time sustained flame integrity failure occurred.

The test was discontinued after a period of 33 minutes.

Ongoing Implications

Limitations

This report details the method of construction, the test conditions and the results obtained when the specific element of construction described herein was tested following the procedure outlined in BS EN 1363-1: 1999, and where appropriate BS EN 1363-2: 1999. Any significant deviation with respect to size, constructional details, loads, stresses, edge or end conditions other than those allowed under the field of direct application in the relevant test method is not covered by this report. Annex A of BS EN 1363-1: 1999, provides guidance information on the application of fire resistance tests and the interpretation of test data.

Because of the nature of fire resistance testing and the consequent difficulty in quantifying the uncertainty of measurement of fire resistance, it is not possible to provide a stated degree of accuracy of the result.

Conclusions

Evaluation against objective

A specimen of a double-acting, single-leaf and a single-acting, double-leaf doorset, incorporating various items of building hardware, mounted within a low-density rigid supporting construction have been subjected to a fire resistance test in accordance with BS EN 1634-1: 2000, Fire resistance tests for door and shutter assemblies, BS EN 1363-1: 1999, General requirements and BS EN 1363-2: 1999, Alternative and additional procedures.

The evaluation of the doorsets against the requirements of BS EN 1634-1: 2000 showed that the doorsets satisfied the requirements for the following periods.

Test Results:

Integrity performance	Sustained flaming	28 minutes
	Gap gauge	33 minutes*
	Cotton Pad	27 minutes
Insulation performance		28 minutes

*The test duration. The test was discontinued after a period of 33 minutes.

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