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Testing. Advising. Assuring.

Title:

Fire Resistance Test Utilising
The General Principles of
BS 476: Part 22: 1987 on Two
Specimens of Access Hatch

Report No:

309752/A



Prepared for:

**Timloc Building Products
Limited**

Rawcliffe Road
Goole
East Yorkshire
DN14 6UQ

Date: 20th September 2011

Summary

Objective To determine the fire resistance performance of two specimens of insulated, loft and wall access hatch, when tested utilising the general principles of BS 476: Part 22: 1987 and in conjunction with BS 476: Part 20: 1987.

Sponsor **Timloc Building Products Limited.** Rawcliffe Road, Goole, East Yorkshire, DN14 6UQ

Summary of Tested Specimen For the purpose of the test the specimens were referenced Specimen A and C. Specimen A was fitted within the wall construction and Specimen C was fitted within the simulated loft ceiling construction.

The aerated concrete blockwork wall construction had overall nominal dimensions of 1500 mm high by 1500 mm wide by 150 mm thick. The wall construction was provided with a single aperture of overall nominal dimensions 205 mm high by 205 mm wide into which was installed the access hatch assembly. The assembly had overall dimensions 200 mm high by 200 mm wide by 30 mm thick.

The loft ceiling construction had overall nominal dimensions of 2200 mm long by 1700 mm and comprised timber joists and fireline board ceiling, provided with a single aperture of overall nominal dimensions 305 mm long by 305 mm wide into which was installed the loft hatch assembly. The assembly had overall dimensions 300 mm long by 300 mm wide by 30 mm thick.

Each hatch was constructed from a layer of mineral wool sandwiched between a single sheet of zinc coated mild steel to the exposed face and a foil sheet to the unexposed face.

The test incorporated another loft access hatch referenced "Specimen B", which is reported separately in WF Test Report No. 309752/B

Test Results:	Specimen A	Specimen C
Integrity	60 minutes*	60 minutes*
Insulation	6 minutes	7 minutes

*The test duration. The test was discontinued after a period of 60 minutes.

Date of Test 3rd August 2011

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Signatories



Responsible Officer
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* For and on behalf of **Exova Warringtonfire**.

Report Issued

Date : 20th September 2011

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Test Procedure

Introduction

BS 476: Part 22: 1987 'Methods for determination of the fire resistance of non-loadbearing elements of construction'; details test methods for evaluating the fire resistance performance of doorsets. However the standard primarily details the testing of vertical, wall mounted doorsets and although the general testing principles may be applied to a horizontal, floor mounted doorset, a test of this type could not be considered to be fully in accordance with the standard. This test was therefore conducted utilising the general principles of BS 476: Part 20: 1987, 'Method for determination of the fire resistance of elements of construction (general principles)'.

Each access hatch incorporated a hinged panel. Specimen A was mounted within an aerated blockwork wall construction. Specimen C was mounted within a timber joist floor and plasterboard, ceiling construction. Both specimens were installed such that its panel opened towards the heating conditions of the test. The test results therefore may not be appropriate to alternative orientations.

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 3rd August 2011 at the request of Timloc Building Products Limited 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 specimen and information supplied by the sponsor of the test.

Installation

The access hatches were mounted within an aperture provided in an aerated blockwork wall construction (Specimen A) and a timber joist and plasterboard construction (Specimen C) such that the door leaf opened towards the heating conditions of the test. A representative of **Exova Warringtonfire** conducted the installation of the floor and wall constructions and doorsets on the 1st and 2nd August 2011.

Sampling

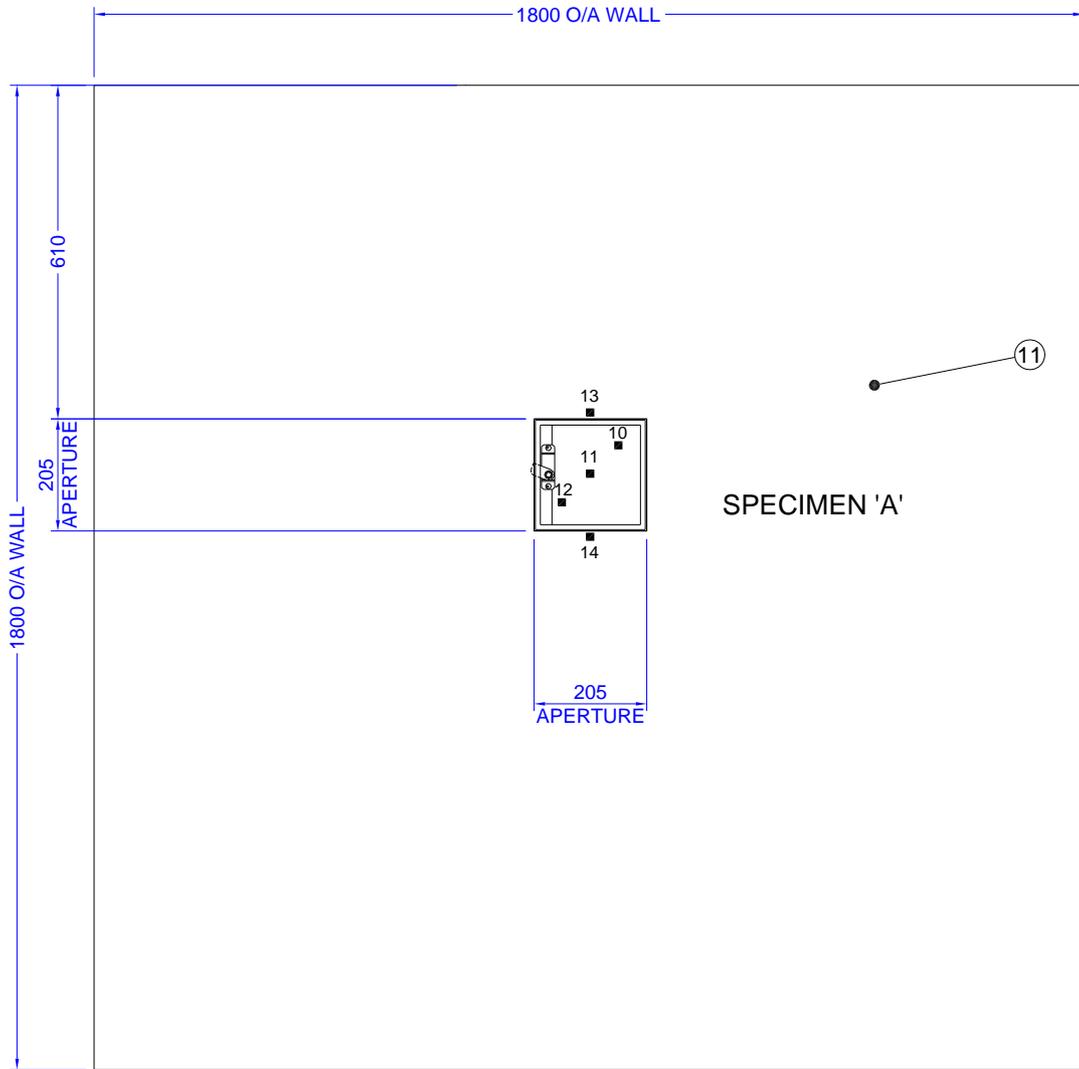
Exova Warringtonfire was not involved in any sampling or selection procedure of the sealing system components.

Conditioning

The specimen's storage, construction, and test preparation took place in the test laboratory over a total, combined time of 3 day. 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 15°C to 27°C and 44% to 82% respectively.

Test Specimen

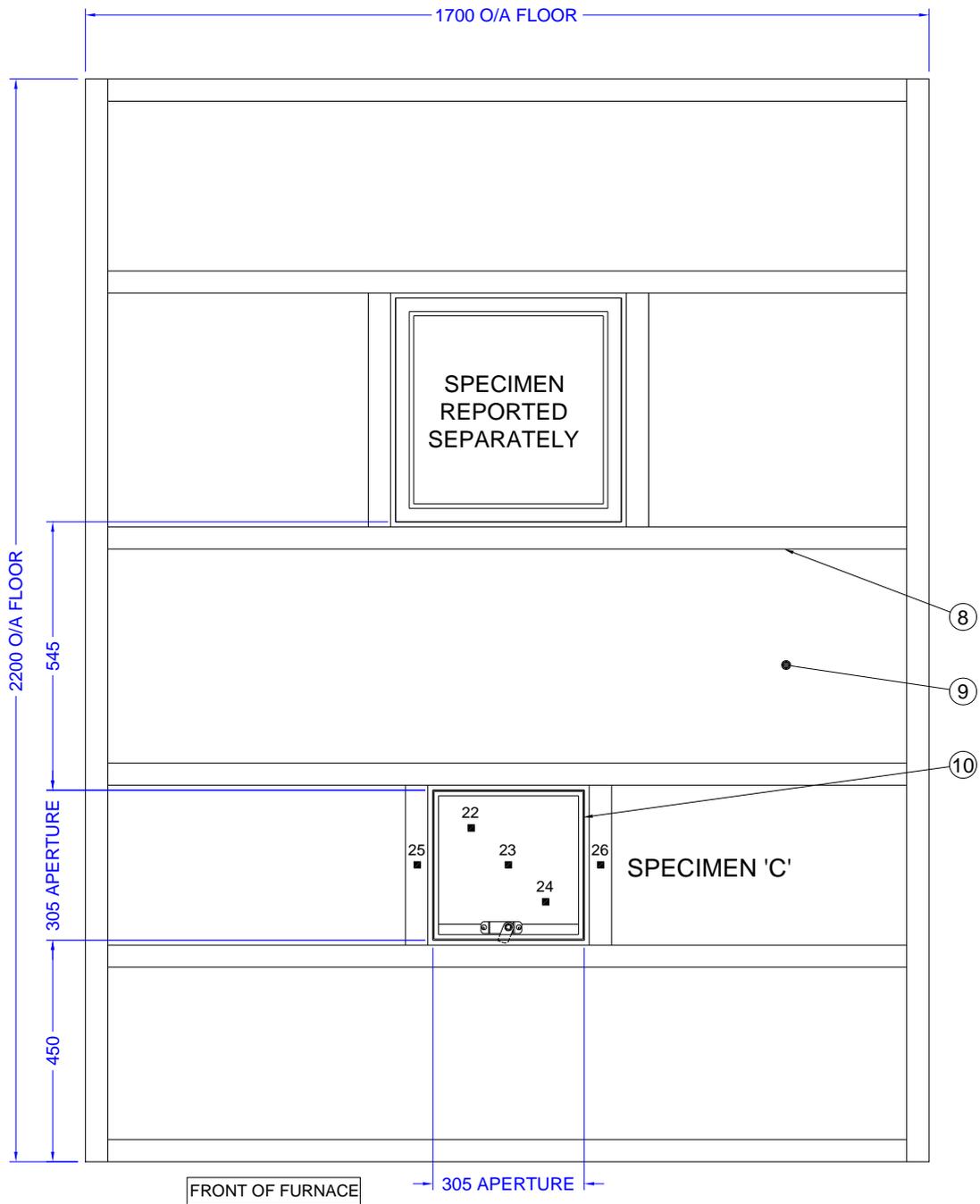
Figure 1 - General elevation of the unexposed the face of specimen 'A' built into a blockwork wall



- POSITIONS OF THERMOCOUPLES

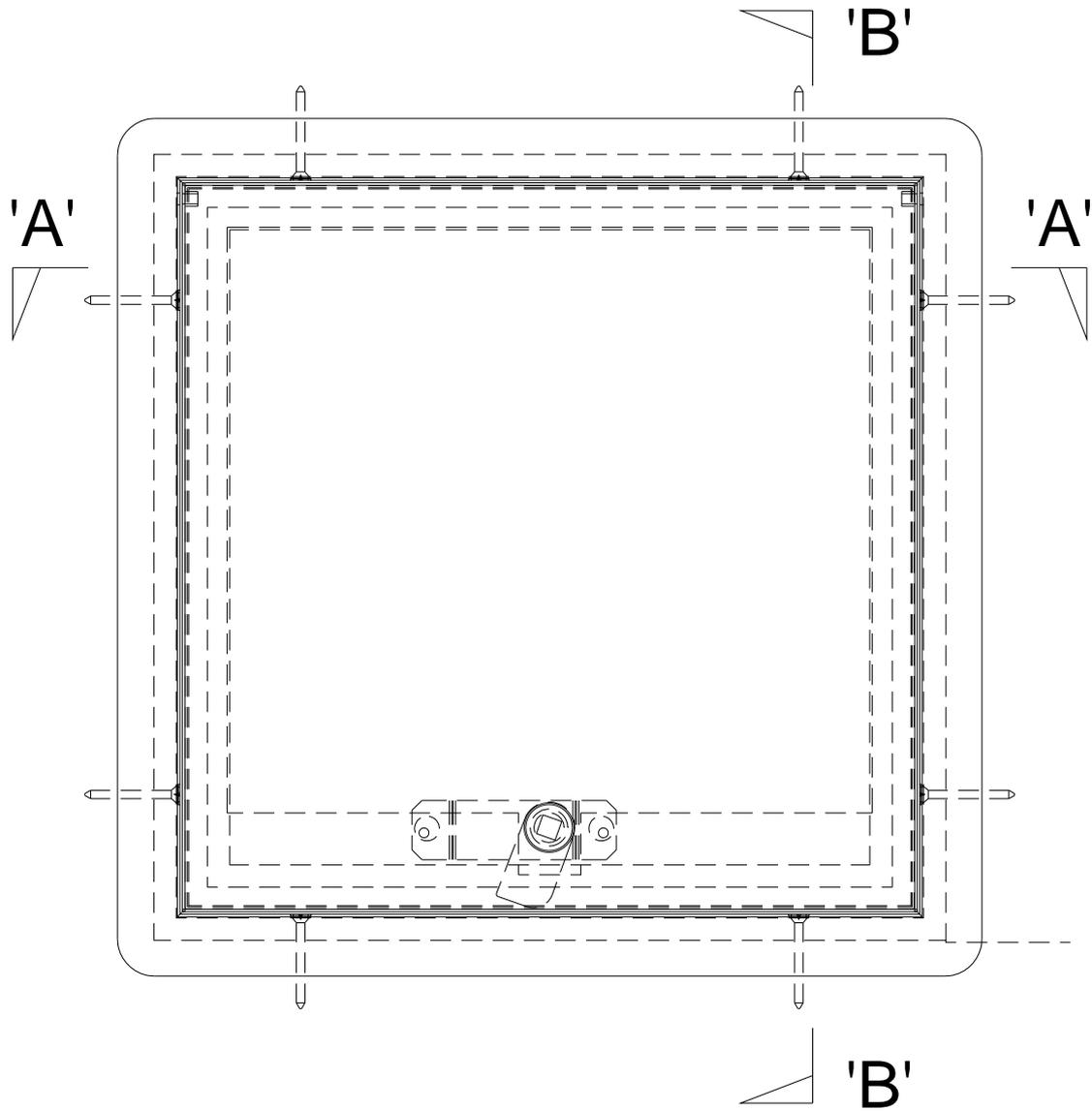
Do not scale. All dimensions are in mm

Figure 2 – General plan of the unexposed the face of specimen 'C' built into a timber floor



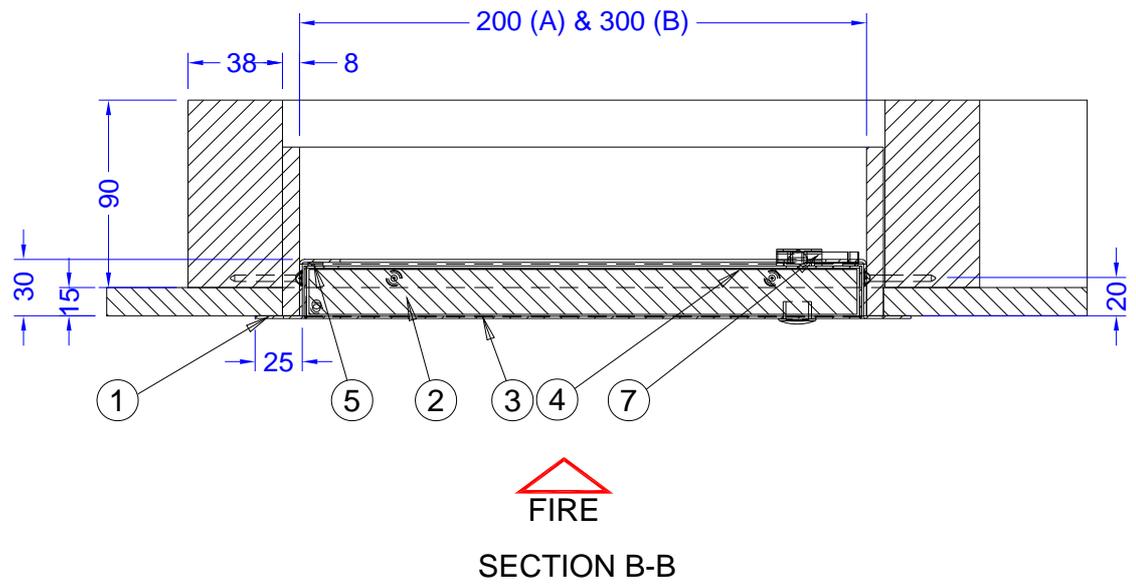
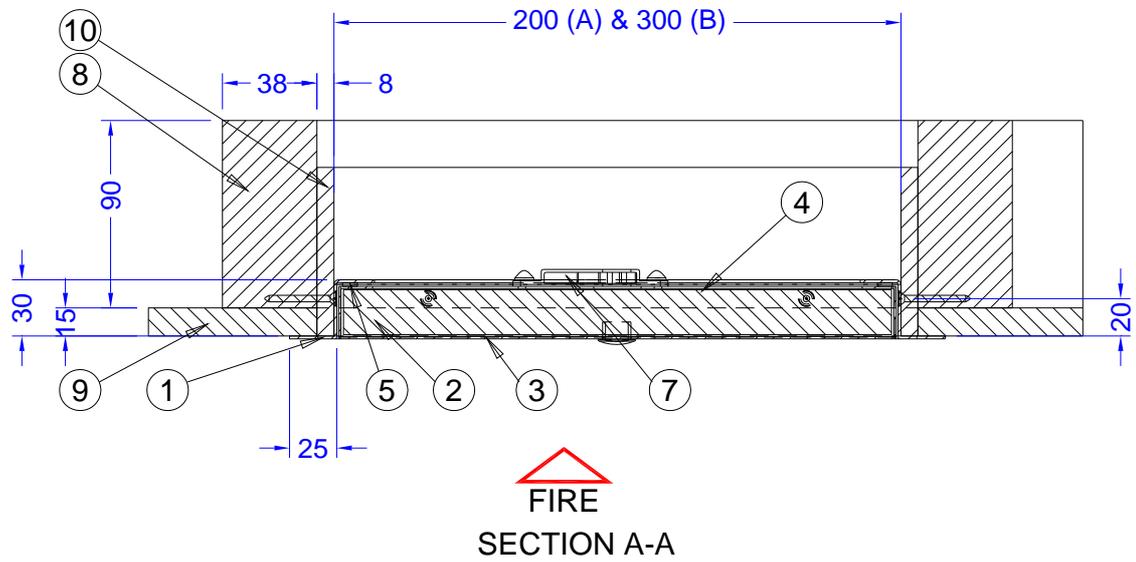
Do not scale. All dimensions are in mm

Figure 3 – Typical elevation of the specimens



Do not scale. All dimensions are in mm

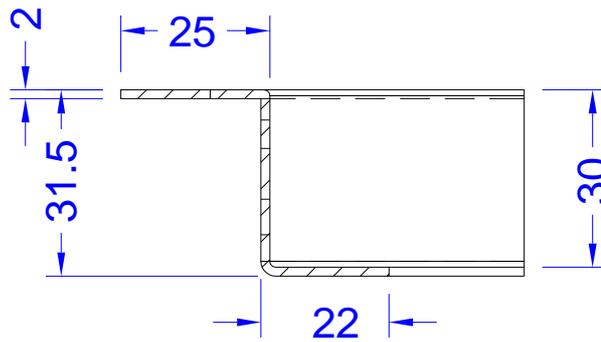
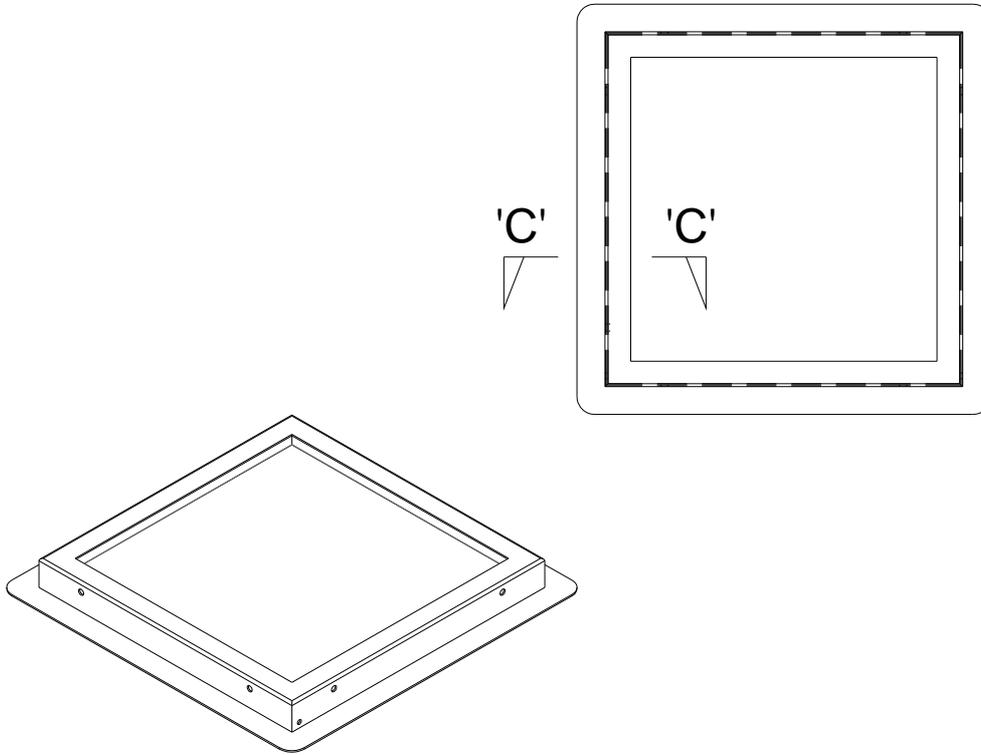
Figure 4 – Sections through the specimens



TYPICAL SECTIONS THROUGH SPECIMEN 'C' BULT INTO THE FLOOR.
SPECIMEN 'A' IS SIMILAR BUT BULT INTO A BLOCKWORK WALL

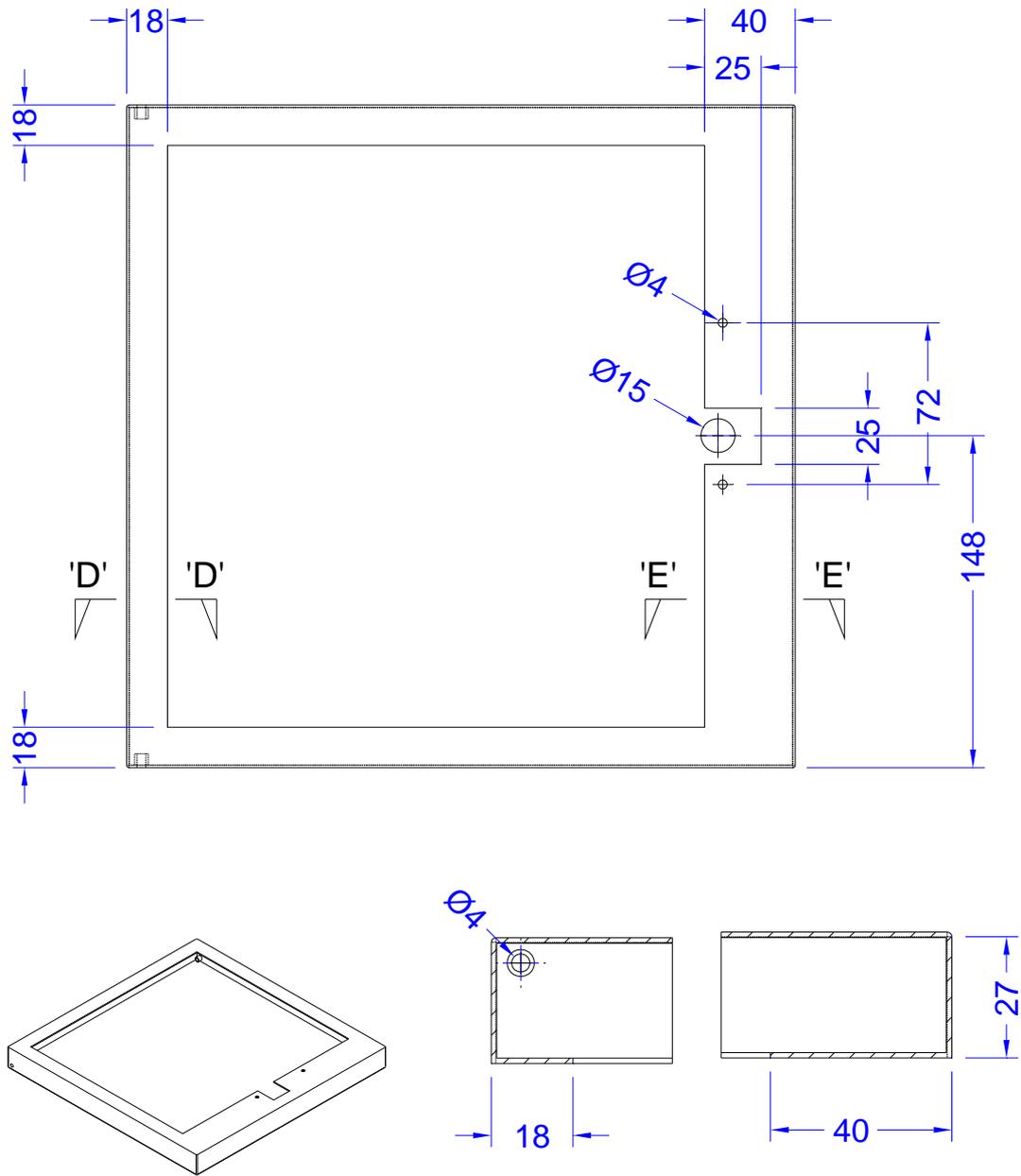
Do not scale. All dimensions are in mm

Figure 5 – Frame profile details



Do not scale. All dimensions are in mm

Figure 6 – Door skin details



Do not scale. All dimensions are in mm

Schedule of Components

(Refer to Figures 1 to 6)
 (All values are nominal unless stated otherwise)
 (All other details are as stated by the sponsor)

<u>Item</u>	<u>Description</u>
1. Door frame	
Material	: Zinc coated mild steel
Finish	: White texture finish powder coating
Thickness	: 1.5 mm
Overall section size	: See Figure 5
Corner jointing method	: Welded
Fixing method	: 4.7 mm diameter x 50 mm long countersunk head screws, 2 no. per side positioned 50 mm in from each corner
2. Door leaf core	
Manufacturer	: Rockwool
Reference	: RW2
Material	: Mineral wool
Density	: 30 kg/m ³ stated (uncompressed)
Thickness	: 20 mm approximately (30 mm uncompressed)
3. Door leaf skin	
Material	: Zinc coated mild steel
Finish	: White texture finish powder coating
Thickness	: 1.2 mm
4. Foil sheet	
Material	: Aluminium foil
Thickness	: 0.01mm
5. Door seal	
Manufacturer	: CB Frost
Material	: CF2 Black closed cell neoprene sponge
Overall section size	: 8 mm x 2 mm
Fixing method	: Gasket has an adhesive back
6. Hinges	
Material	: Zinc plated mild steel
Quantity of hinges	: 2 no. screw hinges
Fixing method to door frame and leaf	: Machine screws into rivet nuts to door and into frame
Quantity and size of screws	: 2 no. 15 mm long x 4.7 mm diameter
7. Lock assembly	
Material	: Zinc plated mild steel
Overall sizes	
i. lock bar	: 18 mm wide x 5 mm thick
ii. bracket	: Formed by two plates, each 22 mm wide x 80 mm long x 1.5 mm thick
Fixing method of bracket to door leaf	: Machine screws into rivet nuts
Quantity and size of screws	: 2 no. 15 mm long x 4.7 mm diameter

Item

Description

7. Lock assembly (continued)

Operation : Lock bar engaged in a slot within the door frame

8. Ceiling joists

Material : Timber, softwood grade C16
Overall section size : 90 mm deep x 38 mm wide
Jointing method : Joists butt jointed and nailed together
Details of nails
i. type : Ringshank nails
ii. size : 100 mm long x 3.5 mm diameter
iii. quantity : 6 no. per joint

9. Ceiling boards

Material : Fireline board (to 1 hour rated specification)
Thickness : 15 mm
Fixing method to joists : With 38 mm long x 3.5 mm diameter screws at 150 mm nominal centres

10. Aperture lining

Material : Calcium silicate board
Thickness : 8 mm
Fixing method to joists : 38 mm long x 3.5 mm diameter screws at 150 mm nominal centres.

11. Wall assembly

Material : Autoclaved aerated concrete blocks
Nominal density : 760 kg/m³
Thickness : 150 mm thick
Wall construction : The blocks were installed in stretcher bond and joined using a sand/cement mortar

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 four mineral insulated thermocouples positioned such that they were 100 mm from the surface of the floor construction, and three mineral insulated thermocouples positioned such that they were 100 mm from the surface of the wall 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 10 to 12 (Specimen A) and 22 to 23 (Specimen C)	At five positions, one approximately at the centre and one at approximately the centre of each quarter section of the assembly.
Thermocouples 13 to 14 (Specimen A) and 20 to 21 (Specimen C)	At two positions on the unexposed surface of the access hatch frame. The locations and reference numbers of the various unexposed surface thermocouples are shown in Figures 1 and 2.
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 furnace atmospheric pressure was measured and controlled such that, at a point 100 mm below the soffit of the ceiling assembly, the differential pressure was calculated to be between 18 Pa and 20 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 37°C at the start of the test with a maximum variation of $\pm 1^\circ\text{C}$ during the test.
00	00	The test commences.
03	30	Smoke release begins from the perimeter edges of Specimen C.
05	15	Smoke release continues from Specimen C and begins from the perimeter edges of Specimen A also.
10	30	The foil face coating of Specimen A begins to melt away throughout the specimen.
12	15	The foil facing of Specimen C begins to melt away around the perimeter edges of the specimen and appears blackened and dull at the same locations.
14	45	A through gap is evident within Specimen A directly behind the lock position, within the mineral wool insulation.
27	45	Smoke release increases from Specimen C.
30	15	Glowing is evident within the insulation of Specimen C. Areas of glowing and black discoloration are evident within the plasterboard ceiling along the joists.
33	00	Sustained flames issue from the plasterboard ceiling along the joists. The flames are sprayed with water to allow the test to continue.
35	40	The mineral wool insulation of Specimen A has slumped down to the bottom half of the specimen. The steel door panel radiates an orange colour.
38	29	The plasterboard ceiling reignites as burn through commences around the timber framework which provides the aperture for Specimen C.
41	30	The aperture lining of Specimen C has discoloured black. Glowing is evident around the perimeter edges of Specimen C.
43	15	The timber joists continue to ignite around Specimen C. The areas are again sprayed with water to allow the test to continue.
51	45	The timber joists continue to ignite around Specimen C. The areas are continually sprayed with water to allow the test to continue.
54	20	Most of the paper face to the unexposed surface of the ceiling has burnt away. The board joints have separated by approximately 6-8 mm along both joints.
59	20	The central plasterboard panel begins to vibrate up and down.
60	00	No significant visible change. The test is discontinued as the ceiling continues to degrade.

Test Photographs

The exposed face
Specimen A prior
to testing



The exposed face
Specimen C prior
to testing



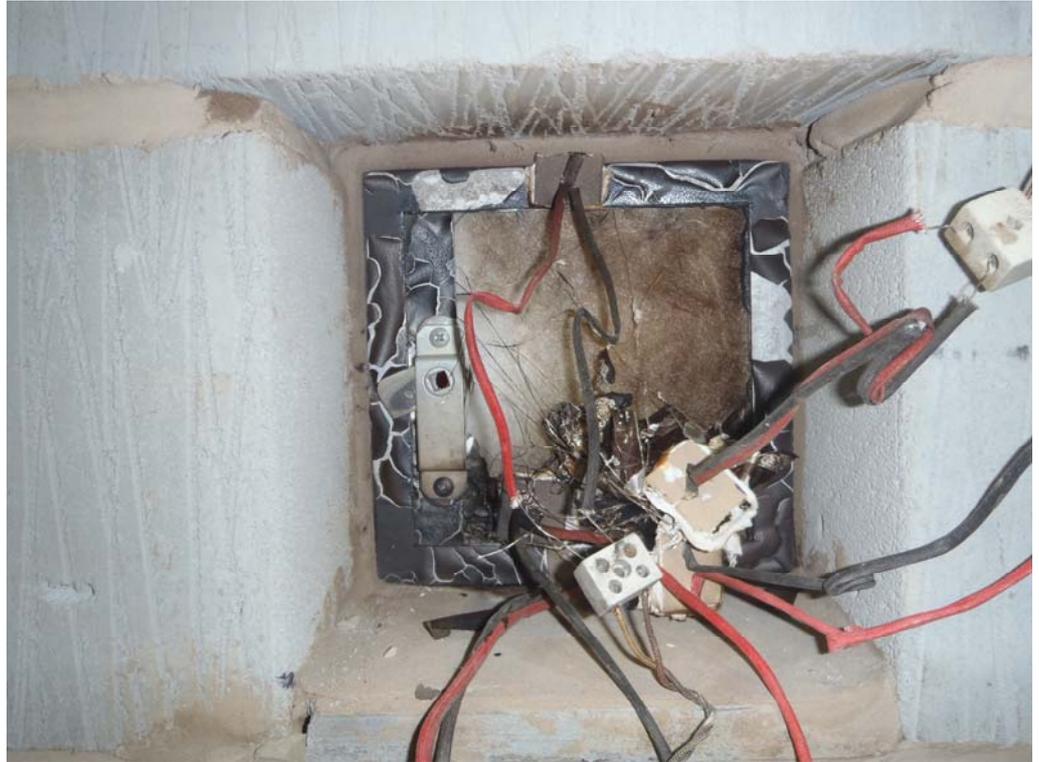
The unexposed
face of Specimen
A after a test
duration of 10
minutes



The unexposed
face of Specimen
C after a test
duration of 10
minutes



The unexposed
face of Specimen
A after a test
duration of 20
minutes



The unexposed
face of Specimen
C after a test
duration of 20
minutes



**The unexposed
face of Specimen
A after a test
duration of 30
minutes**



**The unexposed
face of Specimen
C after a test
duration of 30
minutes**



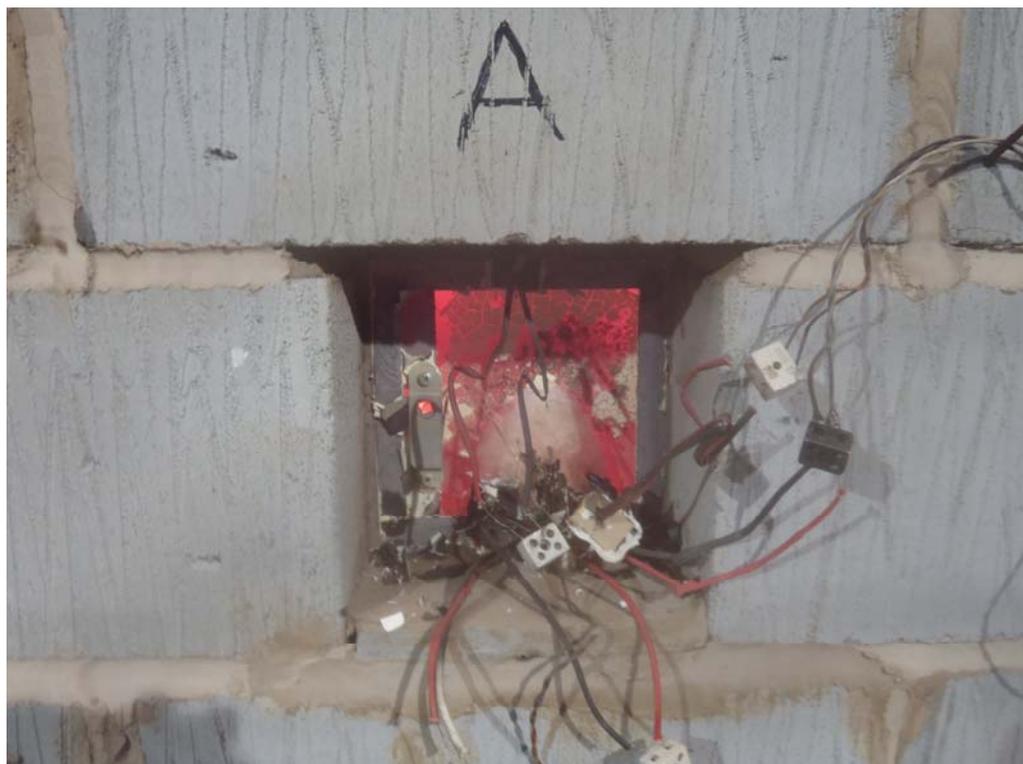
The unexposed
face of Specimen
C during the test



The unexposed
face of Specimen
C during the test



The unexposed
face of Specimen
A after a test
duration of 60
minutes



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	28
2	445	349
4	544	531
6	603	600
8	645	634
10	678	659
12	705	697
14	728	720
16	748	742
18	766	758
20	781	777
22	796	791
24	809	804
26	820	823
28	832	830
30	842	842
32	851	852
34	860	862
36	869	872
38	877	878
40	885	885
42	892	894
44	899	898
46	906	912
48	912	915
50	918	919
52	924	923
54	930	931
56	935	937
58	940	942
60	945	948

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

Time Mins	T/C Number 10 Deg. C	T/C Number 11 Deg. C	T/C Number 12 Deg. C	Mean Temp Deg. C
0	21	20	21	21
1	21	20	22	21
2	23	21	25	23
3	29	25	33	29
4	41	36	51	43
5	65	60	83	69
6	90	99	136	108
7	116	120	204	147
8	152	140	297	196
9	200	167	369	245
10	240	214	426	293
11	254	258	449	320
12	268	*	456	362
13	272		457	365
14	*		453	453
15			*	*

*Thermocouple detachment

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

Time Mins	T/C Number 22 Deg. C	T/C Number 23 Deg. C	T/C Number 24 Deg. C	Mean Temp Deg. C
0	21	22	23	22
2	22	24	26	24
4	30	31	40	34
6	60	61	75	65
8	79	77	115	90
10	100	103	162	122
12	102	132	248	161
14	109	215	328	217
16	172	236	356	255
18	245	241	336	274
20	276	239	336	284
22	260	251	334	282
24	271	*	328	300
26	294		336	315
28	323	253	363	313
30	341	272	407	340
32	369	303	449	374
34	376	301	463	380
36	380	309	492	394
38	386	328	515	410
40	400	355	526	427
42	404	339	548	430
44	411	355	564	443
46	414	346	582	447
48	418	378	572	456
50	426	387	579	464
52	414	375	593	461
54	422	393	587	467
56	437	402	605	481
58	432	395	615	481
60	434	395	621	483

*Temporary thermocouple malfunction

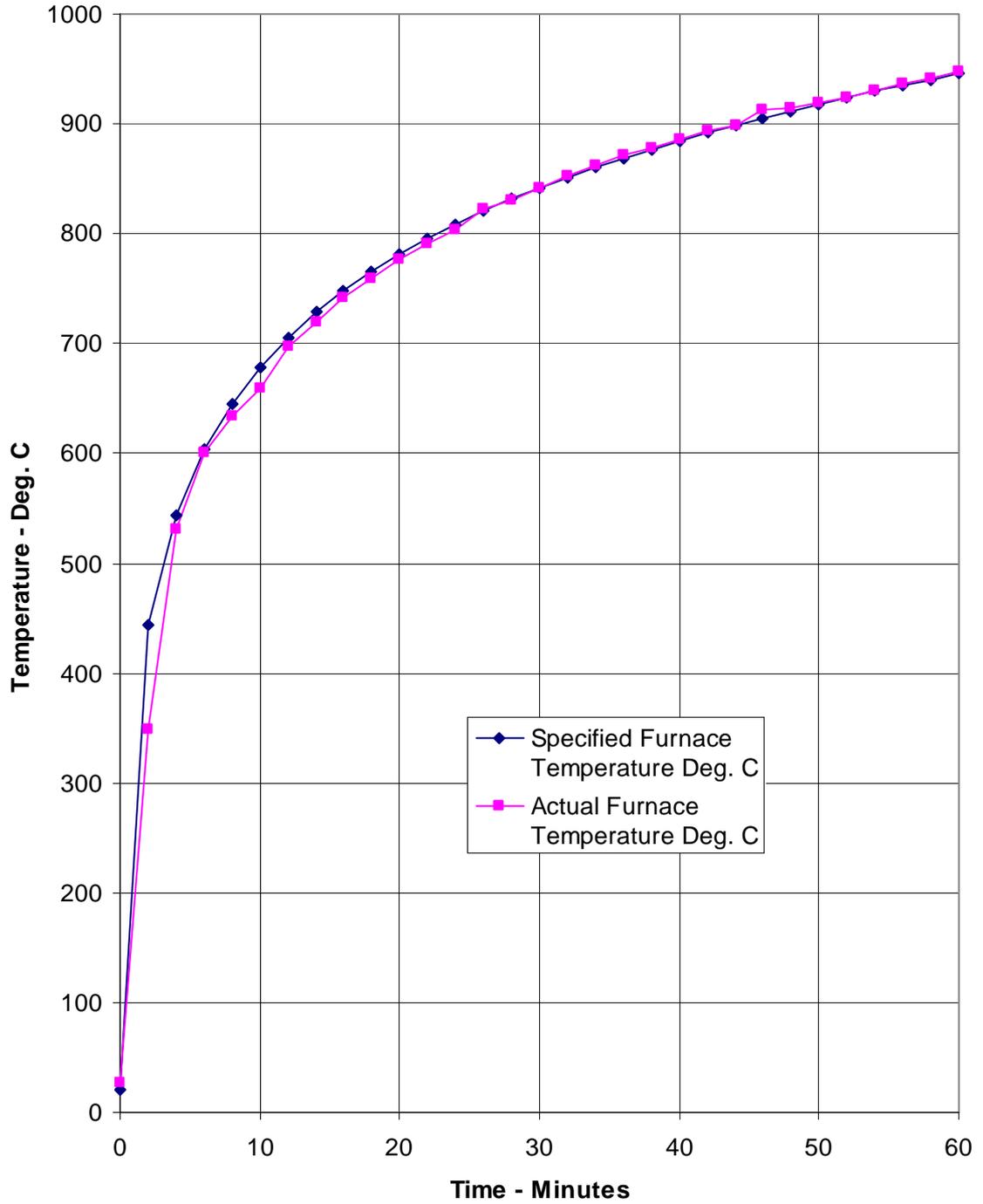
Individual Temperatures Recorded On The Unexposed Surface Of The Frame Of Specimen A

Time Mins	T/C Number 13 Deg. C	T/C Number 14 Deg. C
0	23	22
2	36	39
4	84	101
6	162	182
8	261	258
10	326	316
12	366	357
14	391	395
16	410	397
18	430	418
20	450	434
22	470	448
24	489	444
26	506	455
28	522	471
30	541	487
32	548	510
34	552	524
36	556	535
38	563	541
40	568	547
42	569	554
44	571	566
46	574	570
48	577	573
50	582	582
52	586	587
54	591	596
56	597	602
58	602	607
60	607	609

Individual Temperatures Recorded On The Unexposed Surface Of The Frame Of Specimen C

Time Mins	T/C Number 25 Deg. C	T/C Number 26 Deg. C
0	26	25
2	49	50
4	100	102
6	168	167
8	230	231
10	276	276
12	316	315
14	351	343
16	377	370
18	391	390
20	398	405
22	403	416
24	417	420
26	429	427
28	439	438
30	449	451
32	458	459
34	468	464
36	475	470
38	480	470
40	490	474
42	493	487
44	507	499
46	511	515
48	528	502
50	536	499
52	328	503
54	513	493
56	540	509
58	548	513
60	552	518

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



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 the 60 minute test duration for each specimen.

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 6 minutes by Specimen A and 7 minutes by Specimen C, after which time the maximum temperature rise criteria was exceeded by thermocouple number 14 (Specimen A) and 25 (Specimen C).

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 a doorsets of different dimensions or supported other than by a masonry wall or incorporating different components should be the subject of a design appraisal.

Care should be taken with respect to the application of loft hatch doors to floor constructions. Floor constructions are normally tested in accordance with BS 476: Part 21: 1987, at dimensions of 3 metres by 4 metres and supporting an appropriate design load. Where the installation of loft hatch access doors into such constructions is proposed, due consideration should be given to the additional distortion that may occur in the floor construction and the effect on the fire resistance performance of the hatch and overall construction that this will have. The tested assembly was asymmetric and was tested such that the door panel opened towards the heating conditions of the test. The test results may not be appropriate to alternative orientations.

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**

Two specimens of insulated, access hatch have been subjected to a fire resistance test utilising the general principles of BS 476: Part 22: 1987 and in conjunction with BS 476: Part 20: 1987.

If the specimen was judged against the criteria for integrity and insulation in accordance with BS 476: Part 22: 1987, then the results would be as follows:

Test Results:	Specimen A	Specimen C
Integrity	60 minutes*	60 minutes*
Insulation	6 minutes	7 minutes

*The test duration. The test was discontinued after a period of 60 minutes