test report

Bodycote

Title:

The fire resistance performance of a specimen of a symmetrical, non-loadbearing, concrete block wall assembly tested in accordance with BS 476: Part 22: 1987, Clause 5

Report No:

173470 Issue 3

Prepared for:

Kwok Chi Construction Materials Limited
Lot 38 Cha Kwo Ling Road,
Yau Tong, Kowloon,
Hong Kong.

Date:

7th July 2008

Notified Body No:

0833

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Summary

Objective	To determine the fire resistance performance of a symmetrical, non-loadbearing concrete blockwork wall assembly when tested in accordance with BS 476: Part 22: 1987.
Sponsor	**Kwok Chi Construction Materials Limited.** Lot 38 Cha Kwo Ling Road, Yau Tong, Kowloon, Hong Kong.
Summary of Tested Specimen	The specimen had overall nominal dimensions of 3035 mm high by 3000 mm wide and was formed from 600 mm long by 200 mm high by 100 deep insulated concrete blocks bedded on nominally 2-3 mm thick adhesive. The density of a block was measured and recorded as 724 kg/m^3.
Test Results:	
Integrity	264 minutes*
Insulation	264 minutes*
	* The test duration. The test was discontinued after a period of 264 minutes.
Date of Test	19th May 2008

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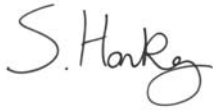
Signatories

Responsible Officer
S. Gilfedder*
Testing Officer



Approved
S. Hankey*
Operations Manager

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

Report Issued

Date : 7th July 2008

Issue 3: Correction of density measurement pages 2 and 8 (28/07/08)

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CONTENTS **PAGE NO.**

Test Procedure

Introduction

The specimen was of a non-loadbearing wall construction and the test was conducted in accordance with Clause 5 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 criteria for integrity and insulation, as required by BS 476: Part 22: 1987, Clause 5.

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 May 2008 at the request of **Kwok Chi Construction Materials Limited**, the test sponsor.

No representatives of the sponsor 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 assembly was installed into a refractory concrete lined, steel restraint frame. Representatives of Bodycote **warrington**fire conducted the installation on the 15th May 2008.

Conditioning

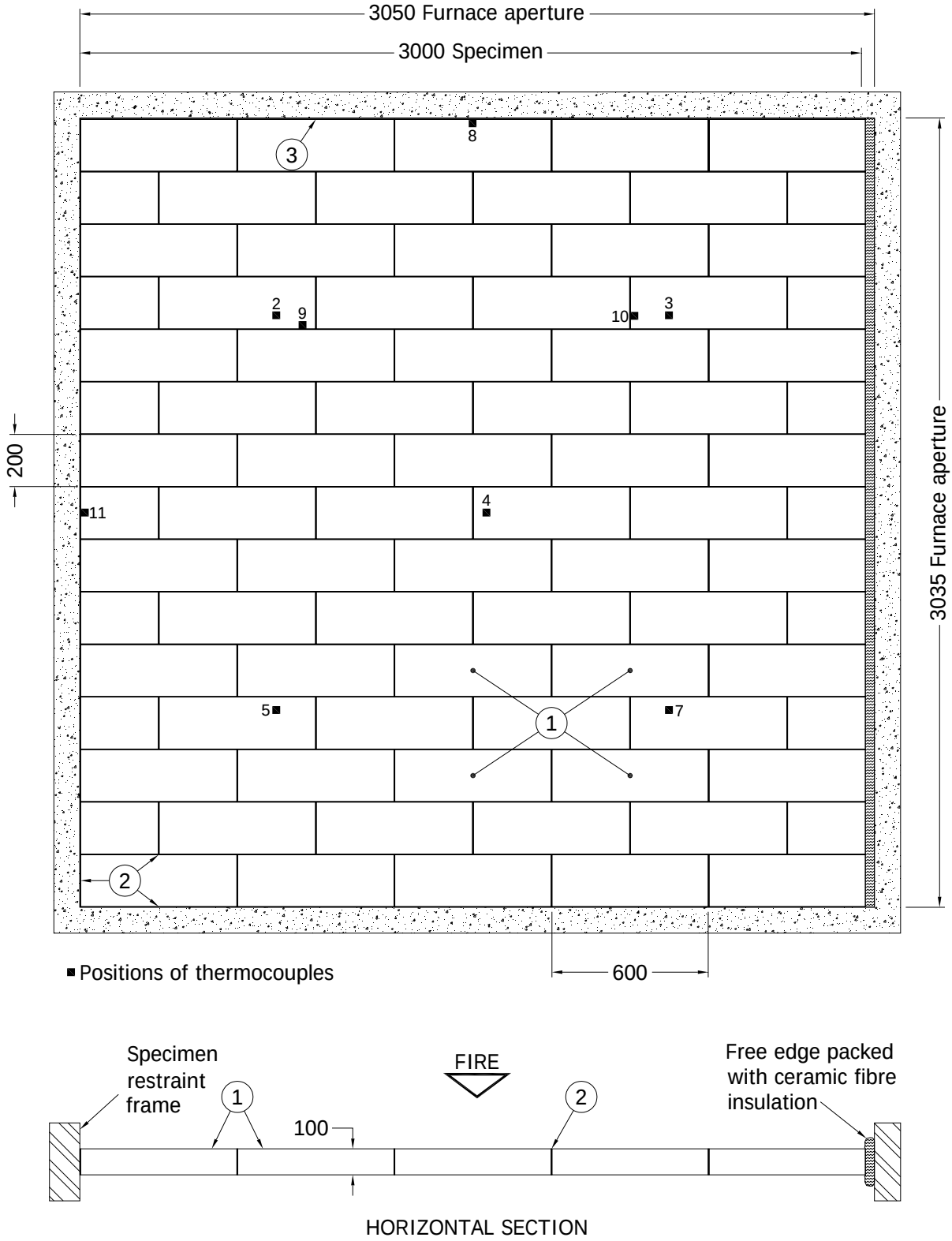
The specimens storage, construction, and test preparation, took place in the test laboratory over a total combined time of 5 days. Throughout this period of time both the temperature and the humidity of the laboratory were measured and recorded as being within a range of from 12°C to 21°C and 37% to 68% respectively.

Sampling

Bodycote **warrington**fire was not involved in any selection or sampling procedures of the specimens or any of the components.

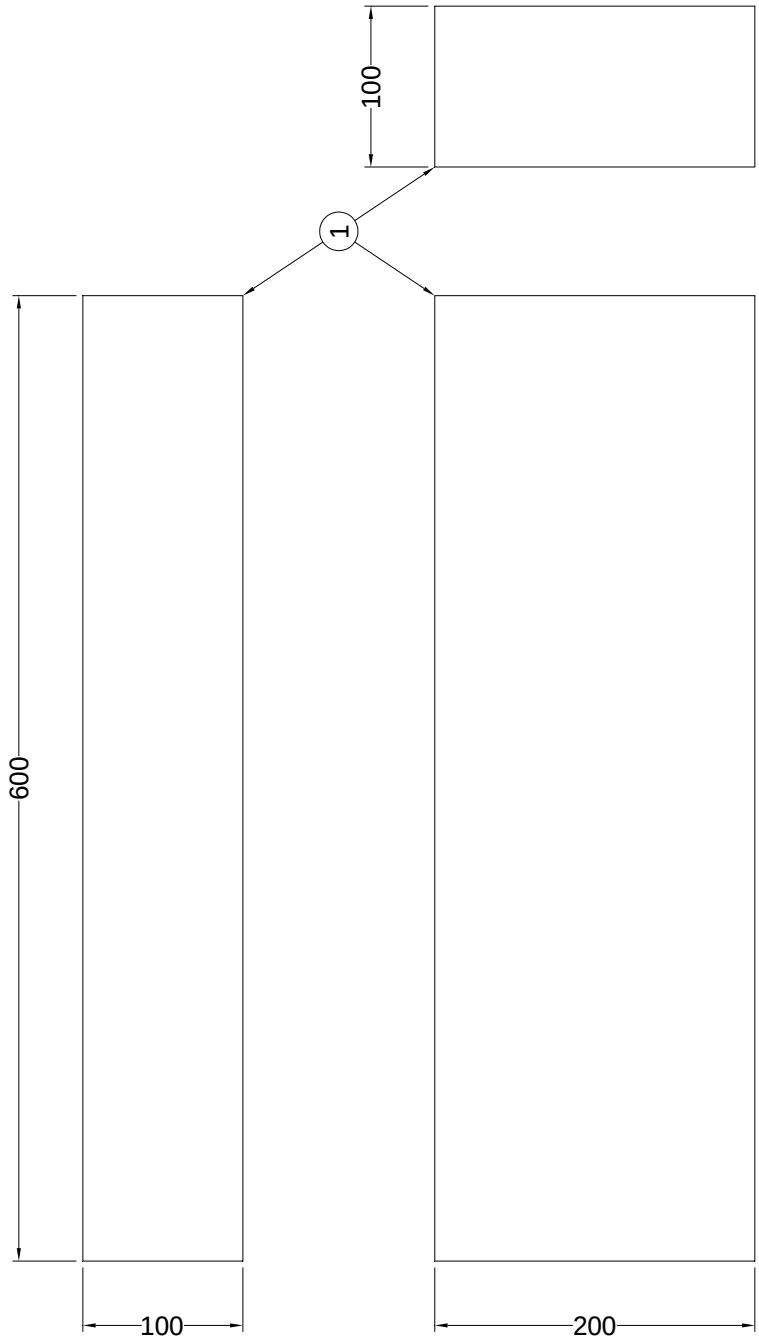
Test Specimen

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



Do not scale. All dimensions are in mm

Figure 2- Typical Block Detail



Do not scale. All dimensions are in mm

Schedule of Components

(Refer to Figures 1 & 2)
(All values are nominal unless stated otherwise)
(All other details are as stated by the sponsor)

Item		Description
1. Blocks		
Manufacturer	:	Kwok Chi Construction Materials Ltd
Material	:	Concrete
Density of Block	:	724 kg/m^3 (measured)
Overall section size of blocks	:	600 mm long x 200 mm high x 100 mm thick
2. Mortar Joints		
Manufacturer	:	Zong Jian Technology
Reference	:	Block - Adhesive
Material	:	High adhesion, waterproof adhesive
Thickness of joints	:	2 mm to 3 mm
Application method	:	Trowel
3. Top Mortar Seam		
Material	:	Sand and cement mortar mixed to a ratio of 3:1

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, Type K 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:

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 specimen 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 11ºC at the start of the test with a maximum variation of +5ºC during the test.
00	**00**	**The test commences.**
05	**30**	Slight steam/smoke release from the top of the free edge.
09	**30**	Slight steam/smoke release also visible at the top of the fixed edge.
15	**00**	Smoke/steam release visible just above mid-height along the horizontal joint 6 rows from the top.
17	**50**	Viewed from the exposed side the blocks glow a dull orange.
20	**00**	It is now possible to see steam/smoke release at several points on the face of the specimen along the top half.
56	**46**	Overall steam release across the face of the specimen increases. There is very little visible movement/bowing of the specimen.
60	**00**	The specimen continues to satisfy the test criteria.
64	**00**	The exposed blocks radiate a bright orange.
120	**00**	The specimen continues to satisfy the test criteria.
145	**00**	The exposed blocks glow bright orange. Steam/smoke release is visible across the unexposed face little or no movement bowing is visible.
180	**00**	The specimen continues to satisfy the test criteria.
210	**00**	Steam/smoke release is still visible across the face of the specimen, no movement or cracking is visible.
240	**00**	The specimen continues to satisfy the test criteria.
260	**00**	The exposed blocks glow bright orange. Steam/smoke release is visible across the unexposed face little or no movement bowing is visible.
264	**00**	The specimen continues to satisfy the test criteria. **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 a test duration of 60 minutes

The unexposed face of the test construction after a test duration of 120 minutes

The unexposed face of the test construction after a test duration of 180 minutes

The unexposed face of the test construction after a test duration of 264 minutes

The exposed face of the test construction immediately after the test

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	19
10	678	671
20	781	789
30	842	841
40	885	873
50	918	914
60	945	953
70	968	978
80	988	992
90	1006	1007
100	1022	1023
110	1036	1036
120	1049	1047
130	1061	1057
140	1072	1067
150	1082	1078
160	1092	1085
170	1101	1091
180	1110	1099
190	1118	1117
200	1126	1129
210	1133	1138
220	1140	1147
230	1146	1151
240	1153	1158
250	1159	1164
264	1167	1172

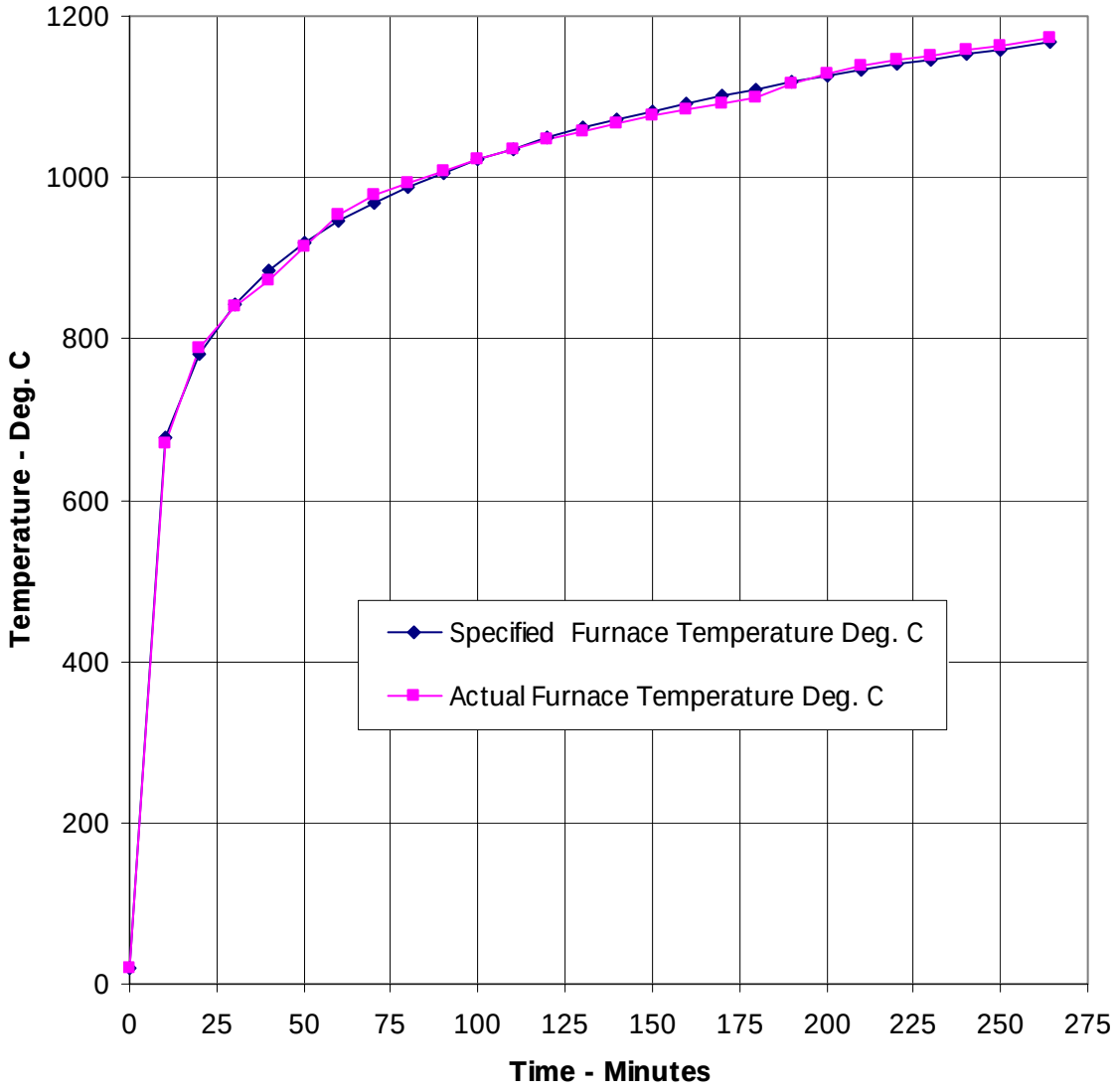
Individual and mean temperatures recorded on the unexposed surface

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 7 Deg. C	Mean Temp Deg. C
0	9	10	10	11	11	10
10	10	10	10	11	11	10
20	10	10	10	11	11	10
30	11	14	14	13	14	13
40	23	36	39	27	34	32
50	49	72	74	61	70	65
60	72	85	83	81	85	81
70	79	86	83	83	85	83
80	81	85	83	83	85	83
90	81	85	83	83	85	83
100	81	84	83	83	85	83
110	81	84	82	82	84	83
120	81	83	82	82	84	82
130	81	83	82	82	83	82
140	81	83	81	82	83	82
150	81	82	81	81	82	81
160	81	82	81	81	82	81
170	81	82	81	81	82	81
180	81	82	81	81	82	81
190	81	82	81	81	82	81
200	81	82	81	81	82	81
210	81	82	82	80	82	81
220	82	83	82	81	83	82
230	82	83	83	81	83	82
240	82	84	83	81	84	83
250	82	84	84	82	84	83
264	83	85	84	83	85	84

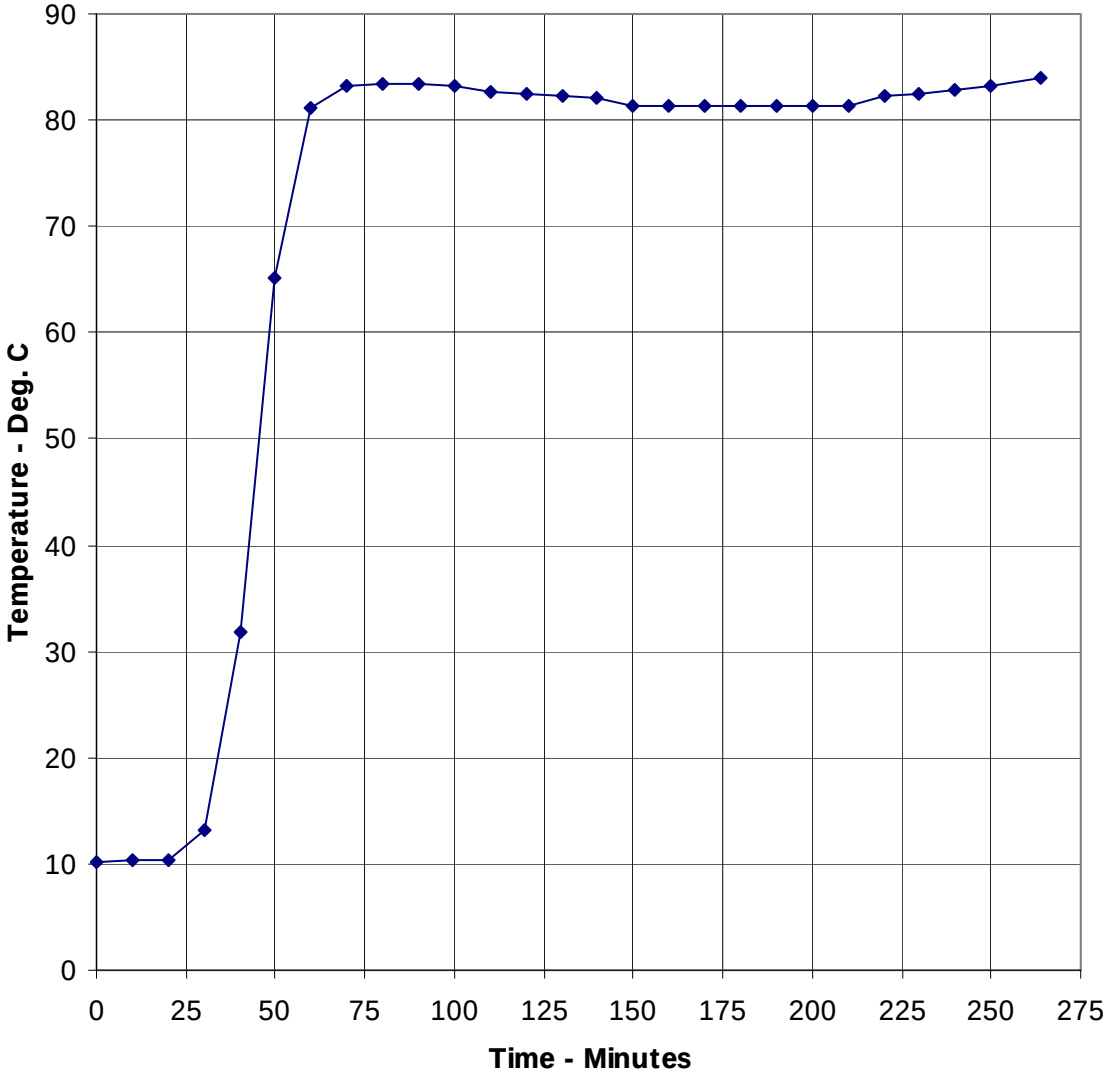
Individual temperatures recorded on the unexposed surface

Time Mins	T/C Number 8 Deg. C	T/C Number 9 Deg. C	T/C Number 10 Deg. C	T/C Number 11 Deg. C
0	12	12	12	13
10	13	12	12	13
20	14	12	16	13
30	20	14	23	16
40	36	25	43	32
50	59	47	67	60
60	76	69	79	79
70	82	79	81	84
80	84	80	81	85
90	85	81	82	85
100	85	80	82	85
110	85	80	83	85
120	86	80	83	85
130	86	80	83	85
140	86	80	84	85
150	86	80	84	85
160	86	80	84	85
170	87	80	85	85
180	87	80	85	84
190	88	80	86	84
200	89	80	86	84
210	90	80	87	84
220	91	81	88	85
230	92	81	89	85
240	93	82	91	86
250	95	82	92	87
264	97	83	95	88

Graph showing mean furnace temperature, together with the temperature / time relationship specified in the Standard



Graph showing mean temperatures recorded on the unexposed surface



Performance Criteria and Test Results

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 264 minutes, the test duration.

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 264 minutes, the test duration.

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 results to assemblies of different dimensions or incorporating different components should be the subject of a design appraisal.

Review

The specification and interpretation of fire test methods is 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 a symmetrical, non-loadbearing, concrete blockwork wall assembly has been subjected to a fire resistance test in accordance with BS 476: Part 22: 1987, Clause 5.

The specimen satisfied the performance requirements specified in the Standard for the periods stated below:

Test Results:

Integrity	264 minutes*
Insulation	264 minutes*

* The test duration. The test was discontinued after a period of 264 minutes.

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