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Title:

The Fire Resistance Performance Of A Non-Loadbearing, Partition Wall Assembly Tested In Accordance With BS 476: Part 22: 1987, Clause 5

Report No:

188642/A

Date:

18th February 2010

Notified Body No:
0833

UKAS
0249

Summary

Objective

To determine the fire resistance performance of a non-loadbearing partition wall assembly when tested in accordance with BS 476: Part 22: 1987.

Summary of Tested Specimen

The partition had overall nominal dimensions of 3035 mm high by 3000 mm wide by 88 mm thick. The framing comprised 70 mm by 32 mm by 0.5 mm thick galvanised mild steel 'C' stud, at maximum 600 mm centres, friction fitted into 72 mm by 24 mm by 0.5 mm 'U' section head and base channels. Each side of the stud frame was faced with a single layer of 9 mm thick Magnesium Oxide board referenced 'Trilite RMS'. The boards were screw fixed in place using 32 mm long, drywall screws, at nominally 300 mm centres.

The cavity of the partition included two layers of nominally 40 mm thick (fireside) and 25 mm thick (non-fireside) 'Rock fibre slab' insulation of a stated density 80Kg/m^2.

Test Results:

Integrity	71 minutes
Insulation	71 minutes

The test was discontinued after a period of 71 minutes.

Date of Test 14th December 2009

Note: This report is additional to that issued as WF Test Report No. 188642. The original report remains valid and is not replaced by this additional test report.

Signatories

Responsible Officer
S. Gilfedder*
Testing Officer

Approved
C. Johnson*
Principal Certification Engineer

* For and on behalf of Exova Warringtonfire

Report Issued

Date : 18th February 2010

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Test Procedure

Introduction

The specimen was of a non-loadbearing wall construction; therefore, 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 14th December 2009.

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 specimen was installed into a refractory concrete lined steel restraint frame by representatives of the test sponsor on the 11th December 2009.

Sampling

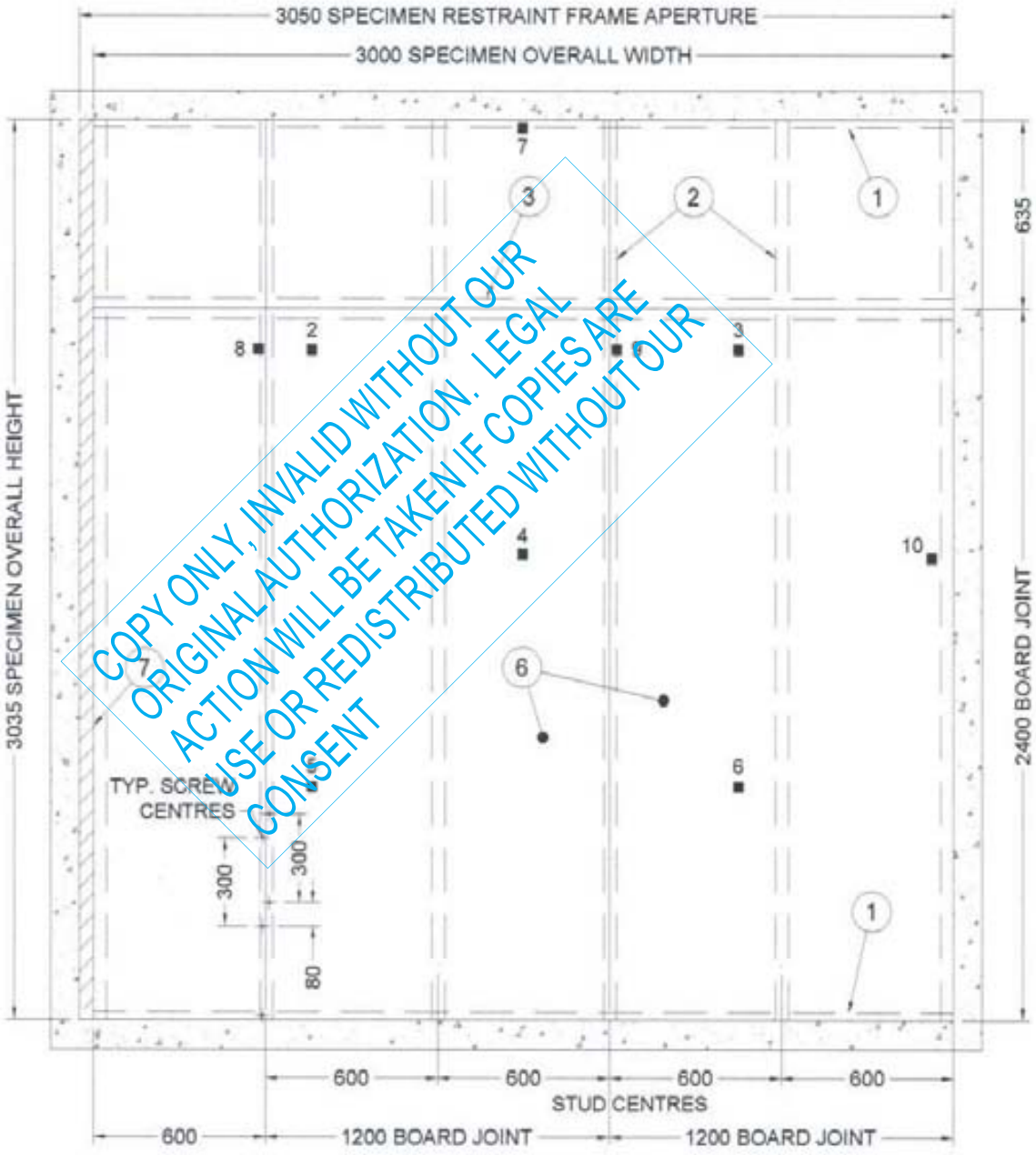
Exova Warringtonfire was not involved in the sampling or selection of the tested specimen or any of the components.

Conditioning

The specimens' storage, construction, and test preparation took place in the test laboratory over a total, combined time of 4 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 5°C to 16°C and 32% to 72% respectively.

Test Specimen

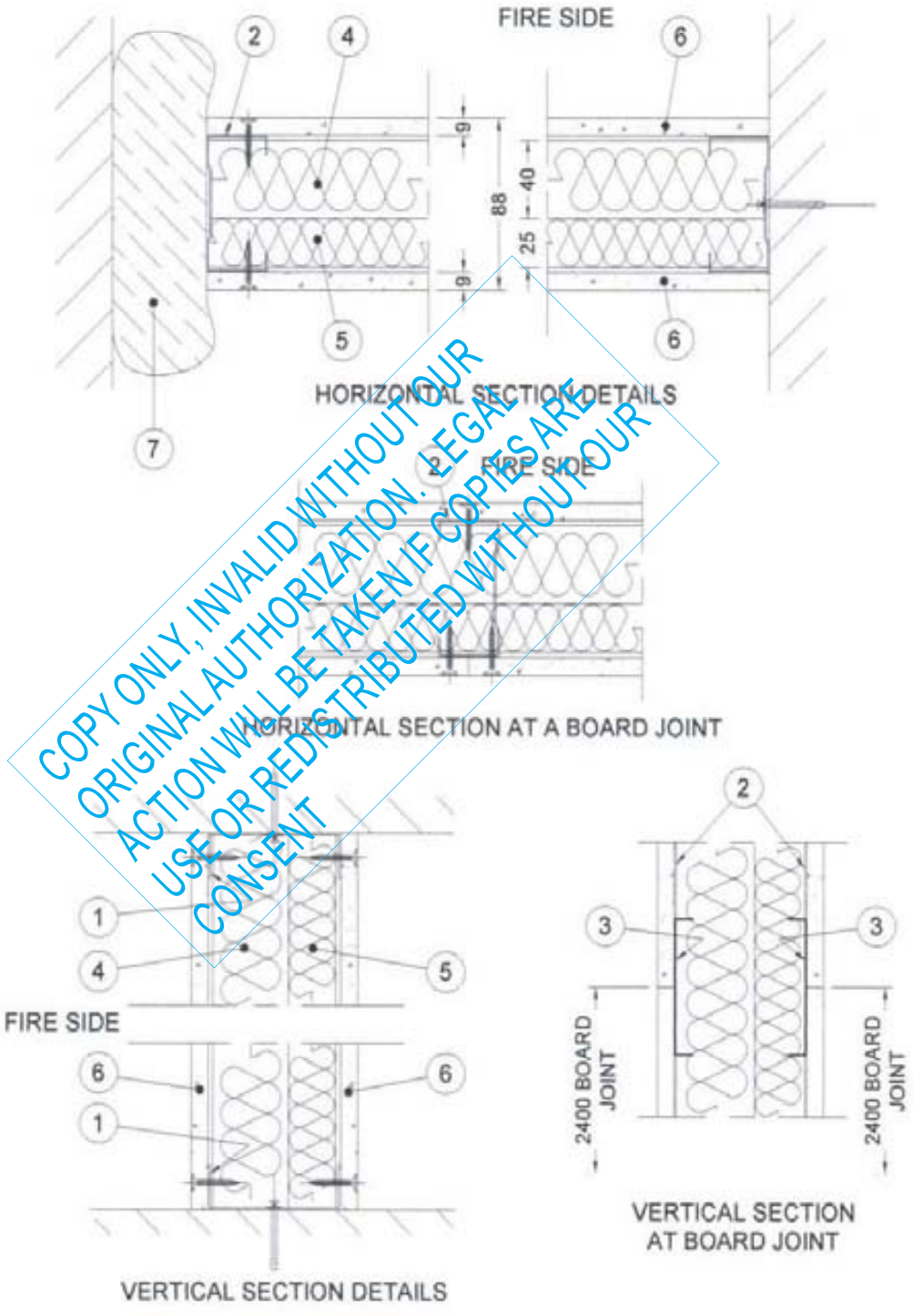
Figure 1- General elevation of test specimen and unexposed face thermocouples



▪ POSITIONS OF UNEXPOSED FACE THERMOCOUPLES.

Do not scale. All dimensions are in mm

Figure 2 – Typical details of test specimen



Do not scale. All dimensions are in mm

Schedule of Components

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

Item		Description
1. Head and Base Channels		
Reference	:	Speedline SPT72
Material	:	Galvanised mild steel channel
Thickness	:	0.5 mm
Overall section size	:	72 mm web x 24 mm flanges
Cut outs in web	:	32 mm wide x 75 mm high cut outs at 600 mm centres
Details of fixings to masonry surround		
i. type	:	Steel screws into aluminium plugs
ii. overall size	:	32 mm x 3.5 mm diameter
iii. spacings	:	600 mm centres
2. Vertical Studs		
Reference	:	Speedline SPS70
Material	:	Galvanised mild steel channel
Thickness	:	0.5 mm
Overall section size	:	70 mm web x 32 mm flanges
Expansion allowance at head	:	15 mm
Fixing method	:	Studs were spaced at 600 mm centres and friction fitted within the head and base channels. One stud was fixed to the masonry surround with the same type of screws and plugs used to fix the head and base channels
3. Partition Brace		
Reference	:	Speedline PB24
Material	:	Galvanised mild steel channel
Thickness	:	0.7 mm
Overall section size	:	70 mm x 10 mm x 3000 mm long
Fixing	:	The braces were fitted behind the horizontal board joints and fixed with the screws used to secure the boards. The studs were cut to fit the flanges of the braces
4. Insulation to exposed side		
Reference	:	RW4
Material	:	Rockfibre based mineral wool slabs
Density	:	80 kg/m^3
Thickness	:	40 mm
Size of insulation slabs	:	1200 mm high x 600 mm wide
Fixing method	:	Friction fit within all voids between the framework members to the exposed side of the partition. The horizontal joints were staggered 600 mm with respect to the adjacent insulation layer

5. Insulation to unexposed side

Reference	:	RW4
Material	:	Rockfibre based mineral wool slabs
Density	:	80 kg/m^3
Thickness	:	25 mm
Size of insulation slabs	:	1200 mm high x 600 mm wide
Fixing method		Friction fit within all voids between the framework members to the unexposed side of the partition. The horizontal joints were staggered 600 mm with respect to the adjacent insulation layer

6. Facing boards

Manufacturer	:	Triple lite
Reference	:	Trilite RMS
Material	:	Magnesium oxide based board
Thickness	:	9 mm
Size of boards	:	2400 mm high x 1200 mm wide
Density	:	1100 kg/m^3
Fixing method		Single layer screw fixed to both faces of all framework members. The vertical joints of the unexposed face boards were staggered 600 mm with respect to those on the opposite face
Details of panel fixings		
i. type		Steel drywall screws through pre-drilled holes in the boards
ii. overall size		32 mm x 3.5 mm diameter
iii. spacings		300 mm centres along all framework members

7. Free Edge Packing

Reference	:	Superwool 607
Material	:	Ceramic fibre based insulation
Density	:	96 kg/m^3, uncompressed
Fitting method	:	Packed into gap along the free edge between lining of restraint frame and left hand edge of the partition as viewed from the unexposed face

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.

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

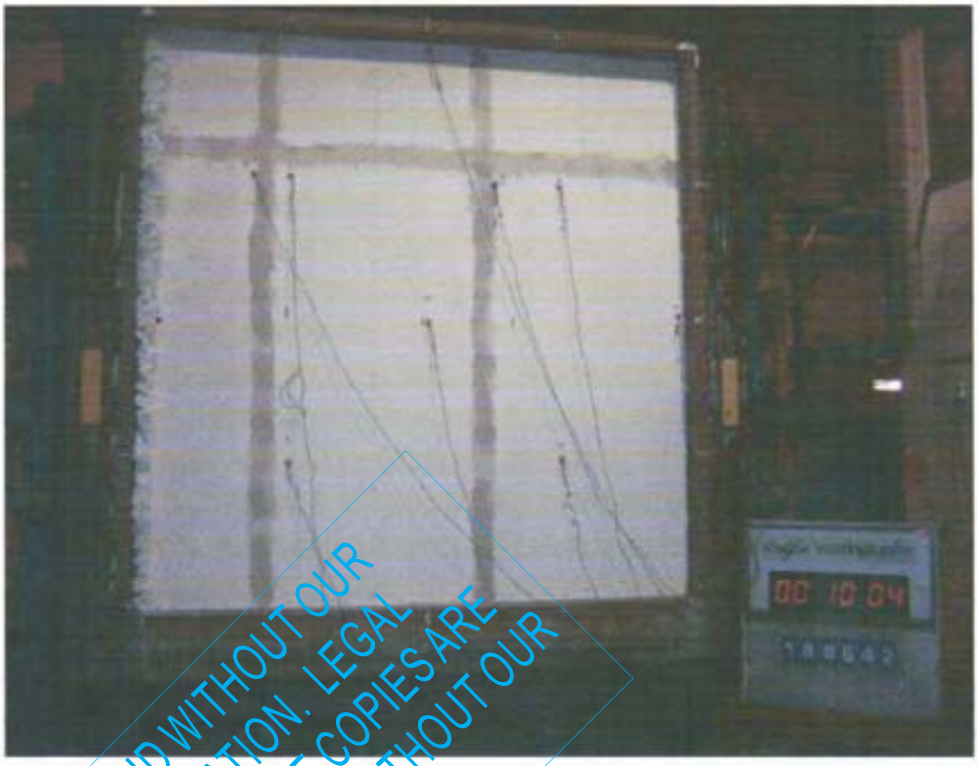
Time		All observations are from the unexposed face unless noted otherwise.
mins	secs	The ambient air temperature in the vicinity of the test construction was 11°C at the start of the test with no variation during the test.
00	00	**The test commences.**
17	00	Slight smoke release seen along the free edge.
19	30	The exposed face of the partition glows orange.
21	00	The centre of the partition starts to bow in towards the furnace.
30	00	The specimen continues to satisfy the test criteria.
41	42	A small hairline crack is visible on the unexposed face above thermocouple 6 caused by deflection of the partition, no smoke release is visible from the crack.
44	40	The exposed face now glows bright orange.
46	19	The unexposed face board also cracks just above thermocouple 5. Slight greenish discolouration is visible just above the top horizontal joint.
51	01	A horizontal crack is now visible running across the face of the partition just above thermocouples 5 and 6, no smoke release is visible from the crack.
60	00	The specimen continues to satisfy the test criteria.
62	00	Slight smoke release now visible from the horizontal crack just above thermocouple 6.
65	30	Very faint glowing can be seen near the stud behind the crack above thermocouple 6.
67	59	The horizontal crack continues to expand glowing can now be seen at approximately mid-span behind the crack.
70	18	At approximately mid-span It's now visible that the board and core behind the crack on the unexposed has fallen away.
71	30	**A 6 mm gap gauge is able to penetrate into the furnace chamber at mid-span along the horizontal crack, over a distance greater than 150 mm. Integrity failure is deemed to have occurred.**
		The test is discontinued at the sponsors request.

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 10 minutes



The unexposed face of the test construction after a test duration of 30 minutes

The unexposed face of the test construction after a test duration of 60 minutes

The exposed face of the test construction immediately after the test

Temperature and Deflection 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	18
3	502	488
6	603	560
9	663	659
12	706	690
15	739	735
18	766	765
21	789	780
24	809	808
27	826	829
30	842	843
33	856	865
36	869	874
39	881	888
42	892	898
45	902	905
48	912	914
51	921	921
54	930	928
57	938	931
60	945	940
63	953	957
66	960	958
69	966	957
72	973	965

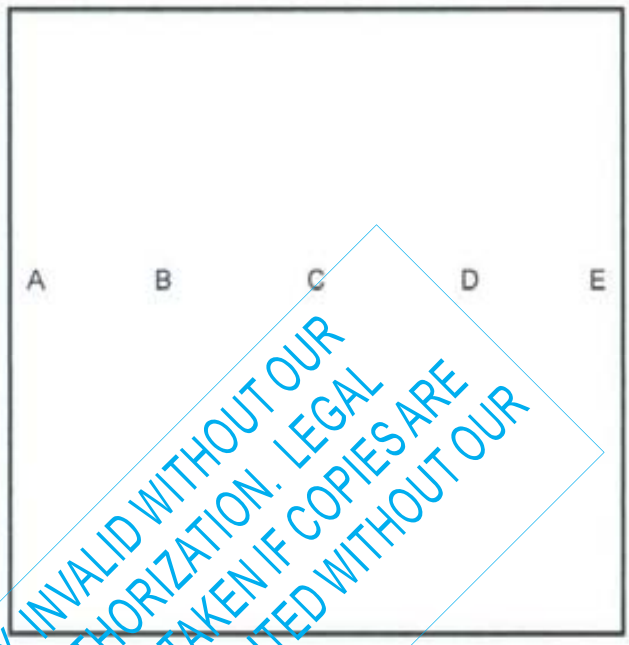
Individual and mean temperatures recorded on the unexposed surface

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 6 Deg. C	Mean Temp. Deg. C
0	13	13	13	12	13	13
3	13	13	13	12	13	13
6	13	13	13	12	13	13
9	14	17	17	14	14	15
12	23	33	35	20	22	27
15	45	48	55	31	39	44
18	62	56	61	42	51	54
21	64	61	63	49	56	59
24	64	62	62	52	58	60
27	63	61	61	54	58	59
30	61	60	59	53	56	58
33	59	58	59	52	53	56
36	58	59	59	53	52	56
39	58	61	60	55	53	57
42	60	64	62	59	58	61
45	63	68	66	64	64	65
48	67	73	70	69	70	70
51	71	75	74	73	76	74
54	75	79	78	78	82	78
57	78	82	82	82	87	82
60	81	85	87	87	90	86
63	85	89	103	97	91	93
66	89	97	108	103	104	100
69	94	99	124	107	109	107
72	96	100	158	123	118	119

Individual temperatures recorded on the unexposed surface

Time Mins	T/C Number 7 Deg. C	T/C Number 8 Deg. C	T/C Number 9 Deg. C	T/C Number 10 Deg. C
0	13	13	13	14
3	13	13	13	14
6	13	13	13	14
9	18	16	17	17
12	59	30	31	33
15	73	52	47	51
18	73	63	55	58
21	72	64	60	62
24	71	64	62	63
27	70	63	61	63
30	66	62	62	62
33	63	60	61	60
36	64	60	61	60
39	64	60	63	61
42	65	61	66	63
45	67	63	69	66
48	71	67	73	70
51	74	70	76	74
54	76	74	79	77
57	78	77	83	80
60	80	81	85	83
63	82	84	87	86
66	84	87	92	88
69	86	92	96	91
72	88	97	98	93

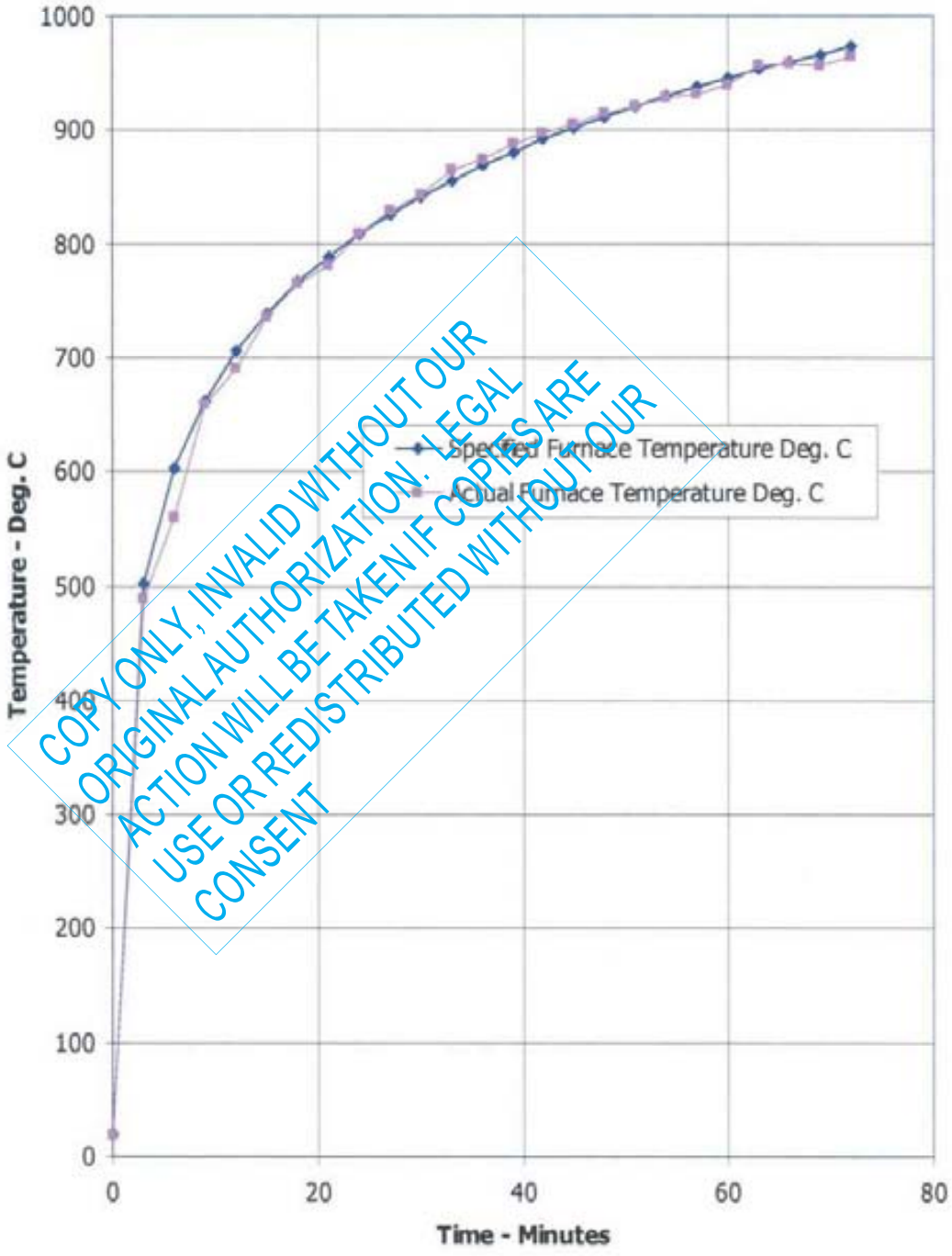
Horizontal deflections of the unexposed face of the specimen during the test



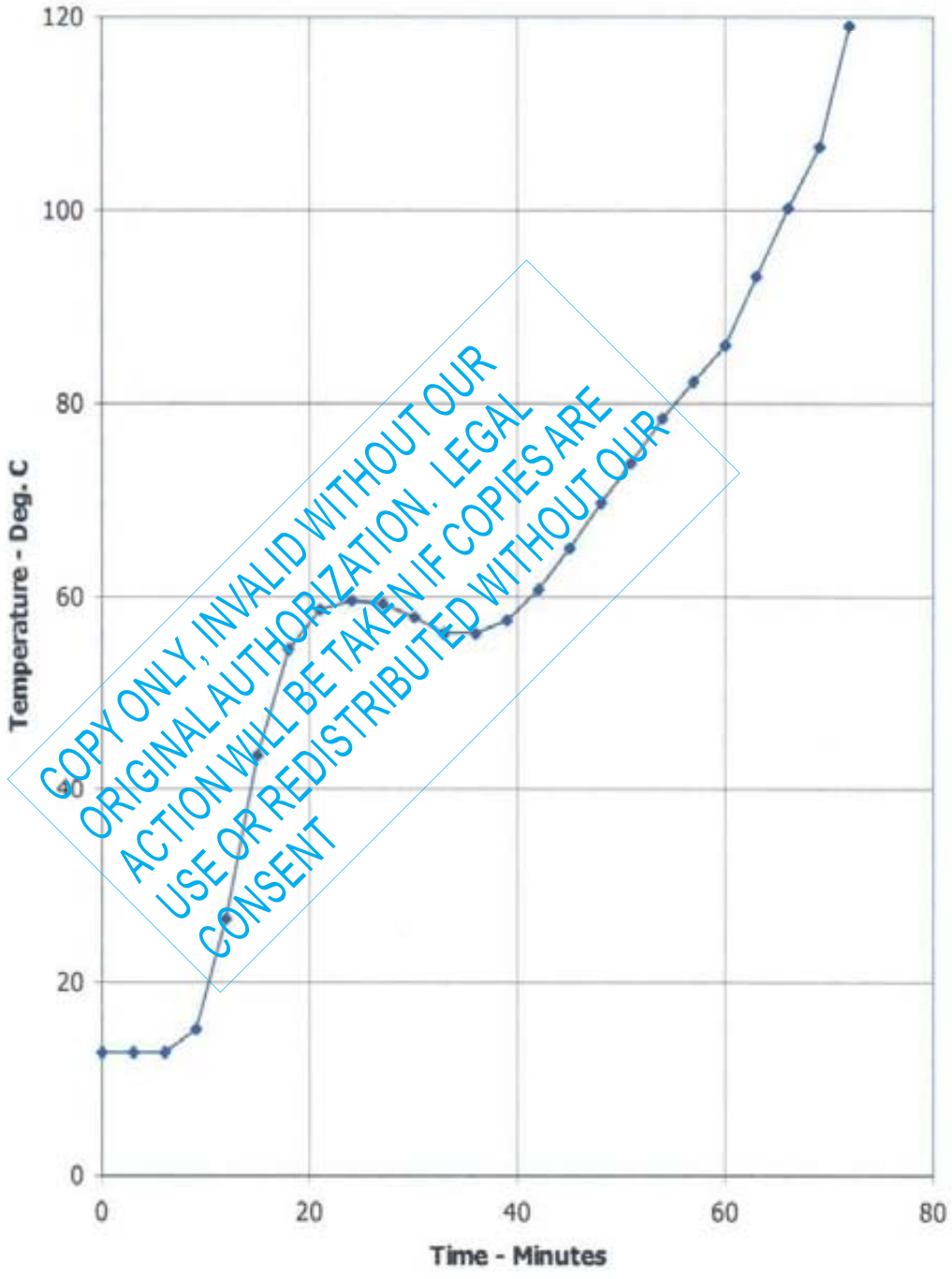
Time Mins	A	B	C	D	E
0	0	0	0	0	0
10	1	11	15	13	2
20	5	34	41	41	6
30	1	56	68	64	4
40	-10	54	64	58	1
50	-14	45	51	46	2
60	-16	39	39	32	-1

Positive deflections indicate movement towards the furnace chamber

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 71 minutes after which time failure was attributed due to the formation of a through gap in excess of 6 mm by 150 mm.

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 71 minutes after which time integrity 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 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 non-loadbearing, partition 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	71 minutes
Insulation	71 minutes

The test was discontinued after a period of 71 minutes.