

TEST REPORT

**FIRE RESISTANCE TEST IN ACCORDANCE
WITH BS 476: PART 22: 1987, CLAUSE 8, ON
AN UNINSULATED, SINGLE-ACTING
SINGLE-LEAF DOORSET**

THE PROFESSIONALS IN FIRE SAFETY •

Warrington
FIRE
research
CONSULTANCY • TESTING

TEST REPORT

TEST SPONSOR : SAUERLANDER SPANPLATTEN, Postfach 5553, 59805 Arnsberg, Germany.

SUMMARY : A specimen of an uninsulated, single-acting, single-leaf doorset has been subjected to a test in accordance with BS 476: Part 22: 1987, Clause 8, to determine its fire resistance performance. The specimen, referenced 'Doorset A' for the purpose of the test, consisted of an extruded tubeboard core and a softwood door frame.

At the request of the sponsor, the specimen was mounted within a masonry wall construction such that the door leaf opened towards the heating conditions of the test.

The doorset had overall dimensions of 2012 mm high by 903 mm wide and incorporated a single door leaf of overall sizes 1981 mm high by 837 mm wide by 44 mm thick with a hardboard facing. The doorset incorporated a glazed aperture of overall sight size 578 mm wide by 908 mm high fitted with nominally 6 mm thick 'Georgian Wired Plate' glass.

The specimen satisfied the performance requirements specified in Clause 8 of BS 476: Part 22: 1987, for uninsulated doorsets, for the following periods:

Integrity : 36 minutes

The test was discontinued after a period of 45 minutes.

An additional doorset, referenced 'Doorset B' was tested simultaneously and is reported separately under our reference WARRES 69484/B.

DATE OF TEST : 8th October 1996

REPORT ISSUED : 21st January 1997

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1. **PURPOSE OF THE TEST**

- 1.1 To determine the fire resistance of a specimen of an uninsulated single-acting, single-leaf doorset in accordance with BS 476: Part 22: 1987.

2. **INTRODUCTION**

- 2.1 The doorset was of an uninsulated construction and the test was therefore conducted in accordance with Clause 8 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)'.
- 2.2 The doorset was asymmetrical and incorporated a single-acting, single-leaf. BS 476: Part 22: 1987 requires asymmetrical doorsets to be tested from both directions unless certain conditions apply. At the request of the sponsor only a single specimen was tested and it was mounted within a masonry wall construction such that the door leaf opened towards the heating conditions of the test. The test results, therefore, may not be appropriate to situations where the door leaf opens away from the fire hazard.
- 2.3 The specimen was judged on its ability to comply with the performance criteria for integrity as required by BS 476: Part 22: 1987, Clause 8.
- 2.4 Certain aspects of some fire test specifications are open to different interpretations. The Fire Test Study Group has identified a number of such areas and has agreed Resolutions which define common agreement of interpretations between fire test laboratories which are members of the Group. Where such Resolutions are applicable to this test they have been followed.
- 2.5 The test was conducted on the 8th October 1996, at the request of Sauerlander Spanplatten, the sponsor of the test.
- 2.6 The test was witnessed by Mr. H. Flototto, a representative of Sauerlander Spanplatten and Mr. R. Zebedee, a representative of J.R.M. Doors.
- 2.7 An additional doorset, referenced 'Doorset B', was tested simultaneously and is reported separately as WARRES No. 69484/B.

3. **TEST SPECIMEN CONSTRUCTION**

- 3.1 A comprehensive description of the test construction is given in Annex A. The description is based on a detailed survey of the specimen and information supplied by the sponsor of the test.
- 3.2 The specimen was supplied as a complete assembly by the sponsor on the 2nd October 1996. Warrington Fire Research Centre was not involved in any selection or sampling procedures of the doorset or any of the components.
- 3.3 The specimen doorset was installed into an unplastered 150 mm thick masonry wall, comprising bricks and aerated concrete blocks and sand and cement mortar, to form the test construction. The specimen was mounted into a prepared aperture by representatives of Warrington Fire Research Centre on the 7th October 1996.

4. **INSTRUMENTATION AND MEASURING EQUIPMENT**

- 4.1 The instrumentation was provided in accordance with the requirements of the Standard.
- 4.2 Six thermocouples distributed over a plane 100 mm from the surface of the test construction, were provided to monitor the temperature of the furnace atmosphere.
- 4.3 Pressure sensors were provided within the furnace to monitor the furnace atmospheric pressure.
- 4.4 Thermocouples were provided to monitor the temperature of the unexposed face of the specimen as follows:
 - 4.4.1 At five positions, one approximately at the centre of the doorset and one at approximately the centre of each quarter section of the doorset. (Thermocouples 11 to 15)
 - 4.4.2 At three positions on the surface of the door frame, one at the approximate mid-point above the door leaf and one at approximately mid-height on each of the vertical frame members. (Thermocouples 22 to 24)
 - 4.4.3 The locations and reference numbers of the various unexposed surface thermocouples are shown in Figure 1 of Annex A.
- 4.5 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 temperatures indicated by the fixed thermocouples.
- 4.6 Cotton pads and gap gauges were available to evaluate the impermeability of the specimen to hot gases.
- 4.7 A water-cooled foil heat-flux meter was used to record the heat radiation from the specimen. The heat-flux meter was positioned at a distance of 1918 mm from the unexposed surface of the specimen so that its angle of view of 60° circumscribed the diagonal of the specimen.

5. **TEST PROCEDURE**

- 5.1 The test was conducted in accordance with the procedure specified in BS 476: Part 22: 1987, Clause 8.
- 5.2 The furnace was controlled so that its mean temperature complied with the requirements of BS 476: Part 20: 1987, Clause 3.1.
- 5.3 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 doorset was 8.6 (± 2) Pa.
- 5.4 Throughout the test the temperatures indicated by the thermocouples provided to monitor the furnace and the specimen were continuously monitored and were recorded at one minute intervals.
- 5.5 The thermocouples referred to in 4.2 were used to determine the mean furnace temperature.

- 5.6 The cotton pads and gap gauges were used, if considered appropriate, to determine compliance with the integrity criterion of the Standard. The occurrence of any sustained flaming on the unexposed surface was also recorded to determine compliance with this criterion.
- 5.7 The deflections of the door leaf at specified positions were measured at selected times during the test.

6. TEST DATA AND INFORMATION

- 6.1 The following data, which was recorded during the test, is given in Annex B:
- 6.1.1 Mean furnace temperature, together with a comparison with the specified temperature/time relationship specified in the Standard.
 - 6.1.2 The mean and individual temperatures recorded by the thermocouples fixed to the unexposed surface of the specimen.
 - 6.1.3 The deflections of the door leaf of the specimen at specified positions.
- 6.2 A summary of the observations made on the general behaviour of the specimen is given in Annex C.
- 6.3 The ambient air temperature in the vicinity of the test construction was 19°C at the start of the test with no variation during the test.
- 6.4 The test was discontinued after a period of 45 minutes at the request of the sponsor.

7. EVALUATION AGAINST THE PERFORMANCE CRITERIA

- 7.1 The performance of the specimen was judged against the following criteria of BS 476: Part 20: 1987:
- 7.1.1 **Integrity** - It is required that there is no collapse of the specimen, no sustained flaming on the unexposed surface and no loss of impermeability. These requirements were satisfied for a period of 36 minutes. Failure was due to sustained flaming on the unexposed surface of the specimen.

8. CONCLUSIONS

- 8.1 A specimen of an uninsulated, single-acting, single-leaf doorset mounted in a masonry wall has been subjected to a fire resistance test in accordance with BS 476: Part 22: 1987, Clause 8.
- 8.2 The specimen satisfied the performance requirements specified in the Standard for the period stated below:

Integrity : 36 minutes

The test was discontinued after a period of 45 minutes.

9. **LIMITATIONS**

- 9.1 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.
- 9.2 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 results 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.
- 9.3 The tested assembly 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 leaf opens away from the fire hazard.
- 9.4 The dimensions of the gaps between the leaf and frame were less than 3 mm at some positions. The results of this test are, therefore, limited to doorsets where the gap dimensions are similar to but do not exceed those which are detailed in this report.

10. **REVIEW**

- 10.1 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.

Responsible Officer

S. Hankey

S. HANKEY
Technical Officer
Structural Fire Protection

Approved

C.W. Miles

C.W. MILES
Senior Technical Officer
For and on behalf of
WARRINGTON FIRE RESEARCH CENTRE

21st January 1997

KC(5132)

ANNEX A

SCHEDULE OF COMPONENTS

(Refer to Figures 1 to 2)

(All values are nominal unless stated otherwise)

(All references are as stated by the sponsor)

<u>Item</u>	<u>Description</u>
1.	<u>Door Frame</u> Material : Softwood, species not stated Density : 440 kg/m³ (stated) Section size : 80 mm x 30 mm Joints : Frame members butt jointed and screw fixed together. Aperture Fixing : Door frame fixed to the masonry using 3 no. 4.7 mm diameter x 125 mm long countersunk head screws at 700 mm centres along each jamb. The fixings passed through the jamb and door stop sections into plastic plugs.
2.	<u>Door Stop</u> Material : Softwood, species not stated Density : 440 kg/m³ (stated) Section size : 33 mm x 13 mm Fixing : Steel nail pins at 250 mm centres
3.	<u>Door Leaf Frame</u> Material : Softwood, species Whitewood Density : 510 kg/m³ nominal Nominal size i) stiles : 38 mm x 38 mm x full height of leaf ii) top rail : 38 mm x 38 mm iii) bottom rail : 38 mm x 38 mm Fixing : Frame members staple fixed together.
4.	<u>Core</u> Material : Extruded Tubeboard referenced Sauerland Type 38 RF Density : 317 kg/m³ nominal Thickness : 38 mm Fitting : Between door leaf frame members.

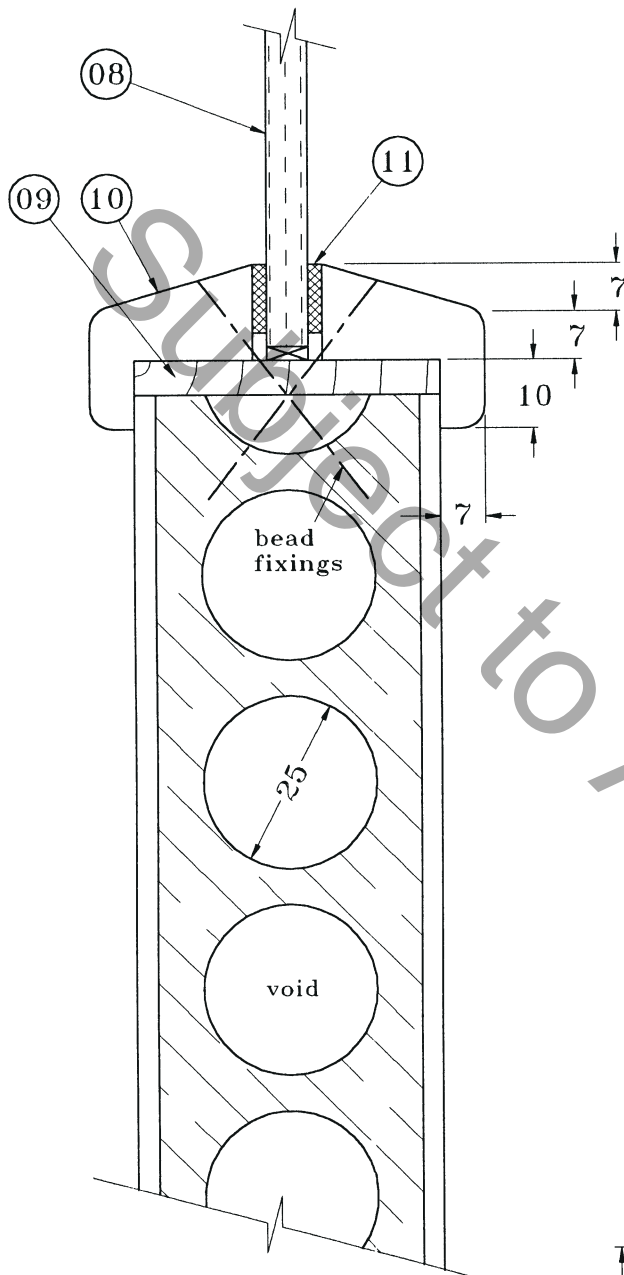
Annex A (Continued)

<u>Item</u>	<u>Description</u>
5.	<u>Door Leaf Facing</u> Material : Hardboard Thickness : 3.2 mm Fixing : Fitted with resin.
6.	<u>Lippings</u> Material : Hardwood, species not stated Size : 44 mm x 5 mm Fixing : Bonded to vertical edges of leaf using a urea formaldehyde adhesive.
7.	<u>Intumescent Seal</u> Type : Palusol reference LP1002 Size : 10 mm x 2 mm Fixing : Self adhesive fixed within a groove along the door frame jambs and head. Seal was interrupted at the hinges and catch plate.
8.	<u>Glass</u> Manufacturer : Schott Glass Type : Georgian Wired Plate Thickness : 6 mm Sight size : 578 mm wide x 908 mm high Setting blocks (at base of glass) i) material : Hardwood, species Meranti ii) section size : 10 mm wide x 3 mm thick approximately
9.	<u>Glazed Aperture Lipping</u> Material : Hardwood, species not stated Thickness : 5 mm Fixing : Bonded to leaf using a urea formaldehyde adhesive.
10.	<u>Glazing Beads</u> Material : Hardwood, species not stated Overall size : 24 mm x 24 mm with a bolection return of 10 mm along the face of the leaf. Fixing : Skew fixed steel panel pins 40 mm long, 3 no. along horizontal beads at 240 mm centres and 4 no. along vertical beads at 265 mm to 280 mm centres.

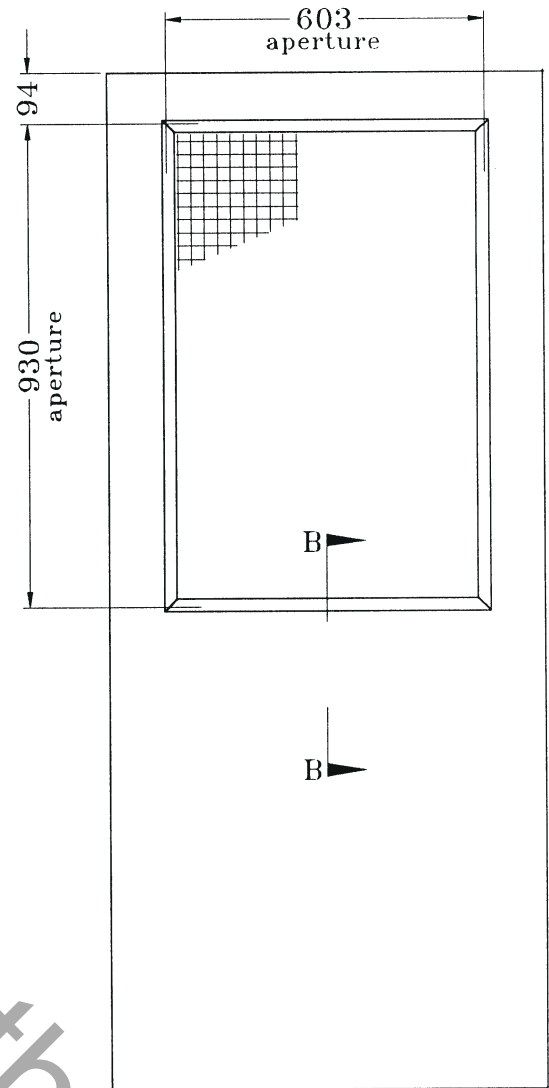
Annex A (Continued)

<u>Item</u>	<u>Description</u>
11.	<u>Glazing Seal</u> Type : Pyrostrip 300 Size : 10 mm x 2 mm
12.	<u>Hinges</u> Type : Butt hinges Material : Mild steel Size : 100 mm x 32 mm x 2 mm thick flaps x 7 mm diameter knuckle. Quantity : 3 no. hinges Fixing : All flaps recess fitted and fixed using 4.4 mm diameter x 30 mm long steel screws, 4 no. per flap.
13.	<u>Latch</u> Type : Legge mortice latch Material : Mild steel Size : i) fore plate : 64 mm x 25 mm ii) strike plate : 64 mm x 25 mm Fixing : 2 no. steel screws per plate Handle set i) type : Lever ii) material : Aluminium iii) fixing : 4 no. screws per handle plate, 3.4 mm diameter x 19 mm long.

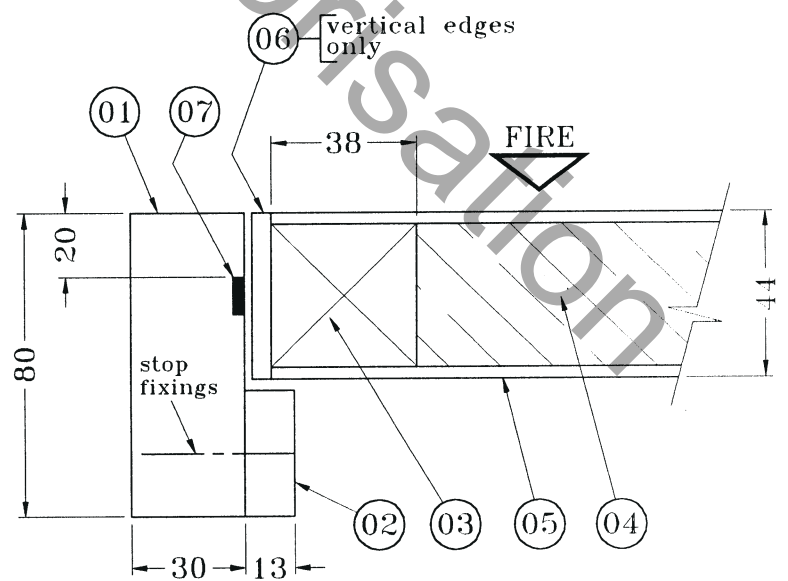




**ENLARGED SECTION B-B
GLAZING DETAILS AND
CORE DETAILS**

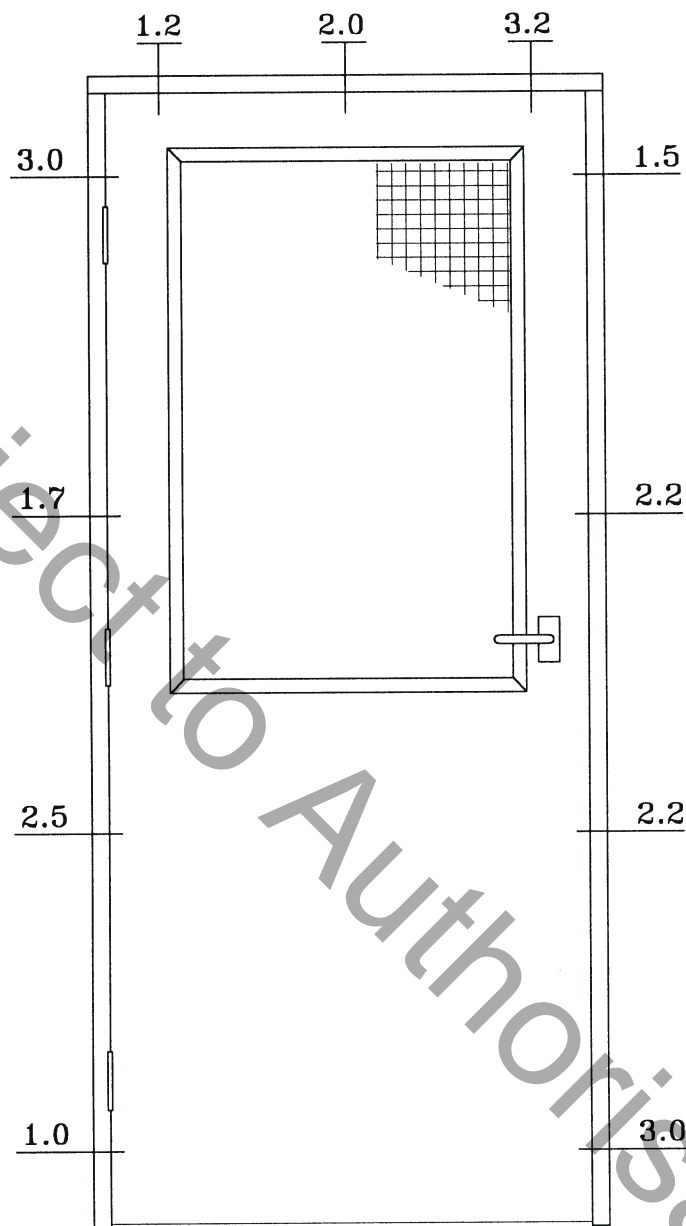


DOOR LEAF DETAILS



**SECTION 'A'
(TYPICAL AT JAMBS & HEAD)**

All dimensions are in mm.
See Annex A for schedule.
Do not scale



DOOR LEAF TO FRAME GAPS IN MM
(measurements taken from fire side face)

MEAN : 2.1

MIN : 1.0

MAX : 3.2

ANNEX B

DATA RECORDED DURING THE TEST

TABLE 1

RECORDED FURNACE TEMPERATURE RISES AND
PERCENTAGE TOLERANCES

: :Time: :Mins:	: : FURNACE : TEMP. : Deg C	: : FURNACE : TEMP. : Deg C	: : AREA : UNDER : STANDARD: : CURVE : Deg C.min:	: : AREA : UNDER : ACTUAL : CURVE : Deg C.min:	: : PERCENT : DIFF. :	: : PERCENT : TOLERANCE: : + or - :
: 0:	20	14	:	:	:	:
: 1:	349	310	:	:	:	:
: 2:	445	429	:	:	:	:
: 3:	502	479	:	:	:	:
: 4:	544	572	:	:	:	:
: 5:	576	550	:	:	:	:
: 6:	603	572	:	:	:	:
: 7:	626	678	:	:	:	:
: 8:	645	625	:	:	:	:
: 9:	663	714	:	:	:	:
: 10:	678	655	5302	5265	-1	15
: 12:	705	710	:	:	:	:
: 14:	728	716	:	:	:	:
: 16:	748	742	:	:	:	:
: 18:	766	768	:	:	:	:
: 20:	781	793	:	:	:	:
: 22:	796	803	:	:	:	:
: 24:	809	808	:	:	:	:
: 26:	820	814	:	:	:	:
: 28:	831	831	:	:	:	:
: 30:	842	856	15493	15499	.04	10
: 35:	865	872	:	:	:	:
: 40:	885	886	:	:	:	:
: 45:	902	900	13111	13187	.582	5

Annex B (Continued)

TABLE 2

INDIVIDUAL AND MEAN TEMPERATURES RECORDED ON THE
UNEXPOSED SURFACE OF THE DOORSET

:Time:	T/C 11	T/C 12	T/C 13	T/C 14	T/C 15	Mean
:Mins:	Deg C	Deg C	Deg C	Deg C	Deg C	Temp.
:	:	:	:	:	:	Deg C
0:	15	17	18	19	18	17
1:	19	21	21	18	18	19
2:	53	62	64	18	18	43
3:	82	92	95	18	18	61
4:	122	136	143	18	18	88
5:	165	188	200	19	18	118
6:	200	229	238	20	20	141
7:	241	270	279	23	24	167
8:	271	293	300	29	30	185
9:	306	322	329	37	38	206
10:	355	370	380	46	48	240
11:	403	420	430	56	57	273
12:	452	467	478	61	62	304
13:	474	485	505	64	65	319
14:	481	496	518	67	67	326
15:	490	509	525	70	70	333
16:	499	519	530	72	71	338
17:	510	530	536	74	73	345
18:	518	540	541	76	75	350
19:	528	550	551	78	76	357
20:	541	562	562	80	78	364
21:	551	572	572	81	79	371
22:	559	580	579	82	81	376
23:	567	586	586	83	82	381
24:	572	591	589	84	83	384
25:	575	596	590	85	84	386
26:	578	600	594	86	85	389
27:	582	604	599	88	86	392
28:	588	607	606	90	88	396
29:	596	615	619	93	92	403
30:	605	624	630	97	96	411
31:	615	633	645	100	98	418
32:	624	641	660	100	99	425
33:	632	648	668	102	101	430
34:	638	653	673	106	106	435
35:	643	657	677	112	113	440
36:	646	658	680	120	124	446
37:	649	660	682	132	138	452
38:	651	663	685	146	153	459
39:	653	665	687	161	169	467
40:	656	668	690	177	186	475
41:	658	671	694	194	202	484
42:	661	674	696	211	219	492
43:	664	678	701	227	236	501
44:	669	682	708	245	250	511
45:	672	688	715	260	267	520

Annex B (Continued)

TABLE 3

INDIVIDUAL TEMPERATURES RECORDED ON THE
UNEXPOSED SURFACE OF THE DOOR FRAME

Time:	T/C 22	T/C 23	T/C 24
Mins:	Deg C	Deg C	Deg C
0:	15	14	14
1:	15	14	14
2:	16	14	14
3:	17	14	14
4:	19	14	14
5:	22	14	14
6:	25	14	14
7:	28	14	14
8:	32	15	14
9:	36	17	15
10:	39	16	15
11:	43	16	15
12:	47	15	16
13:	51	15	16
14:	54	16	17
15:	57	16	18
16:	60	16	19
17:	62	17	20
18:	65	18	22
19:	67	18	23
20:	70	19	25
21:	72	19	25
22:	73	20	26
23:	73	21	26
24:	74	22	27
25:	76	22	27
26:	77	23	28
27:	78	23	29
28:	80	24	31
29:	82	25	33
30:	83	25	36
31:	85	26	38
32:	88	27	41
33:	89	27	44
34:	90	28	46
35:	92	28	48
36:	93	28	49
37:	95	30	50
38:	97	30	52
39:	99	31	52
40:	100	32	54
41:	102	32	54
42:	104	33	55
43:	107	34	56
44:	110	36	57
45:	113	37	58

Annex B (Continued)

TABLE 4

RECORDED RADIATION INTENSITIES

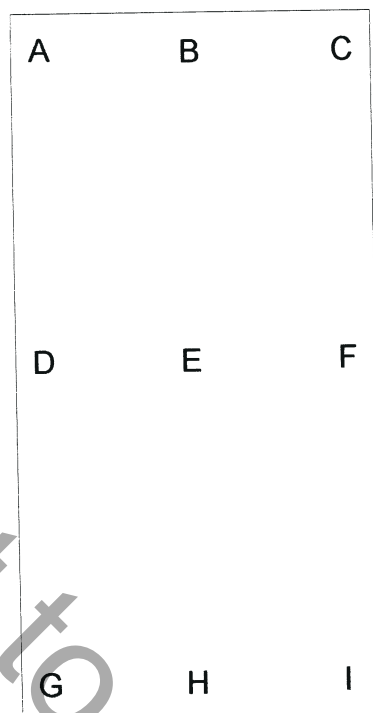
:	:	RADIATION :
:Time:	:	INTENSITY :
:	:	AT 1918mm :
:Mins:	:	SEPARATION :
:	:	W/sqcm :

:	0:	0 :
:	3:	.002 :
:	6:	.012 :
:	9:	.043 :
:	12:	.056 :
:	15:	.062 :
:	18:	.077 :
:	21:	.092 :
:	24:	.103 :
:	27:	.113 :
:	30:	.131 :
:	33:	.146 :
:	36:	.153 :
:	39:	.174 :
:	42:	.190 :
:	45:	.235 :

Annex B (Continued)

TABLE 5

DEFLECTIONS OF THE DOOR LEAF DURING TESTING



As viewed from unexposed face

POSITION									
TIME	A	B	C	D	E	F	G	H	I
0	0	0	0	0	0	0	0	0	0
5	2	1	-1	1	1	-1	0	0	-1
10	*	*	*	*	*	*	2	0	0
15							1	3	1
20							3	-3	0
30							1	0	1

Positive deflections indicate movement towards the furnace.

All deflections given in mm. All times in minutes.

*Deflections unable to be taken due to heat radiation.

Annex B (Continued)

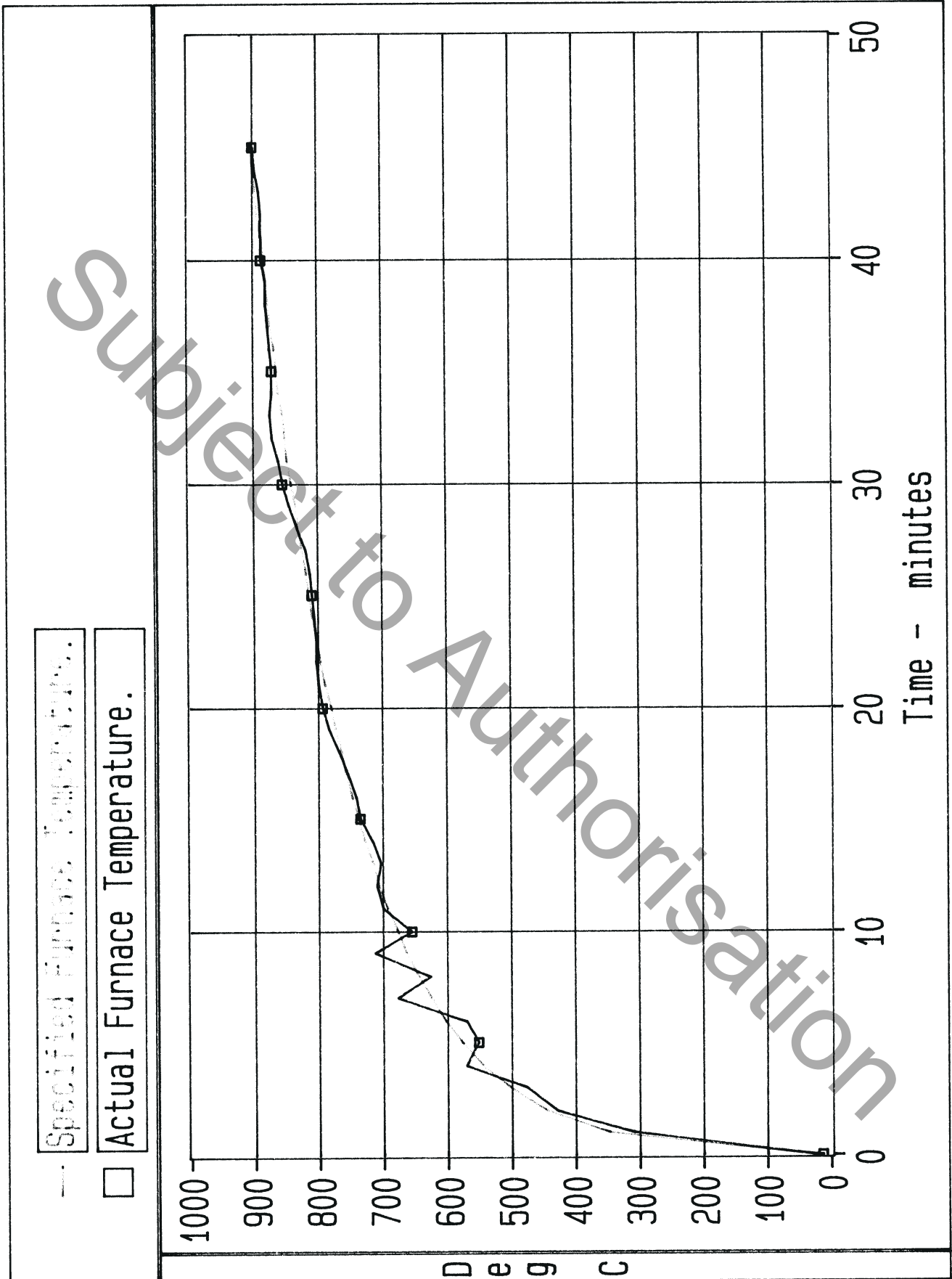


FIGURE 4

Annex B (Continued)

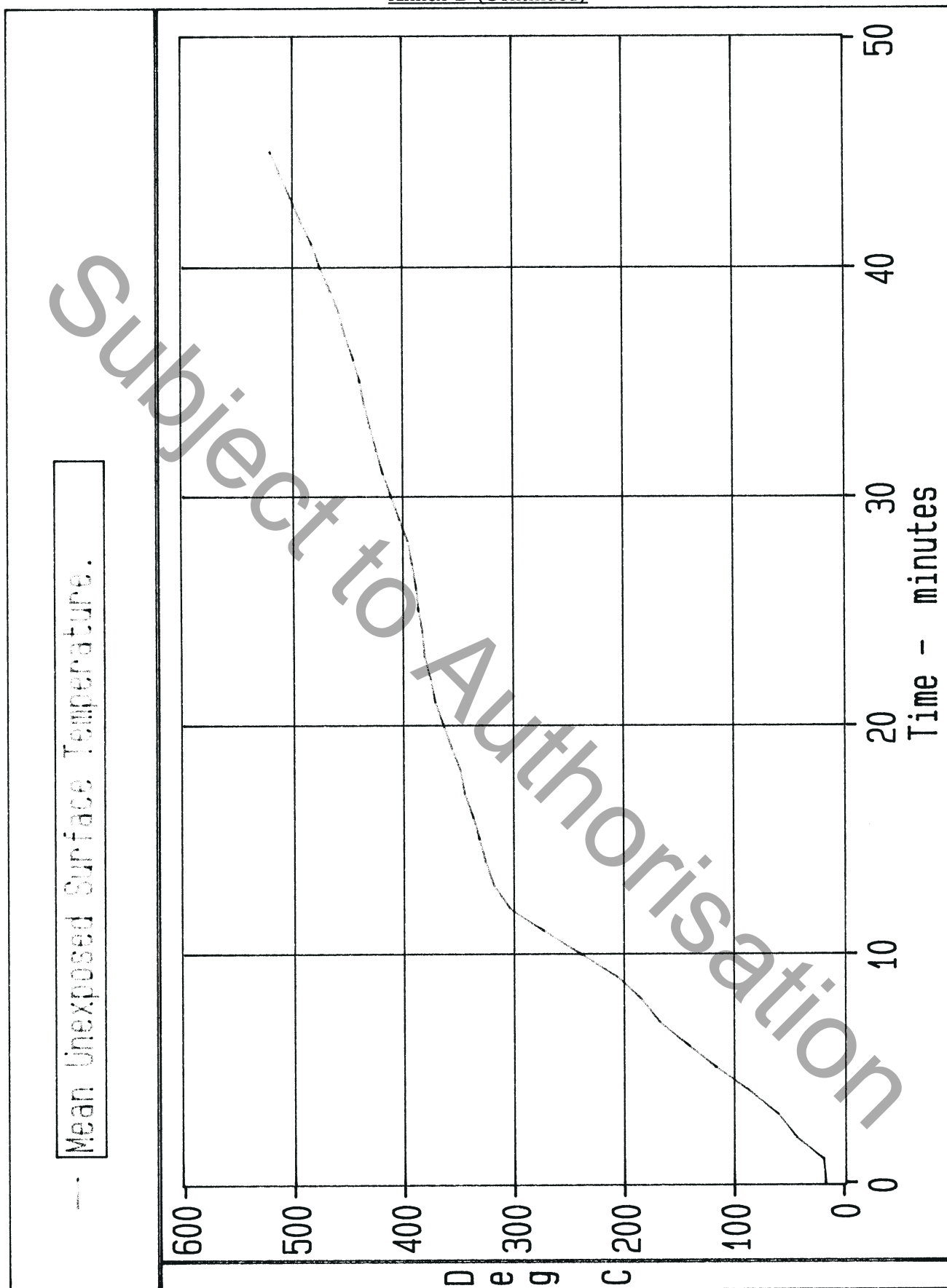


FIGURE 5

ANNEX C

OBSERVATIONS MADE DURING THE TEST

The following observations were made during the test by Warrington Fire Research Centre

E - Observations from exposed side

U - Observations from unexposed side

Time			
mins	secs		
00	00		Test commences.
01	25	U	The glass has started to crack around its edges.
03	50	U	Smoke release begins from around the head of the door leaf.
04	15	E	The door leaf facing has ignited.
12	00	U	The perimeter of the glazed aperture has discoloured black.
14	00	U	A white fluid is oozing from behind the glazed bead at top edge of the glazed aperture.
16	00	U	The smoke release has decreased from the perimeter of the door leaf but continues from the top right (trailing edge) of the door leaf/frame perimeter gap.
17	20	U	The door leaf remains visually flat.
18	25	E	The intumescent around the glazing beads has reacted fully, slight sections of intumescent material have fallen away from the exposed face.
19	25	U	The smoke release has increased slightly from the top trailing edge corner as the door leaf deflects towards the furnace by approximately 4 mm.
27	15	E	A small section of the glazing bead has fallen away from the exposed surface.
25	30	U	Areas of charring are visible at the top of glazed aperture adjacent to the area where beads have fallen away on the exposed face.
26	48	U	The smoke release continues from around the glazed aperture.

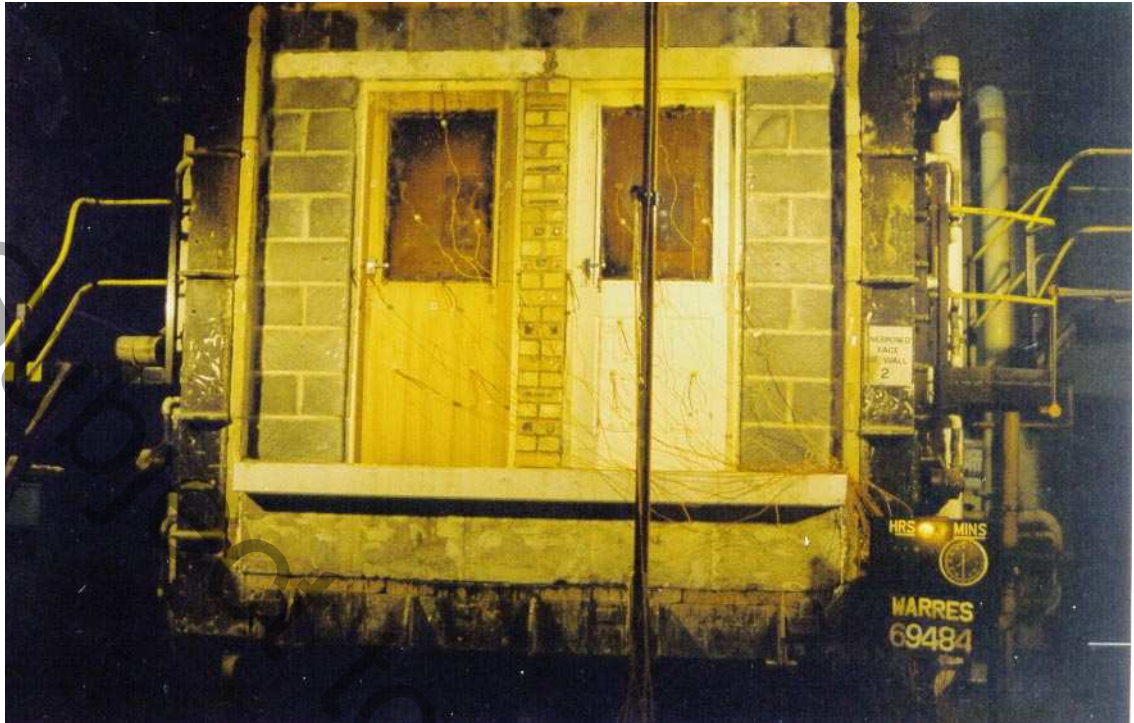
Annex C (Continued)

Time			
mins	secs		
27	15	U	The intumescent in the top of the glazed aperture has reacted further.
28	00	U	Discolouration has increased at the top right corner of the door leaf.
35	00	U	Areas of charring/glowing are visible coincident with the bottom hinge position.
36	45	U	Sustained flames are visible above the bottom hinge position. <u>Integrity failure is deemed to occur.</u>
40	50	U	Flaming has ceased from the position mentioned at 36 minutes 45 seconds.
41	30	U	A smoke release is visible from the face of the door leaf.
42	00	U	The glazed aperture remains intact.
45	10	U	The test is discontinued at the request of the sponsor.









Subject to Authorisation







Subject



to

Authorisation

to

Authorisation

to

Authorisation

to

Authorisation