

test report

Title:

The fire resistance performance of an uninsulated, fabric curtain roller doorset, in accordance with BS 476: Part 22: 1987, Clause 8.

WF Report No:

161169

**Prepared for:**

Fire Curtains Limited
Unit 14,
St Marks Works,
Foundry Lane,
Leicester,
LE1 3WU

Date:

15th May 2007

Notified Body No:

0833



0249

Summary

Objective To determine the fire resistance performance of a specimen of uninsulated, fabric curtain roller doorset when tested in accordance with Clause 8 of BS 476: Part 22: 1987.

Sponsor **Fire Curtains Limited**, Unit 14, St Marks Works, Foundry Lane, Leicester, LE1 3WU.

Summary of Tested Specimen The doorset had overall dimensions of 3035 mm high by 3050 mm wide and comprised a soffit mounted, galvanised steel head box containing a mild steel roller assembly, mild steel vertical guide rails a fire curtain barrier formed from woven glass fibre fabric reinforced with stainless steel wire and coated both sides with a micronised aluminium polymer, reference number Y0533/31.

A pocket made from the same fabric as the curtain was stitched to the unexposed face of the curtain. The pocket incorporated a steel weight bar to simulate the weight of a curtain with a greater height.

Test Results:


Integrity 69 minutes

The test was discontinued after a period of 69 minutes.

Date of Test 2nd February 2007

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Signatories


Responsible Officer S. Whatham* Testing Officer


Approved D. Forshaw* Senior Technical Officer

* For and on behalf of Bodycote **warringtonfire**.

Report Issued
Date : 15 th May 2007

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Test Procedure

Introduction

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)'.

The specimen was judged on its ability to comply with the performance criterion for integrity, as required by BS 476: Part 22: 1987, Clause 8.

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 2nd February 2007 at the request of Fire Curtains Limited.

Mr. A. Calow, a representative of Fire Curtains Limited, witnessed the test.

Test Specimen Construction

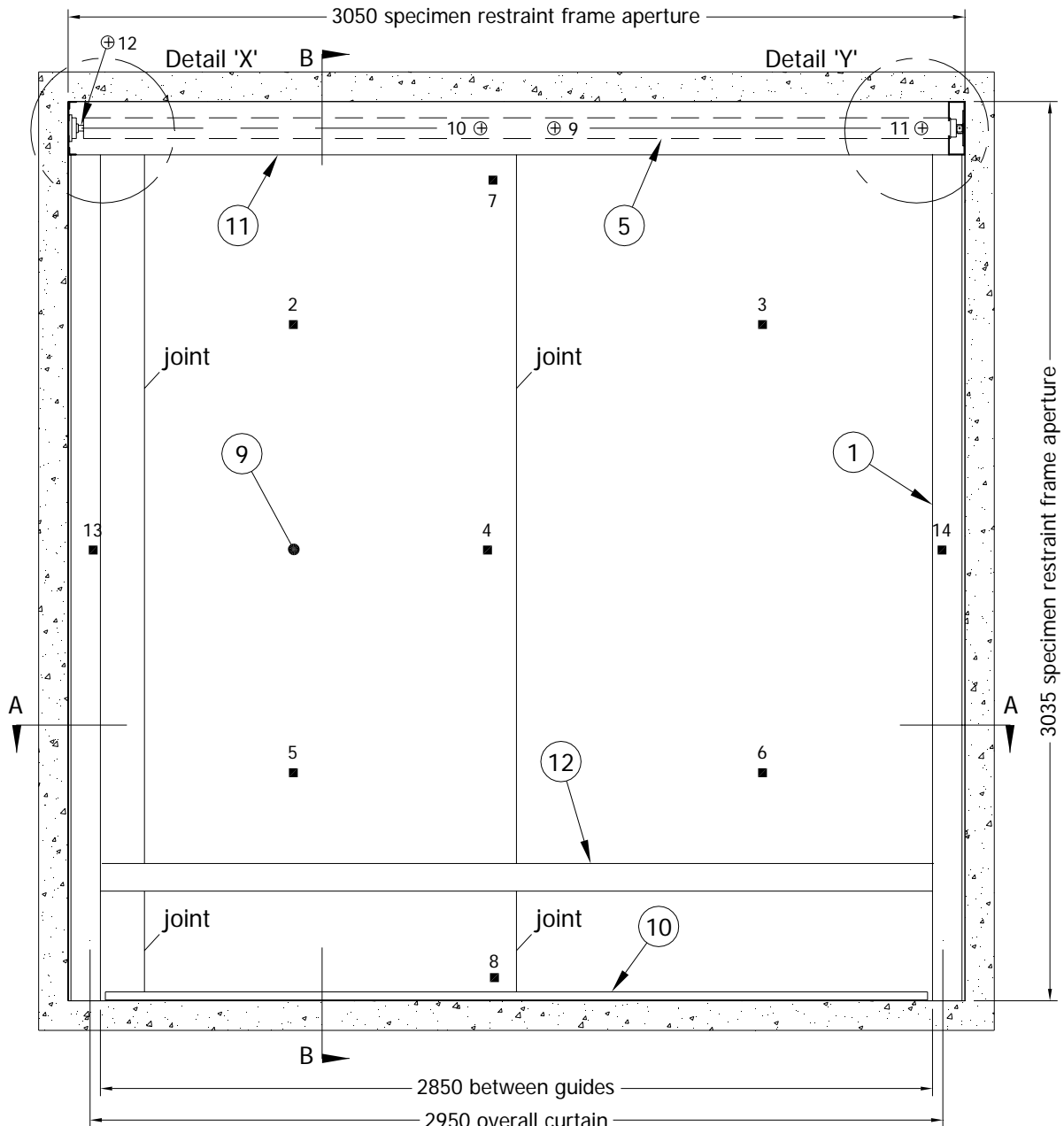
A comprehensive description of the test construction is given in the Schedule of Components. The description is based on a detailed survey of the specimen and information supplied by the sponsor of the test.

Installation

The doorset was mounted within an aperture in a refractory concrete lined, steel support frame. Representatives of the test sponsor conducted the installation on the 1st February 2007.

Test Specimen

Figure 1- General elevation of test specimen and unexposed face thermocouples



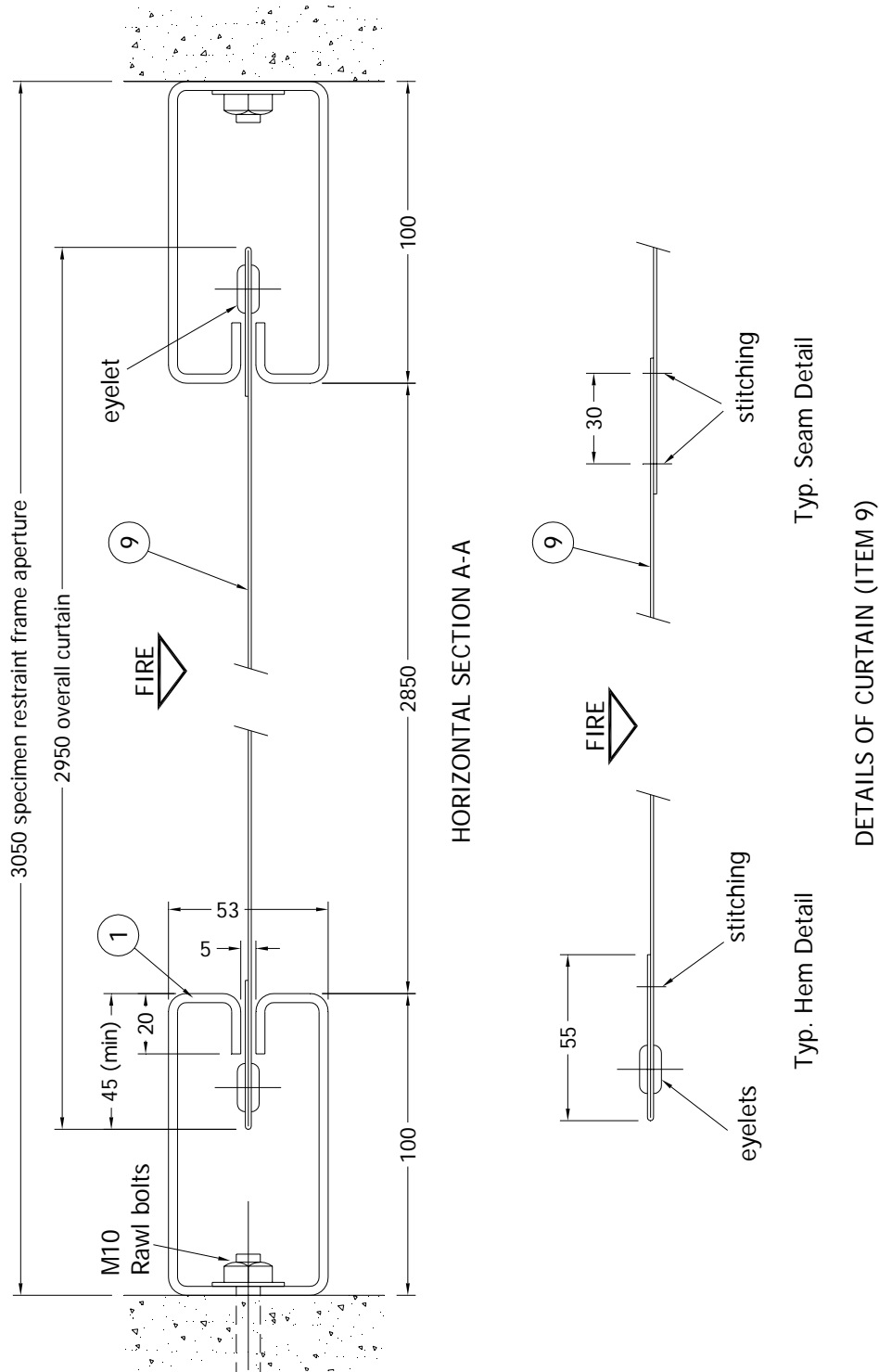
GENERAL ELEVATION OF UNEXPOSED FACE

Positions of thermocouples

- surface mounted thermocouples (Nos. 2 to 8)
- ⊕ mineral insulated thermocouples (Nos. 9 to 14)

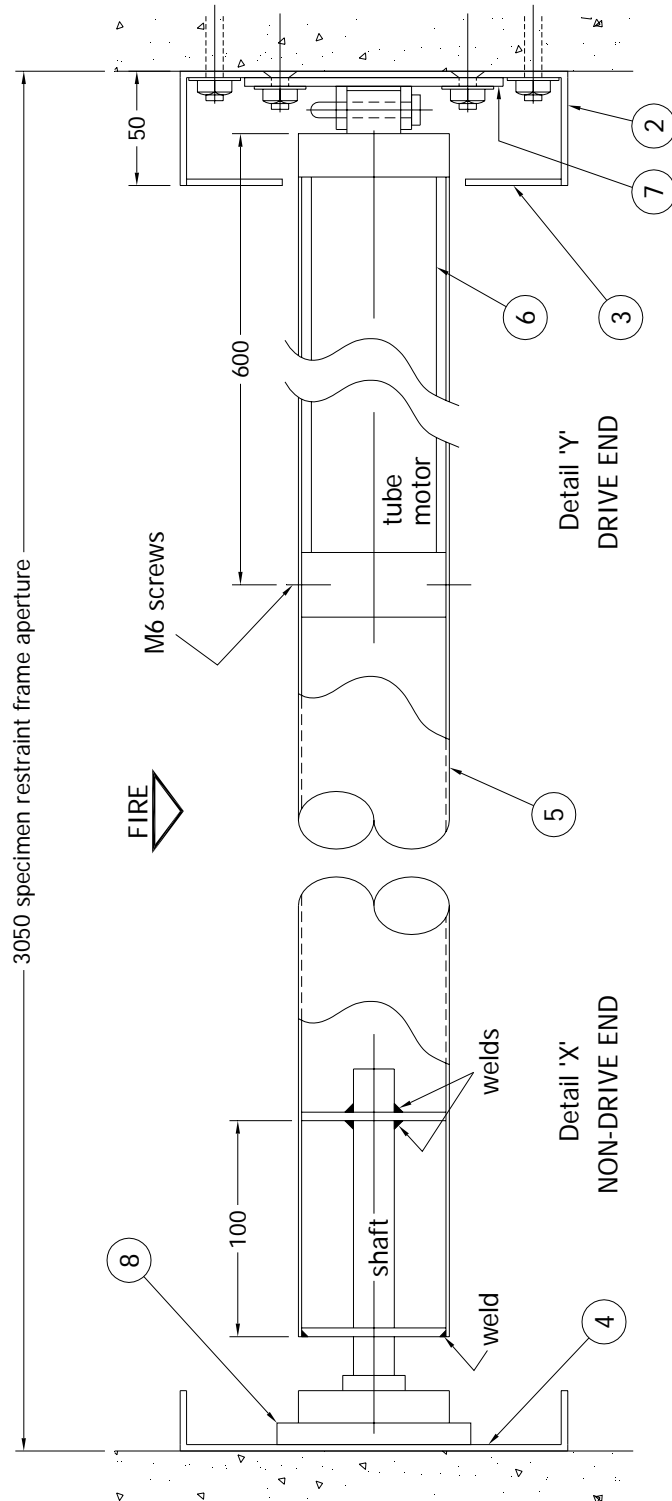
Do not scale. All dimensions are in mm

Figure 2 – Horizontal section A-A through test specimen



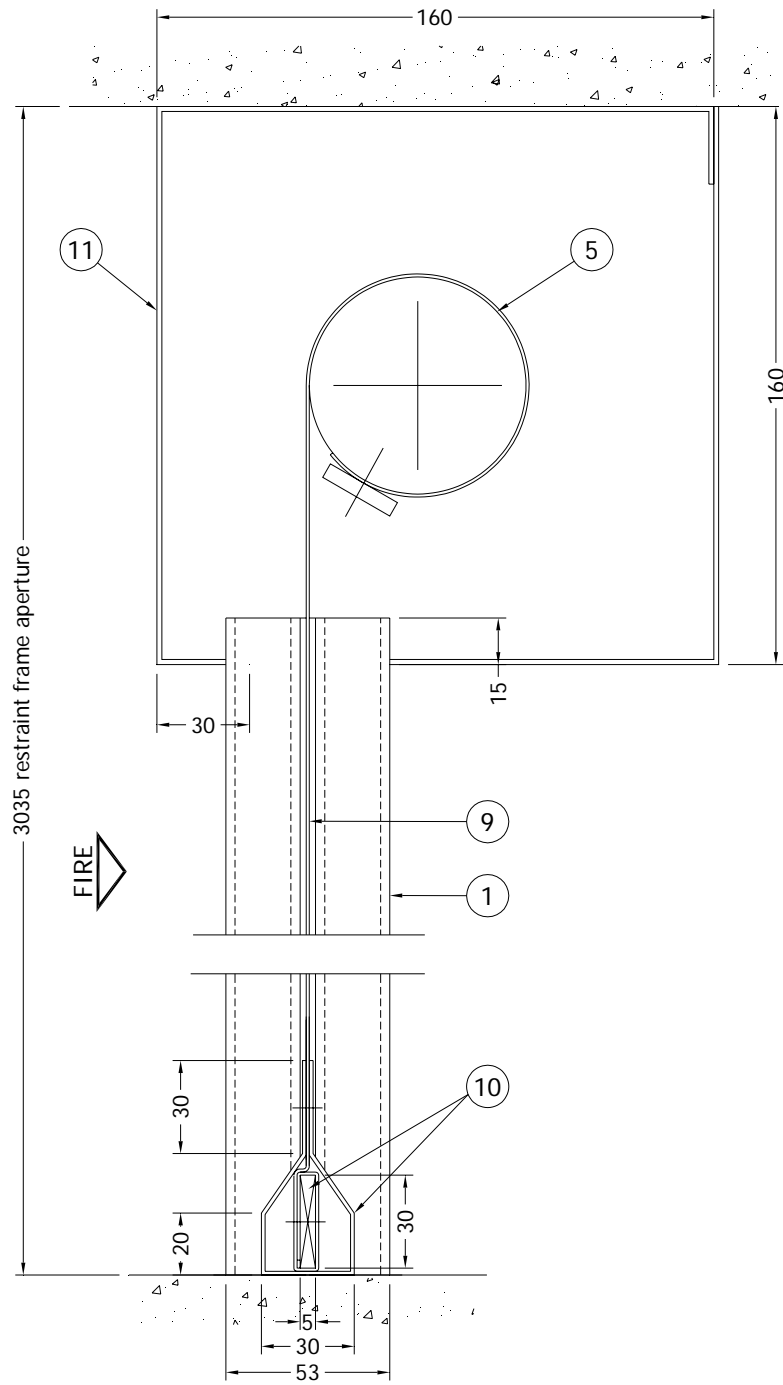
Do not scale. All dimensions are in mm

Figure 3 – Detail 'X' and 'Y'



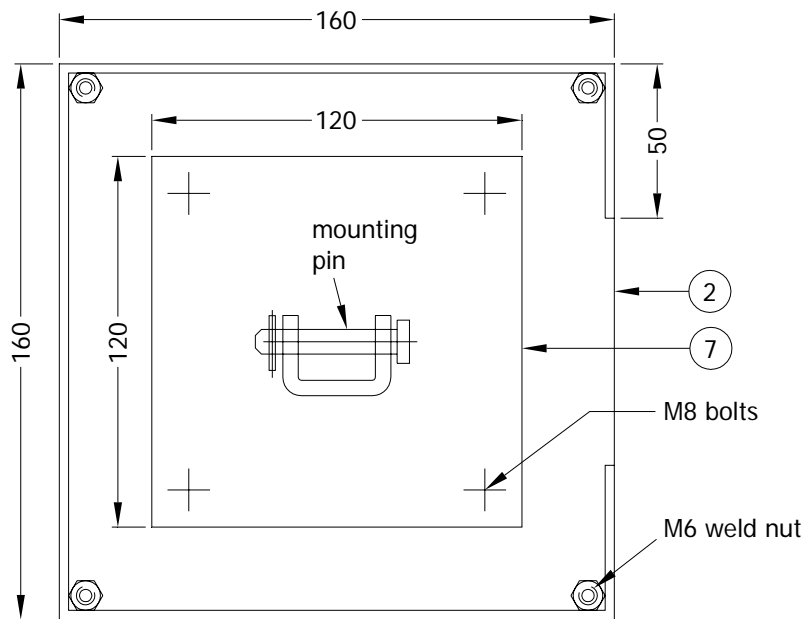
Do not scale. All dimensions are in mm

Figure 4 – Vertical section B-B through test specimen

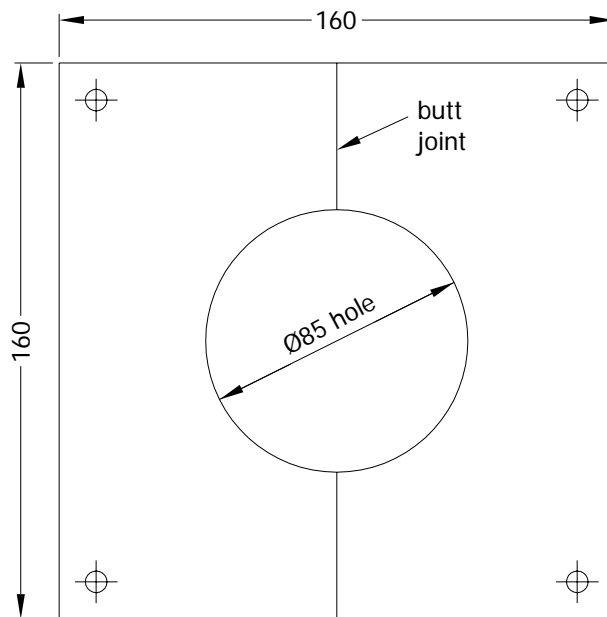


Do not scale. All dimensions are in mm

Figure 5 – Details of drive end plates



View on End Plate (item 2)



Barrel Support Plate (item 3)

DETAILS OF DRIVE END PLATES

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)

<u>Item</u>	<u>Description</u>
1. Side Guide	
Material / type	: Mild steel formed channel, with its leading edge corners cut away to facilitate movement in the channel by the curtain
Overall section sizes	: 100 mm deep x 53 mm wide x 3 mm thick, with a 20 mm deep double return, reducing the opening to 5 mm
Height	: Channel extends approximately 15 mm into the top box
Fixing to wall	: Anchor bolts 10 mm diameter with steel and nylon washers fitted through slotted holes at 600 mm centres
Expansion allowance	: The side guide enters the top box to ensure that expansion is not restricted. The fixing bolts are fitted with nylon washers to allow for expansion. The fixing bolts are fitted to one side of the slotted holes to allow for expansion in one direction
2. End Plate (motor end)	
Material / type	: Mild steel plate, with 50 mm wide right angle returned ends having 6 mm diameter tapped holes for fixing of the top box
Thickness	: 3 mm
Overall size	: 160 mm x 160 mm
Fixing method	: Bolted to masonry wall with 2 no. anchor bolts 10 mm diameter with steel and nylon washers
3. Head Plate (motor end)	
Material	: Mild steel plate
Thickness	: 3 mm
Overall size	: 160 mm x 160 mm, with an 85 mm diameter central hole.
Fixing method	: The plate is cut vertically in half to enable fitting around barrel. The plate is bolted to the end plate with 4 no. 6 mm diameter weld nuts
4. End Plate (bearing end)	
Material / type	: Mild steel plate with 25 mm wide right angle returned ends
Thickness	: 3 mm
Overall sizes	: 160 mm x 160 mm
Fixing method	: Bolted to masonry with 2 no. anchor bolts 10 mm diameter with steel and nylon washers

5. Barrel

Material	:	Mild steel tube
Thickness	:	1.5 mm
Overall diameter	:	70 mm
Length	:	2948 mm

6. Motor Unit

Manufacturer	:	Becker
Reference	:	R60/8G (7 wire version)
Type	:	24v/DC tubular motor
Overall size	:	635 mm long x 58 mm diameter
Fixing method	:	
i. to barrel	:	Housed within the barrel and fixed using 2 no. 6 mm diameter machine screws
ii. to end plate	:	Via bracket plate and mounting pin assembly

7. Motor Bracket plate and Mounting Pin

Manufacturer	:	Becker
Reference	:	4931 000 607 2
Material	:	Steel
Overall sizes	:	
i. bracket plate	:	120 mm x 120 mm x 4 mm thick
ii. pin	:	8 mm diameter x 50 mm long
Fixing method	:	Fixed to end plate with 4 no. 8 mm diameter countersunk head steel bolts with hexagon nut and steel washer

8. Bearing Unit

Bearing manufacturer	:	F S Bearings Limited
Bearing reference / type	:	UCF 204-12 roller bearing
Material / sizes	:	
i. shaft	:	Mild steel bar 19 mm diameter x approximately 300 mm long
ii. internal barrel discs	:	Mild steel disc 5 mm thick x internal diameter of barrel
Fixing method	:	
i. internal discs to barrel	:	Inner disc is welded to shaft only to allow for fitting. Outer disc is welded to barrel only
ii. bearing unit to end plate	:	Face mounted with 4 no. 6 mm diameter countersunk head steel bolts with hexagon nut and steel washer.
Expansion allowance	:	A 15 mm float allowance is allowed for barrel expansion

9. Curtain

Manufacturer	:	Fothergill Engineered textiles Limited
Product development reference	:	Y0533/31
Material	:	
i. description	:	Filament glass fibre, treated with a proprietary finish to enhance temperature resistance characteristics and coated on both sides with a flame retardant silver grey aluminium filled polymer
ii. weave	:	4 end satin
iii. weight	:	450 g/m ²
iv. thickness	:	0.4 mm
v. warp count	:	1360 d'tex
vi. weft count	:	1360 d'tex
vii. fibre type	:	Cont. fil glass

9. Curtain (continued)

Fixing together of curtain	:	The curtain is sewn together with a cotton covered stainless steel thread. Double seams are used at all joints and on the sides. Retention tags are sewn on with cotton covered stainless steel thread at approximately 400 to 600 mm centres along height of curtain
Eyelet arrangement	:	Single steel eyelet fixed to each retention tag
Fixing method to barrel	:	
i. material	:	Mild steel flat bar used as clamping strip
ii. thickness	:	3 mm
iii. size	:	25 mm wide x approximately 2900 mm long
iv. quantity	:	1 no. clamping strip
v. fixing method	:	Strip secured using countersunk head machine screws into tapped holes in barrel at 530 mm centres along full length of strip

10. Bottom Rail Assembly

Material / type	:	Mild steel flat bar with a galvanised mild steel cover
Overall sizes	:	
i. flat bar	:	5 mm wide x 30 mm deep and extending approximately 45 mm into each guide channel
ii. steel cover	:	30 mm wide x 1.2 mm thick
Fixing method	:	A 6 mm diameter retaining bolt is fitted at each end of the flat bar to prevent it pulling out of the guides. The curtain is wrapped around the flat bar and fixed with steel bolts and nuts. The curtain is trapped by steel clips to hold the bar vertical (30 mm upright). The cover is fitted over the flat bar and fixed to the curtain with steel eyelets at approximately 300 mm centres

11. Top box

Material / type	:	Galvanised mild steel two part cover over the barrel and motor
Thickness	:	1.2 mm
Length	:	3045 mm overall, made up from a 2500 mm length plus make up piece
Fixing method	:	The 1 st part is the top and back section which is fitted along with the end plates before the barrel is installed. The 2 nd part is the front cover which is fitted after the completed installation. The motor wires are routed through the end plate. The fixings are 6 mm diameter steel screws into tapped holes provided in the returns of both endplates

12. Weighted Fabric Sleeve

Material	:	Steel bar held within a sleeve made from same fabric as curtain
Weight of steel bar	:	9.2 kg (stated)
Fixing method	:	Sleeve stitched to unexposed face of curtain

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 nine 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	At five positions on the curtain, one approximately at the centre and one at approximately the centre of each quarter section of the curtain.
Thermocouples 7 & 8	At one position on the curtain at the head and one position at the base at approximately mid-width.
Thermocouples 13 and 14	At one position on each vertical guide rail at mid-height. Additional thermocouples were provided for information purposes.
Thermocouples 9 to 12	At three positions on the barrel and at one position on the axle. 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	Gap gauges were available to evaluate the impermeability of the specimen to hot gases.
Radiometer	A water-cooled foil heat flux meter was used to record the heat radiation from the doorset. The heat flux meter was positioned at a distance of 3674 mm from the unexposed surface of the specimen, so that its angle of view circumscribed the diagonal of the doorset.
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 doorset was 17 (± 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 13°C at the start of the test with a maximum variation of 4°C during the test.
00	00	The test commences.
00	40	Smoke commences issuing from the curtain fabric.
05	00	The curtain fabric has discoloured from the head down to the position of the weight pocket.
08	00	The bottom rail is beginning to bow towards the furnace chamber.
10	00	The head box cover is starting to distort slightly right of centre, along the top edge.
11	00	The bottom rail has risen up slightly, a gap of approximately 10-15mm is present.
21	00	The bottom rail gap is checked with the 25 mm diameter gap gauge. The gauge does not penetrate through to the furnace chamber.
30	00	The specimen continues to satisfy the integrity criterion.
35	00	The gap between the bottom rail and frame appears to be reducing.
60	00	The specimen continues to satisfy the integrity criterion of the test.
69	00	A hole has formed in the curtain fabric below the head box in excess of 25mm. Integrity failure is deemed to have occurred. The test is discontinued.

Test Photographs

The exposed face of the specimen prior to testing



The unexposed face of the specimen prior to testing



The unexposed face of the specimen after 20 minutes of testing



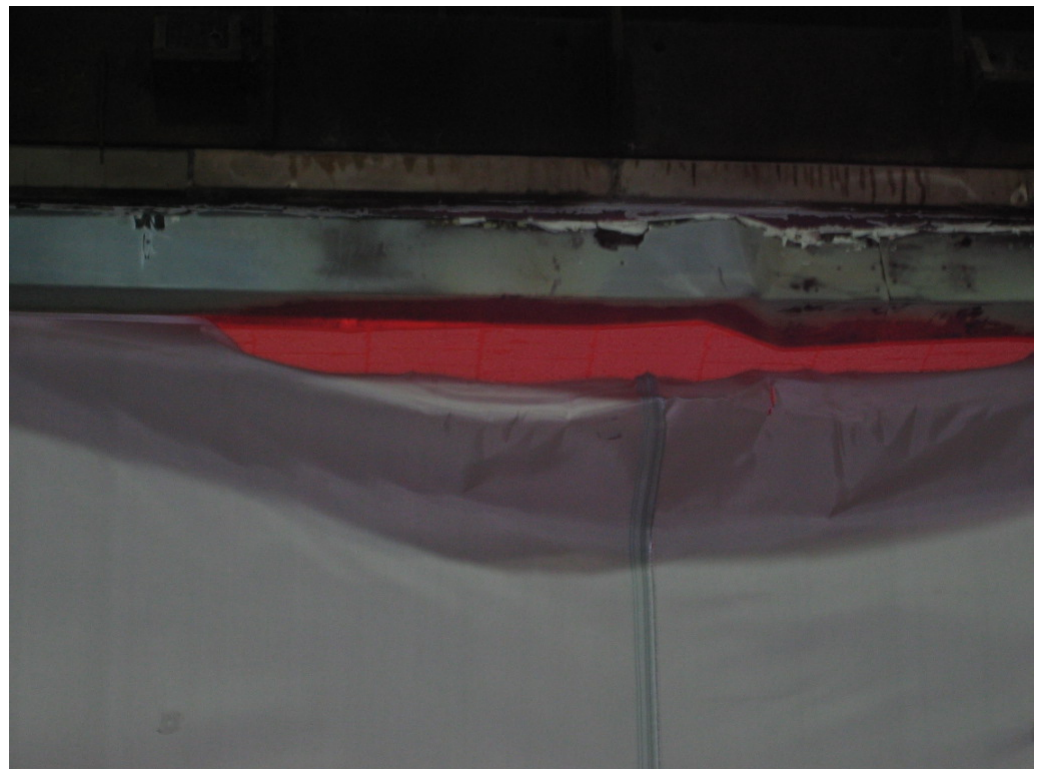
The unexposed face of the specimen after 40 minutes of testing



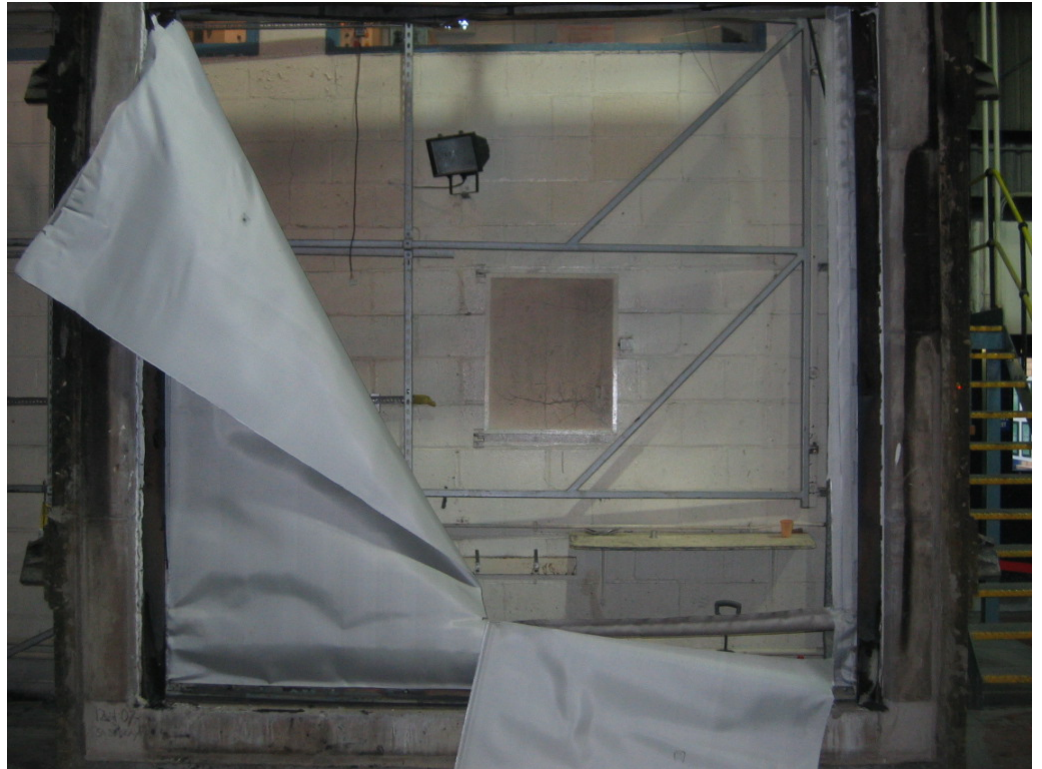
The unexposed face of the specimen after 60 minutes of testing



Integrity failure after a duration of 69 minutes



The exposed face
of the specimen
immediately after
testing



Temperature 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
2	445	436
4	544	498
6	603	596
8	646	645
10	678	680
12	706	711
14	728	725
16	748	745
18	766	769
20	781	783
22	796	789
24	809	811
26	820	818
28	832	828
30	842	844
32	852	851
34	860	859
36	869	877
38	877	868
40	885	882
42	892	893
44	899	889
46	906	901
48	912	915
50	918	921
52	924	923
54	930	938
56	935	929
58	940	941
60	945	946
62	950	949
64	955	961
66	960	960
68	964	960
69	966	961

Individual And Mean Temperatures Recorded On The Unexposed Surface Of The Specimen

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	18	18	18	19	18	18
2	91	153	150	110	120	125
4	*	259	231	*	*	245
6		333	314			324
8		395	395			395
10		434	469			452
12		443	478			461
14		464	505			485
16		492	535			514
18		511	560			536
20		527	574			551
22		536	588			562
24		560	613			587
26		575	625			600
28		593	634			614
30		611	646			629
32		627	*			627
34		637				637
36		654				654
38		659				659
40		678				678
42		692				692
44		699				699
46		701				701
48		714				714
50		720				720
52		726				726
54		739				739
56		735				735
58		751				751
60		753				753
62		765				765
64		774				774
66		781				781
68		778				778
69		779				779

* Indicates thermocouple detachment

Individual Temperature Recorded On The Unexposed Surface Of The Specimen

Time Mins	T/C Number 7 Deg. C	T/C Number 8 Deg. C
0	17	19
2	94	42
4	*	63
6		107
8		145
10		197
12		245
14		284
16		337
18		385
20		400
22		397
24		423
26		437
28		458
30		478
32		503
34		517
36		544
38		539
40		564
42		564
44		566
46		571
48		588
50		593
52		602
54		616
56		608
58		630
60		640
62		659
64		656
66		658
68		662
69		664

* Indicates thermocouple detachment

Individual Temperatures Recorded On The Barrel And The Axle

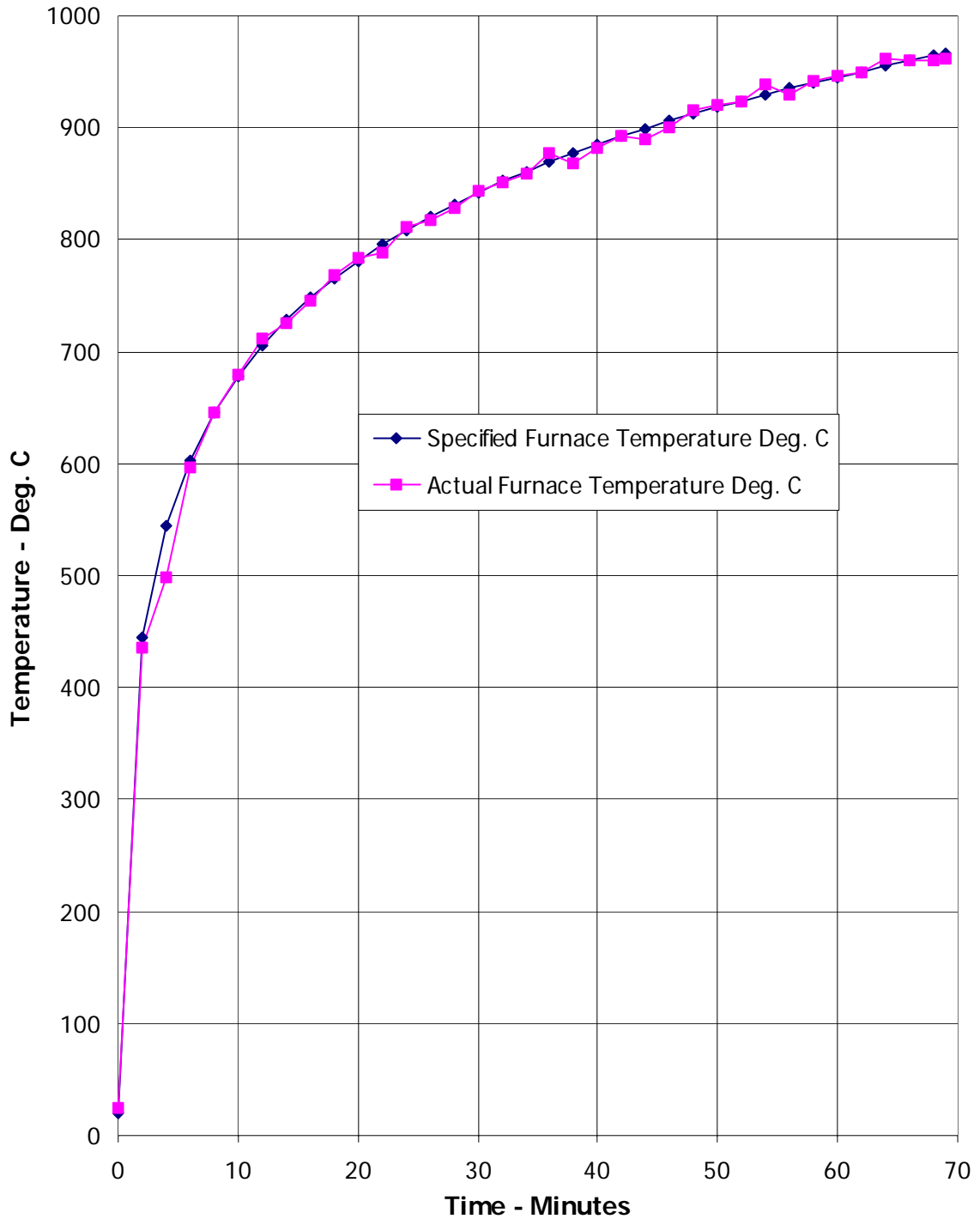
Time Mins	T/C Number 9 Deg. C	T/C Number 10 Deg. C	T/C Number 11 Deg. C	T/C Number 12 Deg. C
0	18	18	17	18
2	41	34	48	35
4	135	117	120	62
6	181	208	162	91
8	216	220	190	110
10	259	253	220	137
12	314	285	247	166
14	370	301	269	196
16	425	*	295	225
18	473		320	257
20	511		339	288
22	538		354	318
24	559		369	342
26	580		384	365
28	596		395	385
30	609		404	403
32	621		416	419
34	631		428	435
36	641		437	451
38	652		444	*
40	663		461	
42	675		472	
44	686		480	
46	692		482	
48	701		492	
50	709		505	
52	719		519	
54	728		531	
56	734		542	
58	742		554	
60	748		566	
62	756		576	
64	759		586	
66	765		594	
68	772		604	
69	774		607	

* Indicates thermocouple malfunction

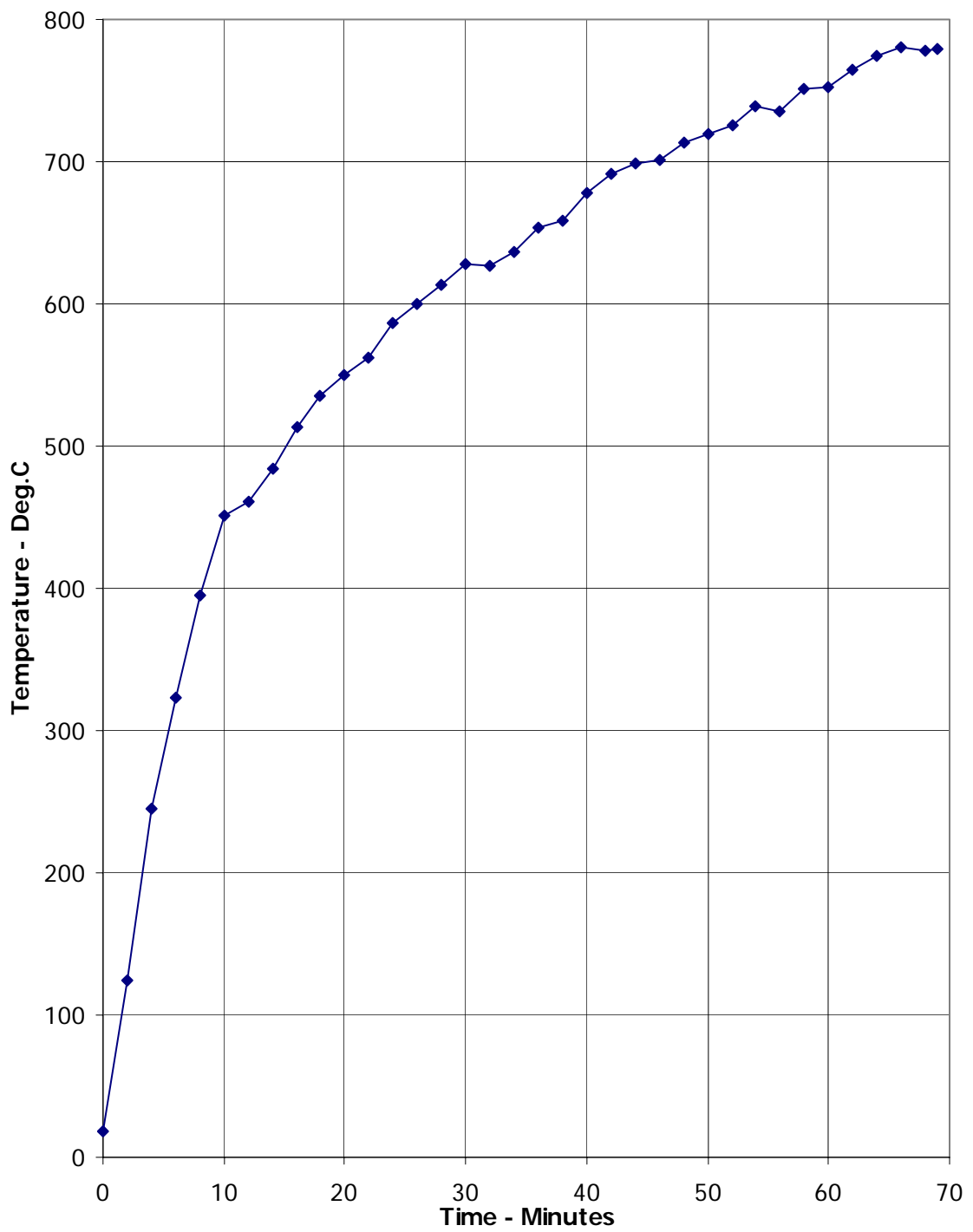
Individual Temperatures Recorded On Guide Rails

Time	T/C	T/C
Mins	Number	Number
	13	14
	Deg. C	Deg. C
0	18	18
2	20	20
4	31	27
6	49	43
8	68	57
10	97	71
12	129	92
14	165	120
16	204	153
18	243	189
20	283	226
22	328	261
24	359	295
26	383	333
28	398	357
30	409	373
32	422	382
34	433	390
36	443	397
38	450	400
40	456	402
42	460	409
44	464	414
46	468	419
48	472	426
50	477	431
52	481	437
54	486	443
56	490	446
58	494	453
60	497	459
62	503	469
64	513	480
66	521	487
68	513	491
69	514	491

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 Specimen



Performance Criterion and Test Result

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 by the specimen for 69 minutes after which time gap gauge 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 assembly was asymmetrical and therefore, the test results may not be appropriate to situations where exposure is from the opposite face.

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

A specimen of uninsulated, fabric curtain roller doorset has been subjected to a fire resistance test in accordance with BS 476: Part 22: 1987

The evaluation of the doorset against the requirements of BS 476: Part 22: 1987, Clause 8 showed that it satisfied the requirements for the period stated below:

Test Result:

Integrity

69 minutes

The test was discontinued after a period of 69 minutes.



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