Bodycote

Title:

Fire Resistance Test In Accordance With Clause 8 Of BS 476: Part 22: 1987 On An Uninsulated Asymmetrical, Face Fixed Rolling Shutter Doorset

WF Report No:

182970

Prepared for:

Dover Vanguard Roller Shutters Ltd
Coldhurst Street,
Oldham,
Lancashire,
OL1 2DN

Date:

13th July 2009

Notified Body No:

0833

UKAS TESTING
0249

warringtonfire global safety
TESTING

Summary

Objective	To determine the fire resistance performance of an uninsulated rolling shutter doorset, when tested in accordance with BS 476: Part 22: 1987.
Sponsor	**Dover Vanguard Roller Shutters Ltd.** Coldhurst Street, Oldham, Lancashire, OL1 2DN.
Summary of Tested Specimen	The rolling shutter assembly comprised a mild steel barrel supporting a galvanised mild steel lath curtain and was fixed to the exposed face of a masonry wall to cover an aperture with an opening size of 2400 mm high by 2500 mm wide, such that the barrel assembly was exposed to the heating conditions of the test.
Test Results:	
Integrity	32 minutes
	The test was discontinued after a period of 240 minutes.
Date of Test	28th May 2009

This report may only be reproduced in full. Extracts or abridgements of reports shall not be published without permission of Bodycote warringtonfire.

Signatories

Responsible Officer
N. Howard*
Testing Officer

Approved
D. Hankinson*
Senior Certification Engineer

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

Report Issued

Date : 13th July 2009

This version of the report has been produced from a .pdf format electronic file that has been provided by Bodycote **warrington**fire to the sponsor of the report and must only be reproduced in full. Extracts or abridgements of reports must not be published without permission of Bodycote **warrington**fire. The original signed paper version of this report, which includes signatures in blue ink, is the sole authentic version. Only original paper versions of this report bear authentic signatures of the responsible Bodycote **warrington**fire staff.

CONTENTS **PAGE NO.**

Test Procedure

Introduction

The rolling shutter 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 rolling shutter doorset was asymmetrical. 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 face mounted to a masonry wall construction such that the barrel assembly was exposed to the heating conditions of the test. The test results, therefore, may not be appropriate to situations where the opposite face is exposed to the heating conditions of the test.

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.

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 28th May 2009 at the request of **Dover Vanguard Roller Shutters Ltd**, the test sponsor.

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 specimens and information supplied by the sponsor of the test.

Installation

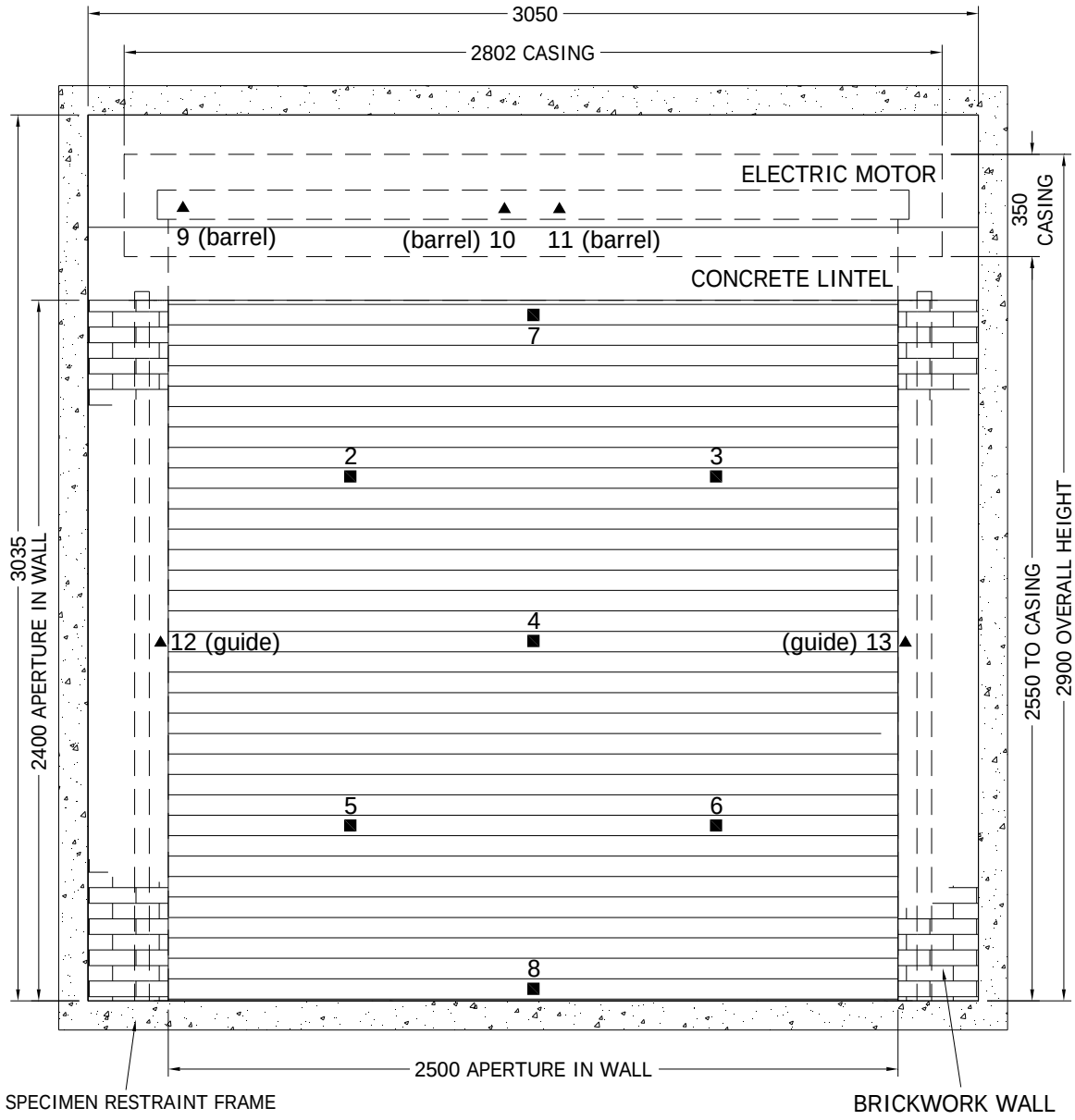
The specimen was assembled and face fixed to cover a prepared aperture within a brickwork wall to form the test construction. Assembly and installation of the rolling shutter was conducted by representatives of the sponsor on the 27th May 2009.

Conditioning

The specimen's storage, construction, and test preparation took place in the test laboratory over a total, combined time of 2 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 18°C to 24°C and 65% to 91% respectively.

Test Specimen

Figure 1- General Elevation of the Unexposed Face

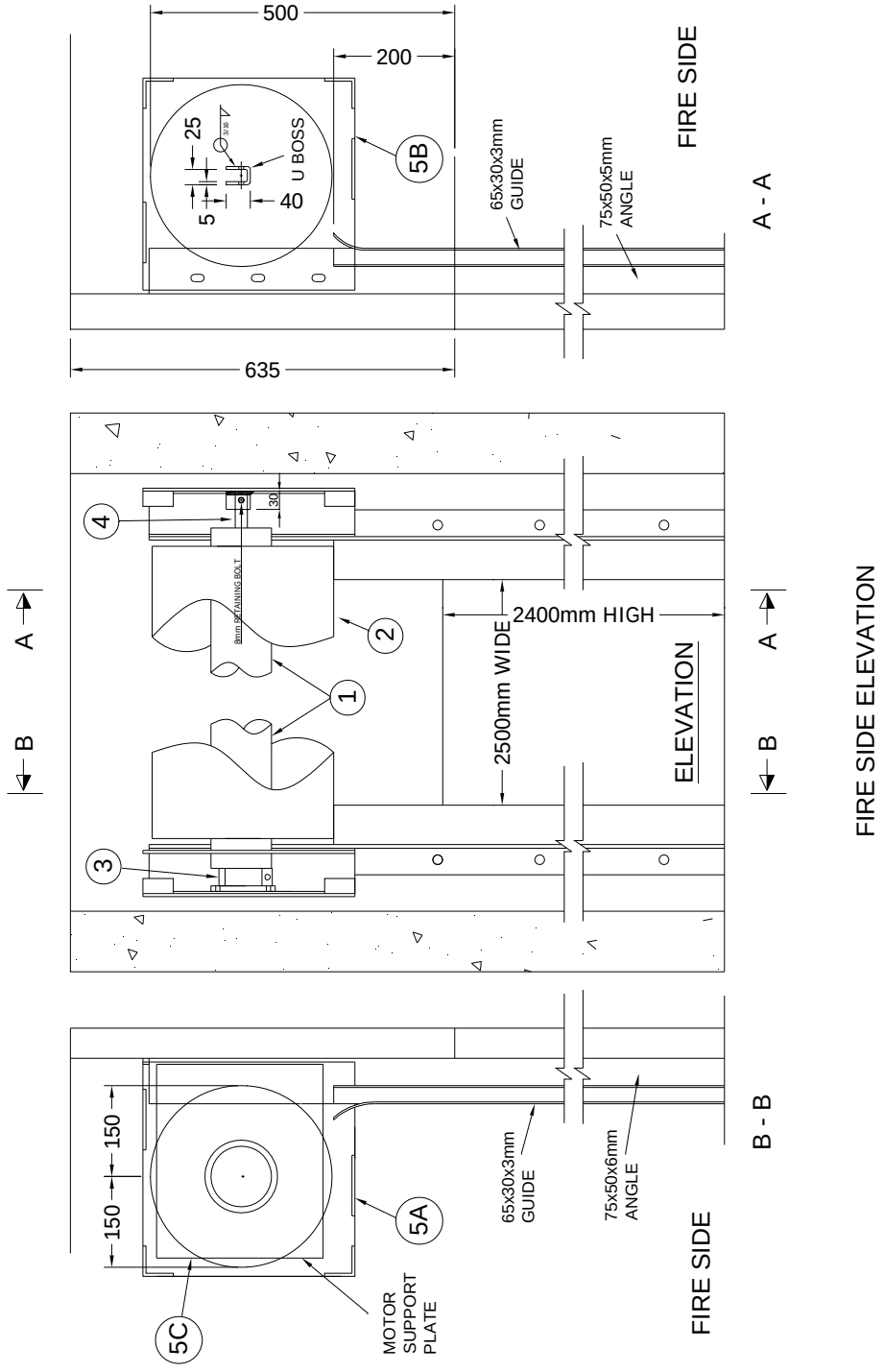


■ POSITIONS OF UNEXPOSED FACE THERMOCOUPLES.

▲ POSITIONS OF EXPOSED FACE THERMOCOUPLES.

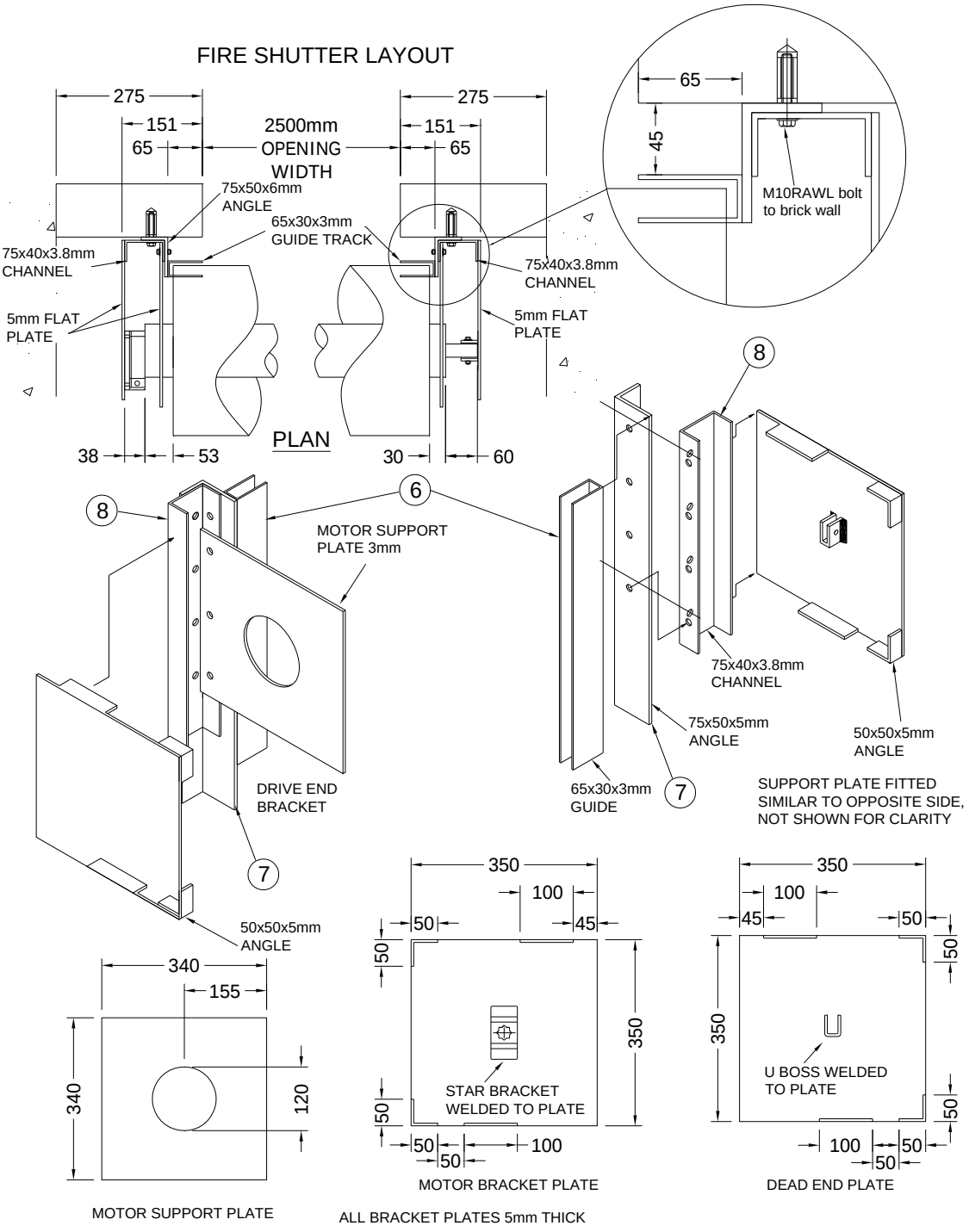
Do not scale. All dimensions are in mm

Figure 2 – Dover Vanguard – Euro Drive Fire Shutter, Elevation of Exposed Face with Vertical Sections



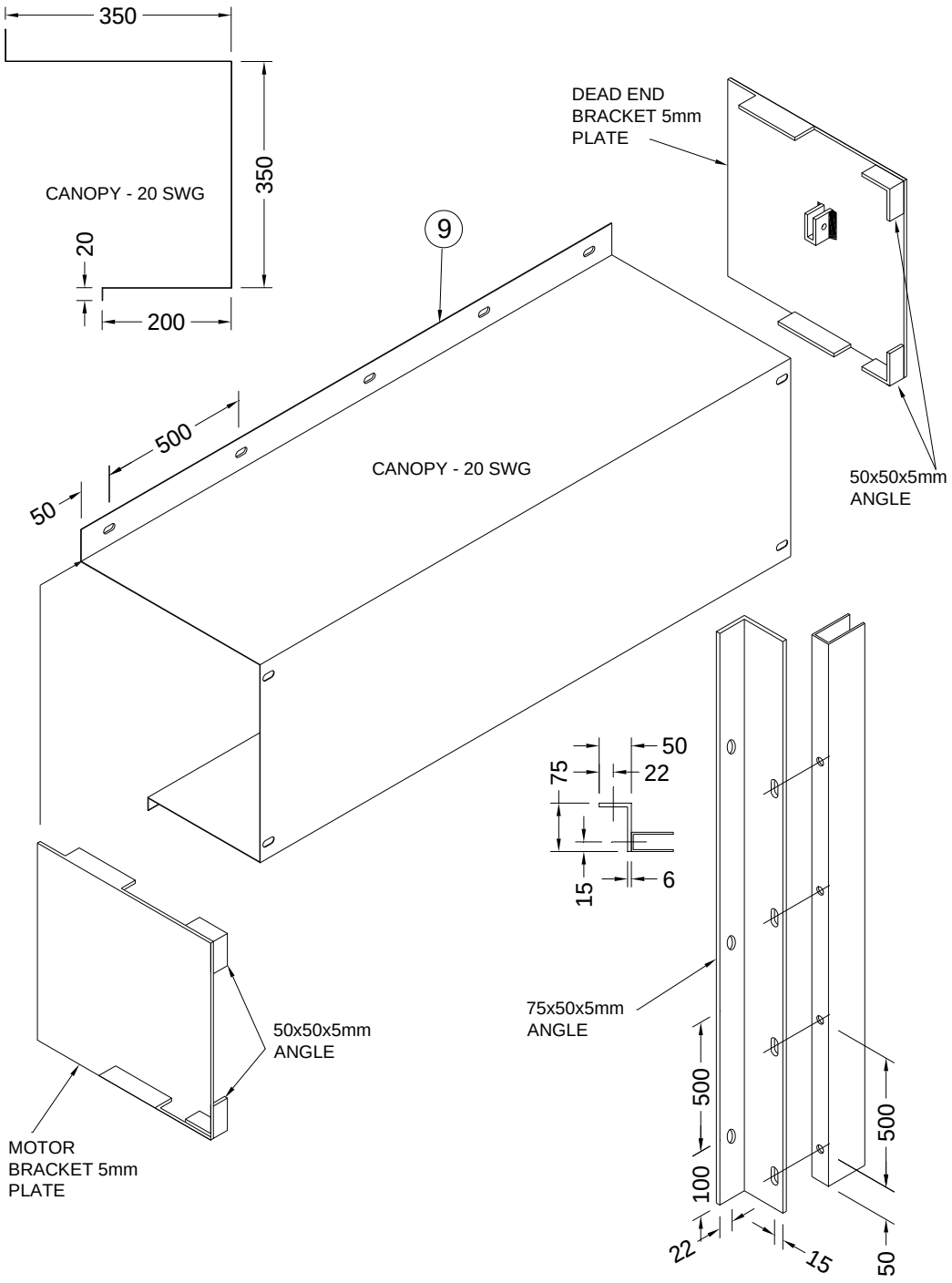
Do not scale. All dimensions are in mm

Figure 3 – Euro Drive Bracket Setup



Do not scale. All dimensions are in mm

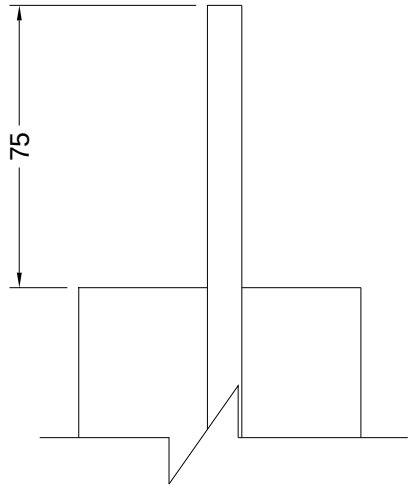
Figure 4 – Euro Drive Bracket & Canopy Setup



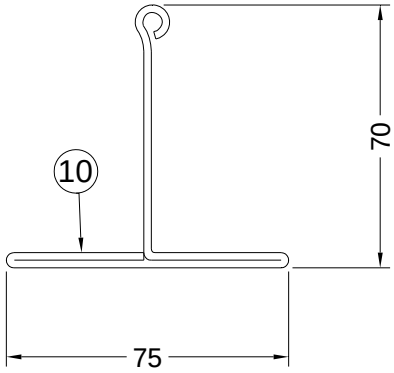
Do not scale. All dimensions are in mm

Figure 5 – T Section Bottom Rail and Elevations of Barrel

T SECTION BOTTOM RAIL

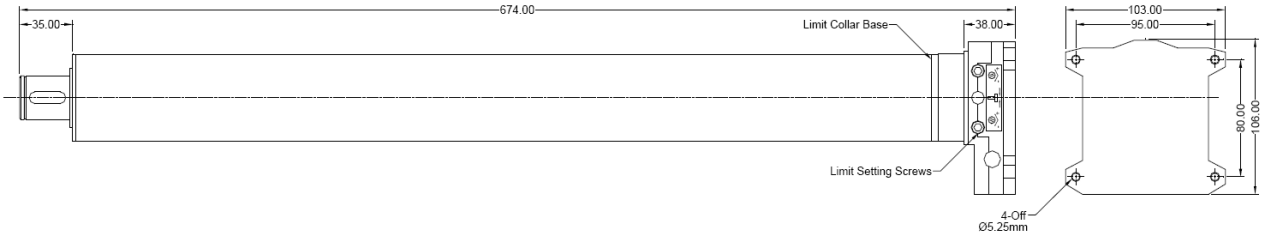


NOTCH ENDS 75MM



Light Duty (1.6mm) - 8m stock length

Heavy Duty (2.0mm) - 9m stock length



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. Barrel		
Material	:	Mild steel tube and lost bobbin
Thickness	:	3.6 mm (barrel and last bobbin)
Overall diameter	:	101.6 mm
Fixing of last bobbin	:	Welded in the dummy end
Axle diameter	:	20 mm
Provision of fixings for curtain top lath	:	8mm bolts welded to the steel tube
2. Curtain		
Material	:	Galvanised mild steel interlocking steel laths
Thickness	:	0.7 mm
Size	:	75 mm
End locks and fixing	:	Cast steel end locks were fitted to alternative laths using two steel pop rivets per end lock
Top lath fixing		Holes were pre-cut in the top lath to enable it to be fixed to the barrel with M8 nuts, steel and plastic washers
3. Tubular motor unit		
Manufacturer	:	Link Controls
Reference	:	M1 Series, Version 110M
Type	:	230V, 50Hz single phase motor, lift capacity 170 kg with a 100 mm diameter barrel
Fixing of motor	:	Fitted into the opposite end of the tube to the last bobbin (dummy end) and fixed with MONO bolts. Steel fire collars and steel adaptors were supplied as standard in the Link fire motor
4. Dummy end axle		
Material	:	Mild steel
Size	:	19 mm diameter
5A. Gear end bracket		
Supplier	:	Link Controls Limited
Material	:	Mild steel
Size	:	350 mm x 350 mm x 5 mm plates with 50mm x 50mm angles
Fixing		The bracket was fixed to a special fixing (supplied by Link) that was welded to the end plate. Angles were welded to the top and bottom of the brackets. Flat cleats were welded to the brackets
5B. Dummy end bracket		
Material	:	Mild steel
Size	:	350 mm x 350 mm x 5 mm with 5 mm thick with a U boss 40 mm high x 30 mm wide x 30 mm depth
Fixing	:	The U boss was welded to the bracket plate

5C. Motor support plate

Size	:	340 mm x 340 mm x 5 mm with a 120 mm diameter hole
Fixing		Bolted to the fixing angle to act as a barrel support using M6 nuts and bolts with steel and plastic washers

6. Guide track

Material	:	Galvanised steel
Size	:	65 mm x 30 mm x 3 mm
Fixing		The guides were drilled and countersunk to allow for fixing with 6mm nuts and bolts with steel and plastic washers. The guides were splayed at the top to allow the curtain to feed into the guides

7. Angle

Material	:	Galvanised steel
Size	:	75 mm x 50 mm x 5 mm
	:	The angles were pre drilled with holes on the 50 mm leg to allow M10 RAWL bolts to be fixed to the brick work. Slotted holes were punched in the 75mm face of the angle to allow the guide section to be bolted to the angle

8. Offset channel

Material	:	Galvanised steel
Size	:	75 mm x 40 mm x 3.8 mm

9. Canopy

Material	:	Galvanised steel sheet
Thickness	:	0.9 mm
Fixing	:	The canopy was provided with slotted holes to allow for fixing to the brackets with M6 nuts and bolts and to the brick work opening with M10 RAWL bolts

10. T Section bottom rail

Material	:	Galvanised steel T section
Thickness	:	1.6 mm
Fixing	:	The rail was trimmed back at each end by 90 mm to allow it to locate and travel freely in the guides. The bottom rail was interlocked with the steel laths

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 specimens 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 shutter curtain, one approximately at the centre and one at approximately the centre of each quarter section of the doorset.

Thermocouples 7 and 8

At one position at the head, and at one position at the base of the shutter curtain.

Thermocouples 9 to 11

At various positions on the barrel and guide rails.

The locations and reference numbers of the various unexposed surface thermocouples are shown in Figures 1 and 4.

Roving Thermocouple

A roving thermocouple was available to measure temperatures on the unexposed surface of the specimens 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 specimens to hot gases.

Radiation

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 3001 mm from the unexposed surface of the specimen so that its angle of view of 60^{o} 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 clear opening was 11.9 (±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 15ºC at the start of the test with a maximum variation of +15ºC during the test.
00	**00**	**The test commences.**
07	**00**	The shutter begins to discolour over its upper third.
07	**50**	The discolouration descends to the centre of the shutter, particularly the right side.
10	**50**	Slight crackling sounds are heard from the specimen probably due to expansion.
13	**00**	The discolouration is now evident to the entire upper half of the shutter. The crackling sounds become louder and more frequent.
15	**00**	The shutter begins to visibly distort towards the furnace chamber particularly at its sill position. Slight glowing is visible at the top lath.
22	**50**	A 25 mm gap gauge is re-applied to a gap that has appeared at the sill position but does not penetrate into the furnace chamber. The gap is estimated to be 20 mm high.
27	**30**	A 25 mm gap gauge Is re-applied at the sill position of the shutter but does not penetrate into the furnace chamber. The bottom rail has twisted downwards on its back/exposed face. Flaming intermittent.
32	**00**	A 25 mm gap gauge is applied to the sill position which penetrates into the furnace chamber. **Integrity Failure Is Deemed To Occur**. The gap is estimated to be 28 mm high at the centre of the sill position.
50	**00**	The gap at the sill position is estimated to be 30 mm at the central position.
55	**00**	The top lath has visibly distorted downwards at its centre.
62	**00**	The gap at the sill position has reduced slightly.
90	**00**	The gap at the sill position has reduced further.
120	**00**	No further significant changes are evident at this time. The gap at the sill is estimated to be 25 – 28 mm.
150	**00**	No further significant changes are evident.
180	**00**	The laths at the centre of the shutter have dropped slightly. The gap at the sill position remains approximately 25 – 28 mm.
240	**00**	**The test is discontinued.**

Test Photographs

The exposed face of the test construction prior to testing

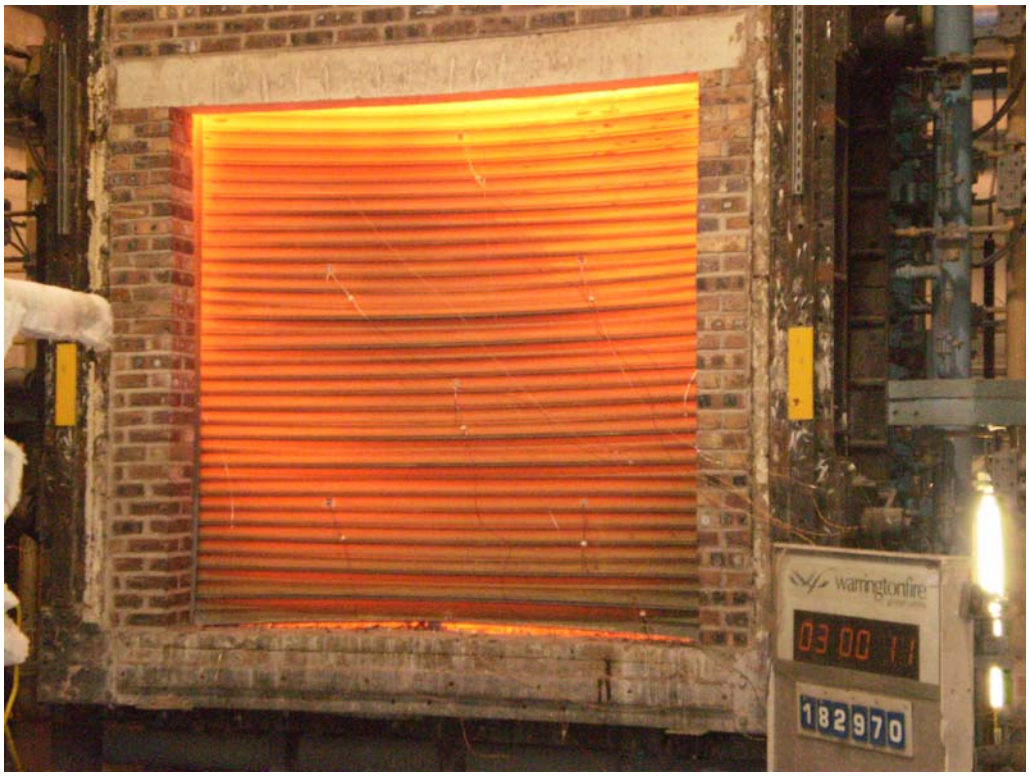
The unexposed face of the test construction prior to testing

The unexposed face of the test construction after 15 minutes of testing

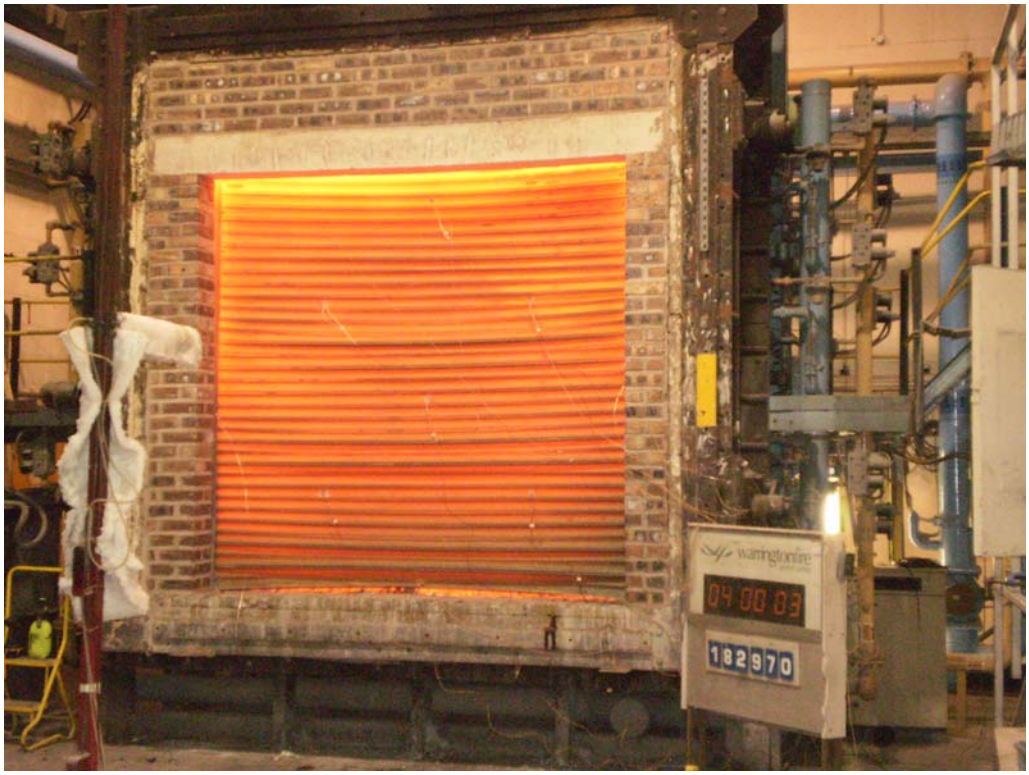
The unexposed face of the test construction after 60 minutes of testing

The unexposed face of the test construction after 120 minutes of testing

The unexposed face of the test construction after 180 minutes of testing



The unexposed face of the test construction after 240 minutes of testing



The exposed face of the test construction immediately after testing

Temperature and Radiation 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
10	678	675
20	781	779
30	842	839
40	885	864
50	918	891
60	945	925
70	968	948
80	988	965
90	1006	989
100	1022	1006
110	1036	1021
120	1049	1036
130	1061	1046
140	1072	1057
150	1082	1066
160	1092	1076
170	1101	1078
180	1110	1083
190	1118	1093
200	1126	1102
210	1133	1110
220	1140	1115
230	1146	1120
240	1153	1128

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	15	16	16	16	17	16
10	349	538	343	334	318	376
20	521	613	544	532	535	549
30	607	701	645	655	617	645
40	634	684	667	678	659	664
50	647	698	686	694	668	679
60	674	758	699	709	696	707
70	708	791	732	737	721	738
80	732	796	750	759	745	756
90	736	797	755	766	747	760
100	742	784	753	765	742	757
110	765	775	775	773	755	769
120	809	848	804	812	783	811
130	816	852	808	809	782	813
140	832	853	826	812	793	823
150	826	864	827	823	799	828
160	829	878	823	844	814	838
170	852	865	836	826	816	839
180	836	885	830	850	820	844
190	859	872	847	831	829	848
200	856	861	843	832	828	844
210	853	860	842	832	827	843
220	857	863	847	837	832	847
230	858	864	848	840	836	849
240	855	865	845	841	840	849

Individual Temperatures Recorded On The Unexposed Surface Of The Doorset

Time Mins	T/C Number 7 Deg. C	T/C Number 8 Deg. C
0	16	18
10	521	121
20	631	233
30	725	379
40	707	553
50	722	561
60	792	596
70	822	627
80	842	646
90	830	654
100	814	647
110	812	666
120	895	696
130	895	696
140	890	708
150	892	710
160	905	726
170	886	724
180	919	733
190	911	723
200	917	721
210	917	719
220	916	717
230	915	720
240	907	719

Individual Temperatures Recorded On The Barrel & Guide

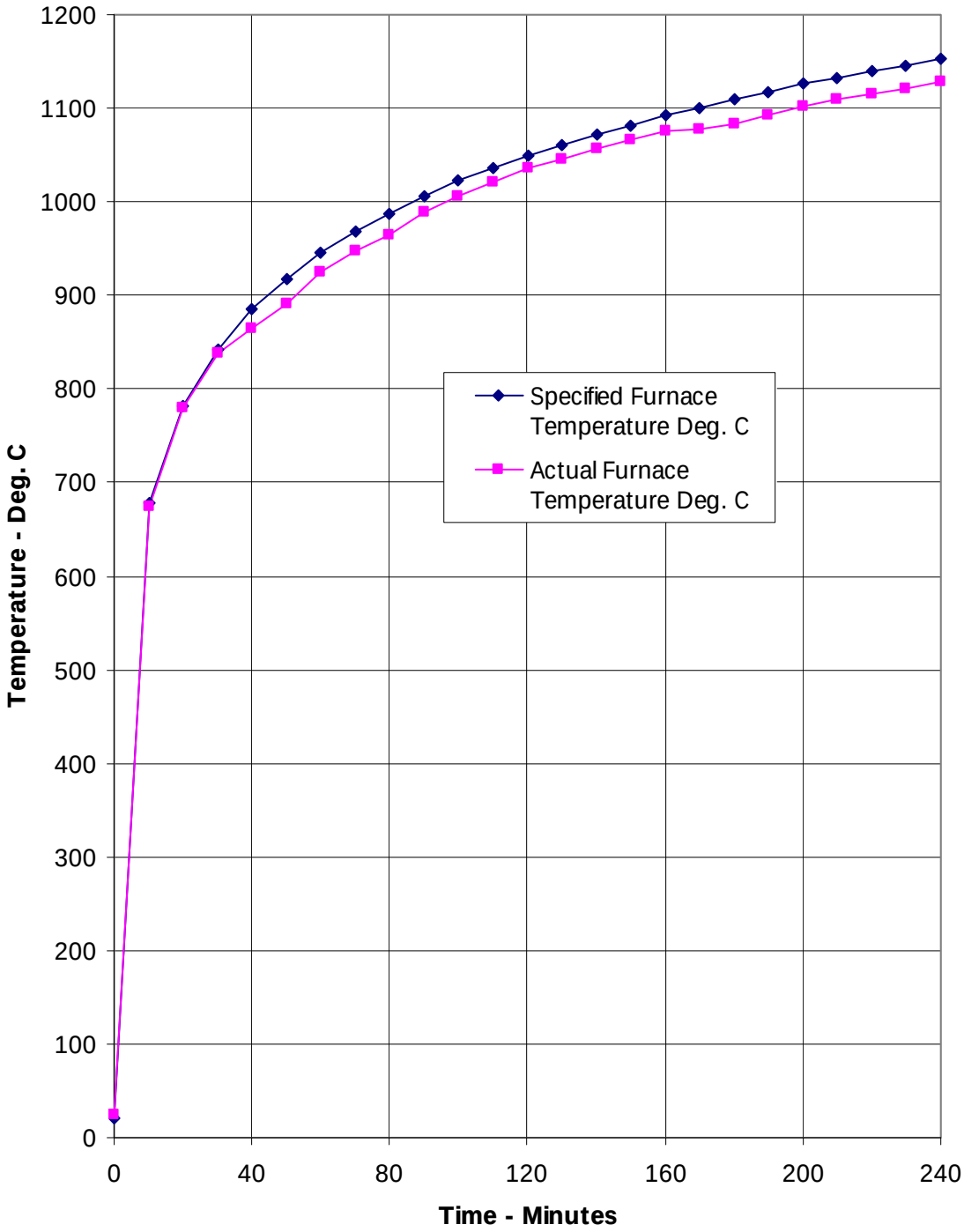
Time Mins	T/C Number 9 Deg. C	T/C Number 10 Deg. C	T/C Number 11 Deg. C	T/C Number 12 Deg. C	T/C Number 13 Deg. C
0	18	18	18	18	18
10	403	467	496	298	269
20	583	681	695	553	495
30	687	765	780	657	643
40	726	772	759	672	677
50	748	792	770	668	676
60	780	852	826	750	745
70	813	*	883	786	795
80	837		908	809	831
90	842		896	809	823
100	834		877	809	820
110	854		899	823	838
120	928		986	868	876
130	942		979	856	873
140	968		984	873	889
150	972		987	880	898
160	979		990	893	912
170	986		992	896	913
180	986		991	917	921
190	994		992	917	917
200	992		*	915	909
210	991			914	907
220	994			917	912
230	995			917	913
240	996			918	913

* Thermocouple Malfunction

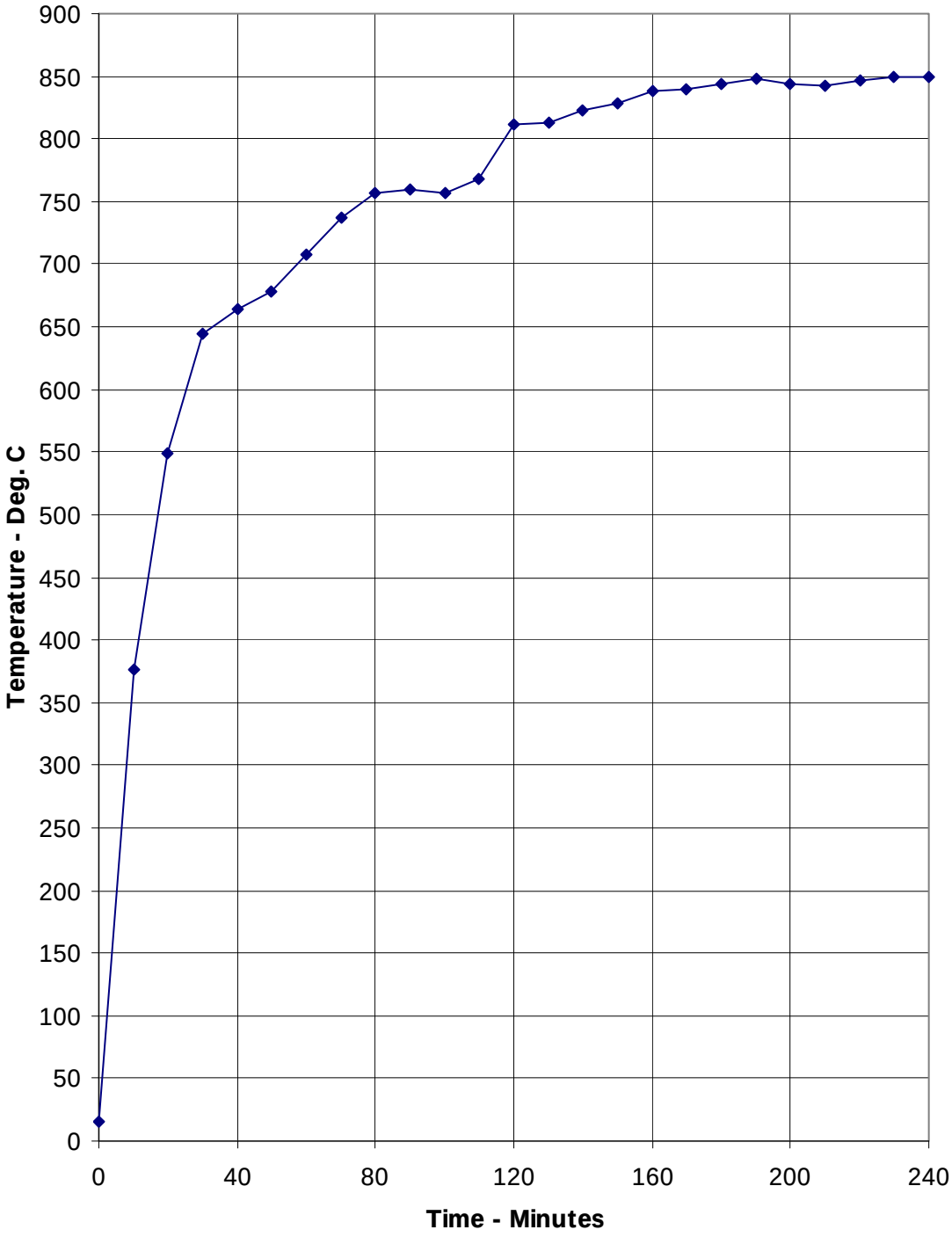
Recorded Radiation Intensity At 3001 mm

Time Mins	Radiation Intensity At 3001 mm kW/m^2
0	0.00
10	1.01
20	2.28
30	3.81
40	4.28
50	4.60
60	5.40
70	5.83
80	6.44
90	6.63
100	6.96
110	7.68
120	9.65
130	9.80
140	10.02
150	10.17
160	10.51
170	10.44
180	10.73
190	10.66
200	10.50
210	10.30
220	10.22
230	10.17
240	10.16

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



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. The specimen satisfied these requirements for the 32 minutes.

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 was tested such that the barrel assembly faced the heating conditions of the test. The test results may not be appropriate to situations where the opposite face is exposed to 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	A single specimen of an asymmetrical, uninsulated, face fixed rolling shutter doorset, mounted to a masonry wall, has been subjected to a fire resistance test in accordance with BS 476: Part 22: 1987, Clause 8. The evaluation of the specimen against the requirements of BS 476: Part 22: 1987, Clause 8 showed that it satisfied the requirements for the periods stated below:
Test Results:	
Integrity	32 minutes
	The test was discontinued after a period of 240 minutes.

Bodycote warringtonfire Testing • 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