Warringtonfire
Holmesfield Road
Warrington
Cheshire
WA1 2DS
United Kingdom
T: +44 (0)1925 655116
W: www.warringtonfire.com

Title:

The Fire Resistance Performance Of Two Specimens Of Vertically Mounted Cavity Barriers And Two Specimens Of Horizontally Mounted Cavity Barriers, When Tested Generally In Accordance With EN 1366-4: 2006 +A1:2010

Report No:

413654

Prepared for:

Manthorpe Building Products Ltd
Manthorpe House
Britain Drive
Ripley
Derbyshire
DE5 3ND

Date:

8th July 2019

Summary

Objective

A fire resistance test has been conducted to assess the ability of two vertical specimens of cavity barriers in an autoclaved aerated concrete blockwork wall and two horizontal specimens of cavity barriers in an aerated concrete floor, to reinstate the fire resistance of the wall and floor constructions when tested generally in accordance with EN 1366-4: 2006 +A1:2010.

Sponsor

Manthorpe Building Products Ltd
Manthorpe House
Britain Drive
Ripley
Derbyshire
DE5 3ND

Summary of the Tested Specimens

For the purpose of the test the floor specimens were referenced A and B and the wall specimens were referenced C and D.

The section of wall had overall dimensions of 1500 mm high by 1500 mm wide by 150 mm thick and was made up of aerated concrete blocks arranged to provide two cavities of 130 mm wide and 1000 mm in length.

The section of floor had overall dimensions of 2220 mm long by 1700 mm wide by 150 mm thick and was made up of autoclaved aerated concrete lintels arranged to provide two cavities of 130 mm wide and 1000 mm in length.

Each cavity was sealed with a Manthorpe Building Products Ltd 'G249F' Cavity closer, comprising of a rock fibre insulation within a plastic case. Specimen A was installed to the exposed face of the floor, Specimen B was installed to the unexposed face of the floor, Specimen C was installed to the unexposed face of the wall and Specimen D was installed to the exposed face of the wall.

Full details of the specimens and installation methods are given in the Schedule of Components.

Test Results

Specimen	Integrity (minutes)		Insulation (minutes)
	Cotton Pad	Sustained flaming	
A	80	80	34
B	65	65	31
C	105	105	25
D	80	102#	25

The test was discontinued after a period of 106 minutes.

Specimen blanked off.

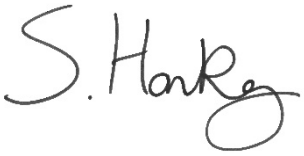
Date of Test

9th May 2019

Signatories

Responsible Officer
C. Sweeney*
Technical Officer

Approved
S. Gilfedder*
Test Report Co-Ordinator



Head of Department
S. Hankey*
Business Unit Head

* For and on behalf of **Warringtonfire.**

Report Issued

Date : 8th July 2019

CONTENTS PAGE NO.

Test Procedure

Introduction

Walls and floors often incorporate gaps to accommodate a specific degree of movement within the linear joint. The fire resistance of such elements is only as good as their weakest point and it is, therefore, important that any gaps or apertures are adequately sealed, such that weaknesses are not created at these positions.

The specimens were judged on their ability to comply with the performance criteria for integrity and insulation, as required by EN 1366-4: 2006 +A1:2010.

The specimens do not comply with the minimum length to width ratio of 10:1 as specified in EN 1366-4: 2006 +A1:2010. As such they have been reported as generally in accordance with EN 1366-4: 2006 +A1:2010.

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 9th May 2019 at the request of Manthorpe Building Products Ltd, the sponsor of the test.

Mr. B. Hales, a representative of the test sponsor witnessed the test.

Test Specimen Construction

A comprehensive description of the test constructions 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

Warringtonfire supplied the wall and floor constructions. The cavity barriers were installed by a representative of the test sponsor on the 8th May 2019.

Sampling

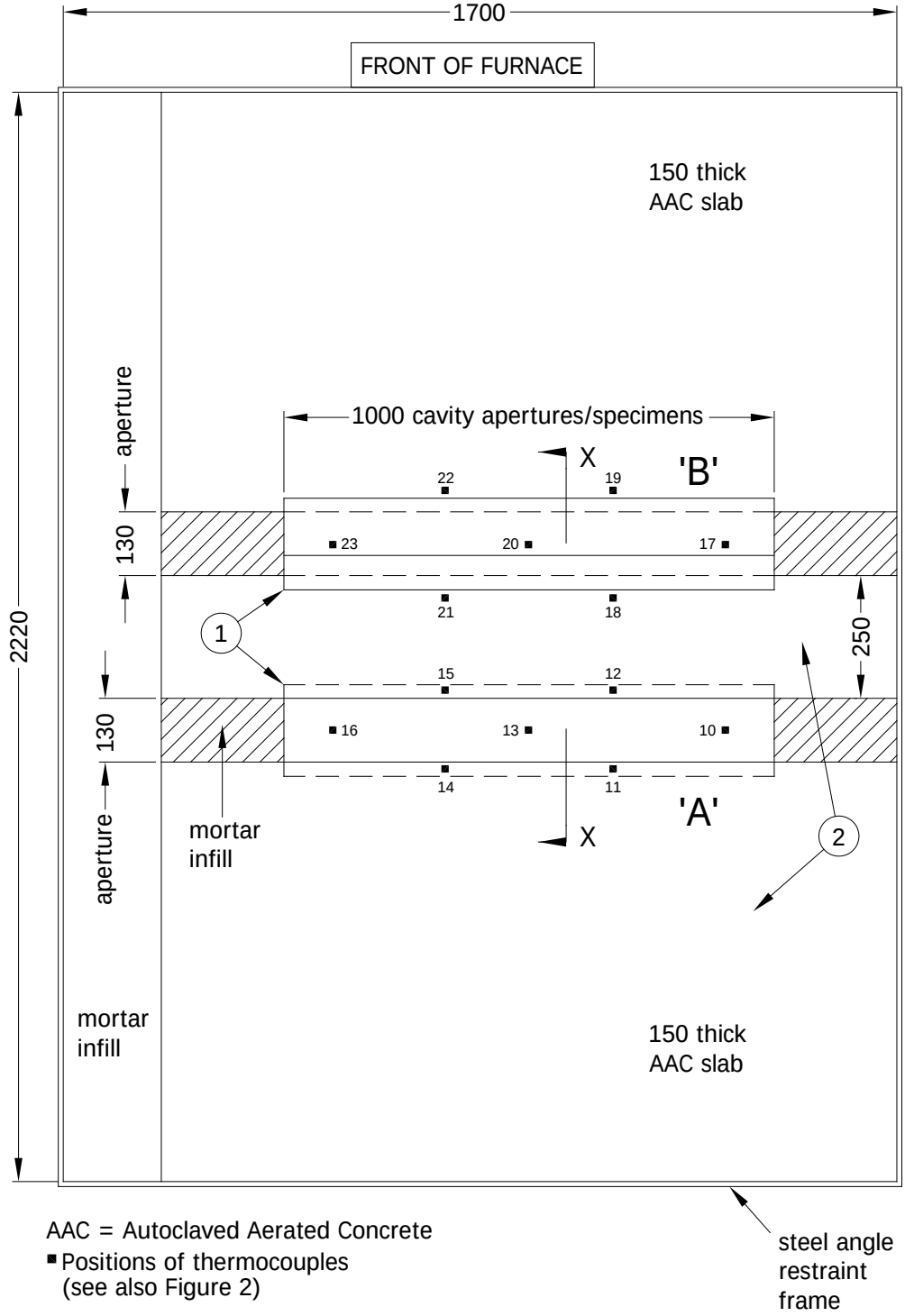
Warringtonfire did not take part in the selection or sampling of any products used for the test.

Conditioning

The specimens' 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 13.5°C to 21.5°C and 48.5% to 68% respectively.

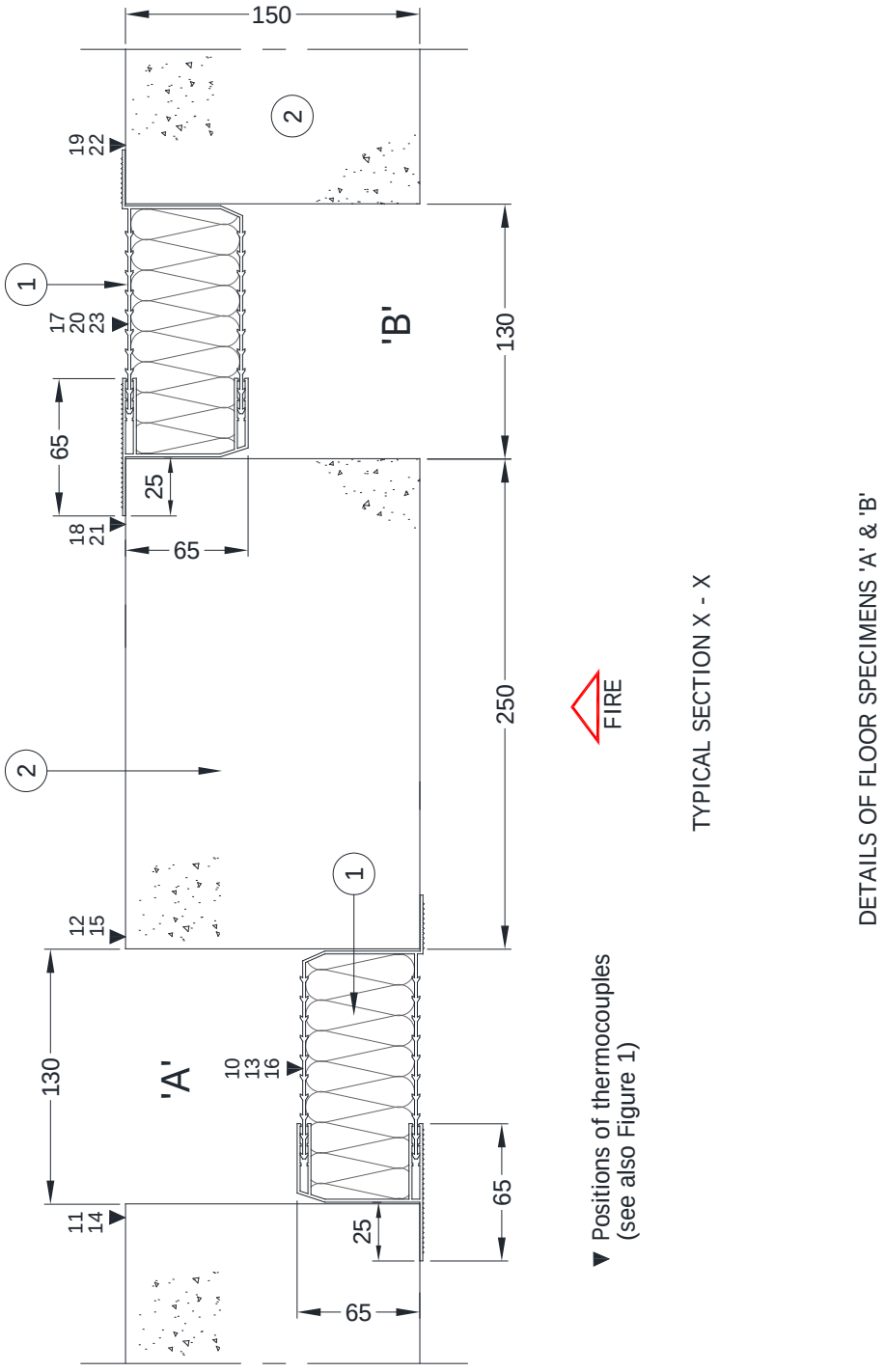
Test Specimen

Figure 1- General plan of floor specimens 'A' and 'B' and unexposed face thermocouples



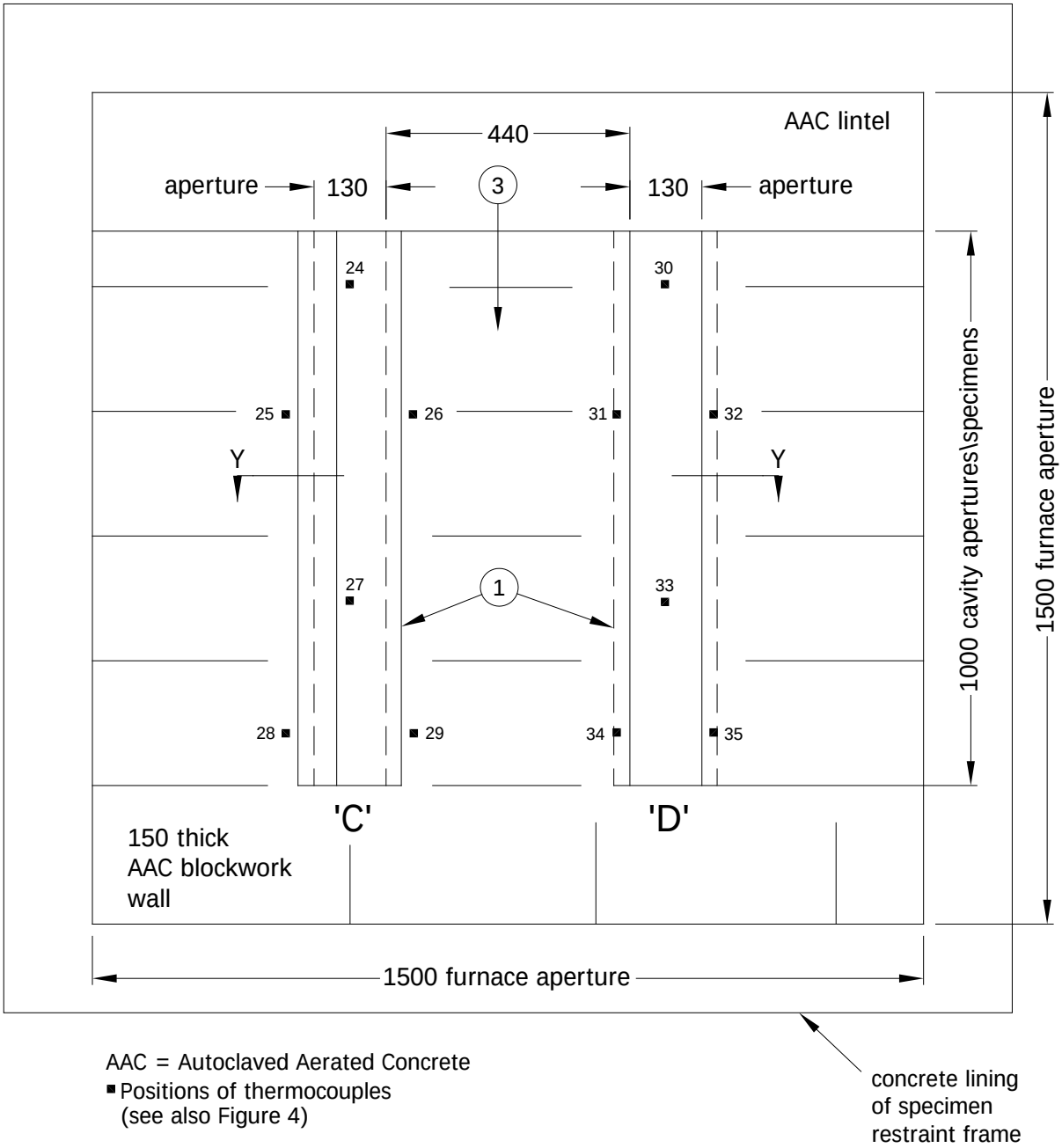
Do not scale. All dimensions are in mm

Figure 2 – Details of floor Specimens ‘A’ and ‘B’



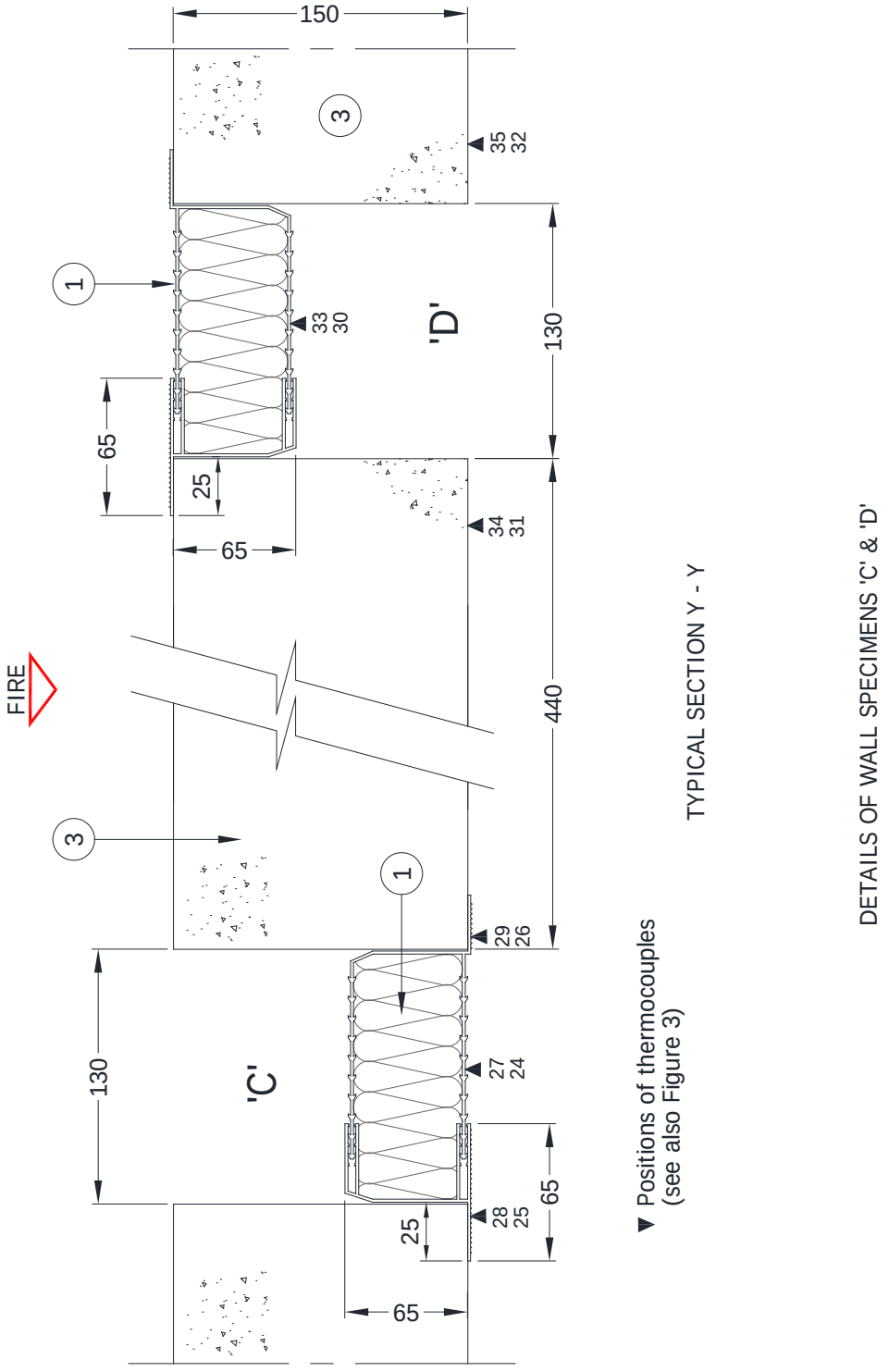
Do not scale. All dimensions are in mm

Figure 3 – General elevation of wall specimens 'C' and 'D' and unexposed face thermocouples



Do not scale. All dimensions are in mm

Figure 4 – Details of wall specimens ‘C’ and ‘D’



Do not scale. All dimensions are in mm

Schedule of Components

(Refer to Figures 1 to 4)
(All values are nominal unless stated otherwise)
(All other details are as stated by the sponsor)

Item		Description
1. Thermal cavity closer		
Manufacturer	:	Manthorpe Building Products Ltd
Reference	:	G249F
Material	:	Rock fibre insulating core within a plastics case
Overall Size	:	180 mm wide x 1000 mm long x 65 mm thick
Details of Core		
i. product reference	:	Rockwool (Lamella)
ii. material	:	Mineral Wool
iii. density	:	100 kg/m^3 (stated)
iv. length	:	1000 mm
Details of Casing		
i. material	:	Extruded PVCu plastic
ii. length	:	1000 mm
Fixing Method		
i. Specimen A	:	Friction fitted into the aperture flush with the exposed face of the construction with two nails to each flange 100 mm in from the ends to hold it within the aperture.
ii. Specimens B and C	:	Friction fitted into the aperture flush with the unexposed face of the construction
iii. Specimen D	:	Friction fitted into the aperture flush with the exposed face of the construction
2. Concrete floor		
Material	:	Autoclaved aerated concrete floor
Density	:	670 kg/m3
Thickness	:	150 mm
Bedding material	:	Sand and cement mortar
Cavity aperture sizes	:	1000 mm long x 130 mm wide
3. Masonry wall		
Material	:	Autoclaved aerated blockwork wall
Density	:	760 kg/m^3
Thickness	:	150 mm
Bedding material	:	Sand and cement mortar
Cavity aperture sizes	:	1000 mm high x 130 mm wide

Instrumentation

General

The instrumentation was provided in accordance with the requirements of EN 1366-4: 2006 +A1:2010.

Furnace

The furnace was controlled so that its mean temperature complied with the requirements of BS EN 1363-1: 2012 Clause 5.1 using four plate thermometers, distributed over a plane 100 mm from the surface of the vertical test construction and four plate thermometers, distributed over a plane 100 mm from the surface of the horizontal 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:

The locations and reference numbers of the various unexposed surface thermocouples are shown in Figures 1 and 3.

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 were available to evaluate the integrity of the specimens.

Furnace Pressure

After the first five minutes of testing, the furnace pressure was controlled to maintain a slightly positive pressure relative to the pressure of the laboratory. The furnace atmospheric pressure was measured and controlled such that, at a point at mid height of the wall specimens, the differential pressure was calculated to be 15 (±2) Pa. At a position 100 mm below the underside of the floor assembly the pressure was calculated to exceed the required 20 (±3) 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 13ºC at the start of the test with a maximum variation of ±7ºC during the test.
00	00	**The test commences.**
01	12	Smoke release from all specimens.
04	45	Smoke release continues.
06	42	Moisture release and yellow substance from Specimen C.
07	47	Plastic on face of Specimen C beginning to melt in the top right corner.
12	15	Specimen D is beginning to distort at the head.
12	53	Specimen B is beginning to distort at the head and centre.
13	01	Specimen C is beginning to distort at both ends.
16	36	Thermocouple 24 and thermocouple 30 have fallen off.
17	41	Specimen D is pushing out, away from the heating conditions.
19	17	Specimen A is distorting at both ends.
22	13	The plastic continues to come away from the insulation at the head of Specimen D.
24	01	Plastic is shrinking away from end of specimen B.
26	00	Thermocouple 27 and thermocouple 33 have fallen off.
32	24	Edges of Specimen C are coming away from blockwork.
36	56	Plastic falls away from the face of Specimen D.
37	30	Edges of Specimen B are lifting from the concrete construction.
41	01	Possible to see into furnace through small hole on Specimen C.
50	01	The insulation material is visible on Specimen A.
52	11	Holes are forming in plastic on Specimen A.
56	07	Cotton wool pad applied to Specimen C at the head did not ignite.
57	00	Roving thermocouple 210ºC at the head of specimen C.
58	00	Roving thermocouple 216ºC at the head of specimen D.

Time		
mins	secs	
65	01	**Specimen B fails integrity. Cotton wool pad applied followed by sustained flame. Specimen blanked off.**
71	01	Specimen D insulation visibly shaking.
80	00	**Specimen D failed cotton pad at the head. Integrity failure is deemed to have occurred.**
80	01	**Specimen A has fallen in to the furnace. Sustained flame, integrity failure is deemed to have occurred. Specimen blanked off.**
90	00	Specimen C continues to satisfy integrity criteria.
102	00	**Specimen D blanked off for safety.**
104	11	Specimen C insulation beginning to vibrate.
104	48	Plastic falls away from insulation on Specimen C.
105	00	**Specimen C falls into the furnace. Integrity failure is deemed to have occurred.**
106	00	**Test discontinued.**

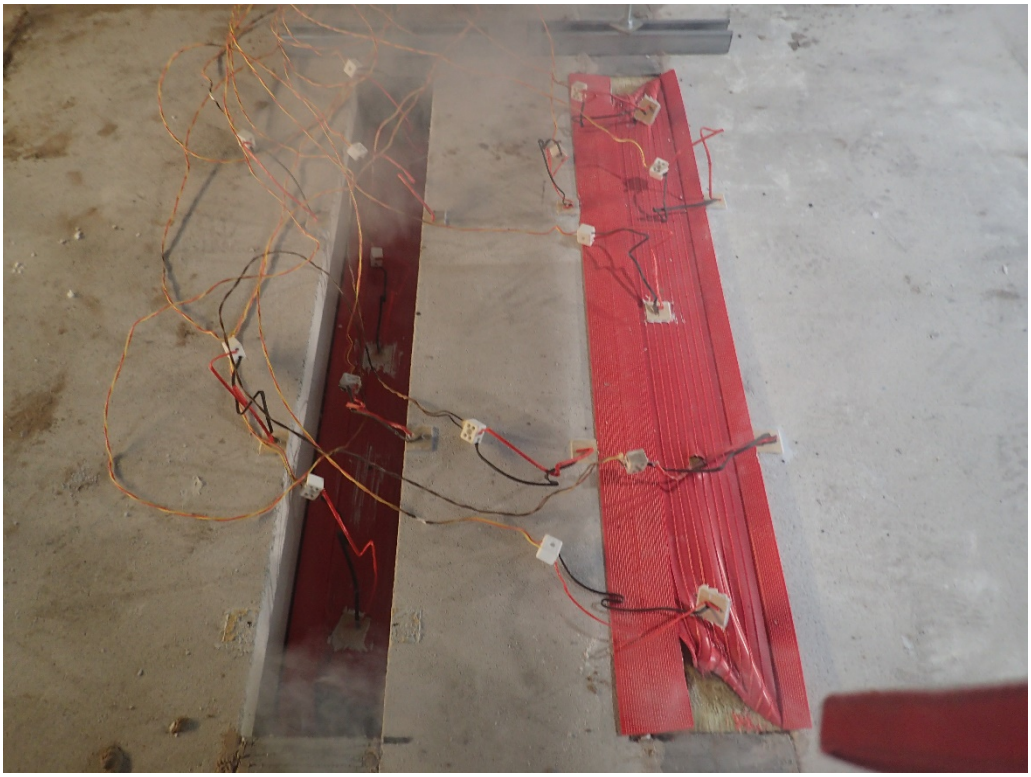
Test Photographs

The exposed face of the wall construction prior to testing

The exposed face of the floor construction prior to testing

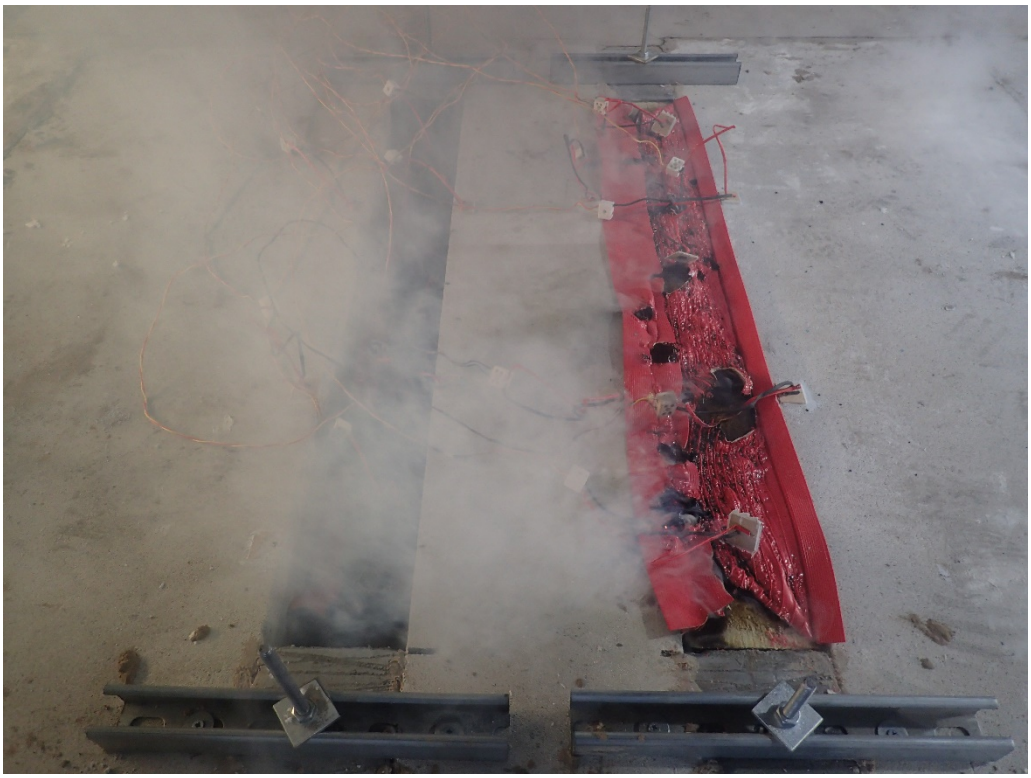
The unexposed face of the wall construction after a test duration of 30 minutes

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



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

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



The unexposed face of the wall construction after a test duration of 90 minutes

The unexposed face of the wall construction after a test duration of 105 minutes

The exposed face of the wall construction immediately after the test

The exposed face of the floor construction immediately after the test

Temperature Data

Mean Furnace Temperature, Together With The Temperature/Time Relationship Specified In BS EN 1363-1: 2012

Time Mins	Specified Furnace Temperature Deg. C	Actual Furnace Temperature Deg. C
0	20	34
3	502	518
6	603	593
9	663	657
12	705	703
15	739	733
18	766	760
21	789	786
24	809	806
27	826	822
30	842	838
33	856	852
36	869	866
39	881	877
42	892	888
45	902	900
48	912	911
51	921	921
54	930	931
57	938	940
60	945	947
63	953	956
66	960	972
69	966	969
72	973	975
75	979	980
78	985	985
81	990	992
84	996	995
87	1001	1000
90	1006	1005
93	1011	1010
96	1016	1015
99	1020	1019
102	1025	1023
105	1029	1028

Individual Temperatures Recorded On The Unexposed Surface And Adjacent To Specimen A

Time	T/C Number 10	T/C Number 11	T/C Number 12	T/C Number 13	T/C Number 14	T/C Number 15	T/C Number 16
Mins	Deg. C	Deg. C	Deg. C	Deg. C	Deg. C	Deg. C	Deg. C
0	17	16	16	18	15	16	17
2	17	16	16	17	15	16	17
4	27	16	16	24	15	16	23
6	42	16	16	41	15	16	37
8	56	16	16	53	16	16	48
10	67	16	17	63	16	17	61
12	93	17	17	67	17	17	72
14	113	17	18	89	18	18	109
16	133	17	18	111	18	18	132
18	150	18	19	123	18	19	91
20	168	18	20	135	19	19	74
22	180	18	20	146	19	20	72
24	187	19	21	156	19	20	67
26	190	19	21	164	20	20	64
28	190	20	22	172	20	21	69
30	189	20	22	178	21	21	71
32	190	20	23	184	21	22	73
34	194	20	23	189	22	22	76
35	199	21	24	192	22	22	77
36	205	21	24	192	22	22	76
38	217	21	24	194	23	23	77
40	232	22	25	202	25	23	80
42	250	22	26	209	26	24	85
44	273	23	27	217	26	26	84
46	292	24	28	226	26	26	86
48	309	25	28	237	28	27	94
50	324	26	29	244	30	28	100
52	340	27	31	248	31	29	104
54	351	29	32	253	31	30	106
56	352	29	33	260	32	31	109
58	345	30	35	263	33	31	111
60	339	31	36	265	34	32	111
62	331	32	38	263	34	33	107
64	325	32	41	252	35	35	108
66	322	33	42	231	36	42	108
68	309	35	41	218	37	41	108
70	301	36	42	200	38	42	109
72	287	37	43	191	39	45	112
74	282	38	44	189	41	48	121
76	274	39	45	195	40	50	117
78	281	40	46	195	41	51	115
80	291	41	48	194	43	56	125
81	#	#	#	#	#	#	#
105	#	#	#	#	#	#	#

Specimen Blanked Off

Individual Temperatures Recorded On The Unexposed Surface And Adjacent To Specimen B

Time	T/C Number	T/C Number	T/C Number	T/C Number	T/C Number	T/C Number	T/C Number
Mins	17	18	19	20	21	22	23
	Deg. C	Deg. C	Deg. C	Deg. C	Deg. C	Deg. C	Deg. C
0	15	18	18	17	18	17	15
2	15	18	17	17	18	17	15
4	32	18	17	21	18	17	31
6	42	18	17	31	18	17	42
8	48	18	18	40	18	17	49
10	57	18	18	48	18	17	57
12	74	18	18	56	18	18	66
14	104	19	18	65	19	18	83
16	126	19	19	73	19	19	111
18	125	20	20	85	20	20	134
20	129	21	21	101	21	22	*
22	*	21	24	118	22	24	*
24	*	23	26	131	24	27	*
26	*	25	29	142	26	30	*
28	*	27	32	149	28	33	*
30	*	29	35	155	30	36	*
31	*	30	37	150	32	38	*
32	*	31	39	*	33	39	*
34	*	34	42	*	35	42	*
36	*	37	45	*	38	46	*
38	*	40	48	*	41	48	*
40	*	43	51	*	44	51	*
42	*	46	54	*	47	54	*
44	*	49	56	*	49	57	*
46	*	51	58	*	51	59	*
48	*	55	60	*	54	61	*
50	*	58	62	*	57	62	*
52	*	60	64	*	59	64	*
54	*	62	66	*	61	66	*
56	*	64	67	*	63	68	*
58	*	66	69	*	64	69	*
60	*	68	70	*	66	70	*
62	*	71	72	*	68	72	*
64	*	77	75	*	69	73	*
65	*	85	74	*	71	73	*
66	#	#	#	#	#	#	#
105	#	#	#	#	#	#	#

* Thermocouple Malfunction
# Specimen Blanked Off

Individual Temperatures Recorded On The Unexposed Surface And Adjacent To Specimen C

Time	T/C Number	T/C Number	T/C Number	T/C Number	T/C Number	T/C Number
Mins	24	25	26	27	28	29
	Deg. C	Deg. C	Deg. C	Deg. C	Deg. C	Deg. C
0	17	18	18	19	18	19
3	21	20	19	19	18	19
6	38	22	21	27	19	19
9	56	26	23	45	19	19
12	76	28	25	63	19	19
15	105	29	28	76	19	19
18	*	31	33	98	20	20
21	*	35	38	118	21	21
24	*	39	42	134	22	22
25	*	42	43	139	23	23
26	*	43	45	*	24	24
27	*	45	47	*	25	26
30	*	50	52	*	28	31
33	*	55	58	*	32	36
36	*	60	66	*	37	41
39	*	66	71	*	43	46
42	*	71	76	*	48	50
45	*	75	80	*	53	55
48	*	78	83	*	57	59
51	*	80	85	*	61	63
54	*	82	87	*	65	67
57	*	84	89	*	68	70
60	*	86	90	*	71	73
63	*	87	91	*	74	76
66	*	89	92	*	77	78
69	*	90	93	*	78	80
72	*	91	94	*	79	82
75	*	92	95	*	81	84
78	*	93	96	*	82	85
81	*	95	97	*	83	86
84	*	97	97	*	85	87
87	*	98	98	*	87	88
90	*	98	98	*	88	89
93	*	98	98	*	89	89
96	*	99	99	*	89	90
99	*	100	100	*	89	90
102	*	100	100	*	89	91
105	*	101	101	*	89	91

* Thermocouple Malfunction

Individual Temperatures Recorded On The Unexposed Surface And Adjacent To Specimen D

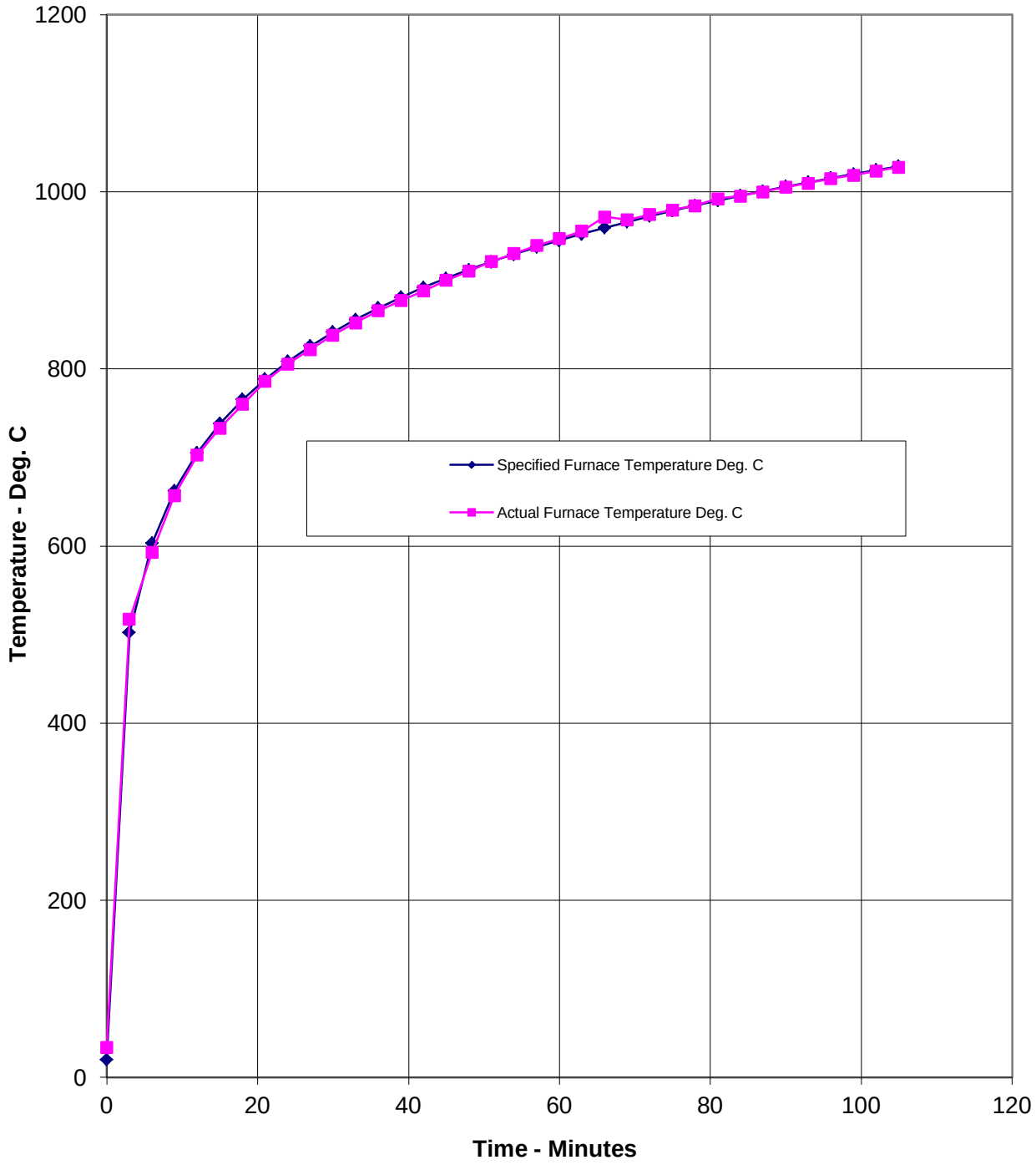
Time	T/C Number	T/C Number	T/C Number	T/C Number	T/C Number	T/C Number
Mins	30	31	32	33	34	35
	Deg. C	Deg. C	Deg. C	Deg. C	Deg. C	Deg. C
0	19	18	18	17	18	17
3	26	19	18	19	18	18
6	47	19	19	32	18	18
9	71	19	19	58	18	18
12	102	19	19	76	19	18
15	130	19	19	105	19	18
18	*	19	19	128	19	19
21	*	19	19	147	19	19
24	*	19	20	164	20	19
25	*	19	20	167	20	20
26	*	19	20	*	20	20
27	*	19	20	*	20	20
30	*	20	21	*	20	21
33	*	20	21	*	21	21
36	*	21	22	*	22	22
39	*	21	23	*	22	23
42	*	22	24	*	23	24
45	*	23	25	*	23	24
48	*	24	26	*	24	24
51	*	25	27	*	24	25
54	*	26	29	*	24	25
57	*	27	30	*	25	26
60	*	29	32	*	25	26
63	*	30	34	*	25	27
66	*	31	36	*	26	28
69	*	33	38	*	27	28
72	*	35	40	*	28	29
75	*	37	42	*	29	30
78	*	40	45	*	30	31
81	*	42	47	*	31	32
84	*	45	51	*	33	34
87	*	48	54	*	34	35
90	*	51	57	*	35	36
93	*	54	60	*	36	37
96	*	57	63	*	37	39
99	*	60	66	*	39	40
102	#	#	#	#	#	#
105	#	#	#	#	#	#

* Thermocouple Malfunction
# Specimen Blanked Off

Graph Showing Recorded Furnace Pressure 250 mm Above The Head Of The Wall Specimens

Time Mins	Recorded Pressure Pascals
0	0.0
3	11.4
6	22.0
9	20.9
12	22.4
15	21.1
18	21.1
21	21.1
24	22.0
27	20.5
30	20.5
33	21.6
36	21.6
39	21.3
42	22.5
45	20.9
48	21.8
51	22.4
54	21.8
57	21.5
60	19.7
63	19.8
66	21.6
69	20.2
72	20.9
75	21.3
78	20.9
81	7.3
84	21.6
87	21.0
90	20.4
93	20.5
96	19.9
99	21.7
102	22.1
105	20.8

Graph Showing Mean Furnace Temperature, Together With The Temperature/Time Relationship Specified In BS EN 1363-1: 2012



Performance Criteria and Test Results

Integrity

It is required that the specimen retains its separating function, without either causing ignition of a cotton pad when applied as specified in BS EN 1363-1: 2012, or resulting in sustained flaming on the unexposed surface.

These requirements were satisfied for the periods shown below.

Test Results

Specimen	Integrity (minutes)	
	Cotton Pad	Sustained flaming
A	80	80
B	65	65
C	105	105
D	80	102#

The test was discontinued after a period of 105 minutes.

Specimen blanked off.

Insulation

The requirements of the standard are that the maximum temperature rise shall not be greater than 180°C. Insulation failure also occurs simultaneously with integrity failure as specified in BS EN 1363-1: 2012.

These requirements were satisfied for the periods shown below:

Test Results

Specimen	Insulation (minutes)
A	34
B	31
C	25
D	25

The test was discontinued after a period of 105 minutes.

Specimen blanked off.

Ongoing Implications

Limitations

The results relate only to the behaviour of the specimens 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 results may not be applicable to situations where the joint widths, sealant depths, orientations, supporting construction and backing material vary from those tested.

Conclusions

Evaluation against objective

A fire resistance test has been conducted to assess the ability of two wall mounted specimens and two floor mounted specimens of cavity barriers, to reinstate the integrity and insulation performance (as defined in EN 1366-4: 2006 +A1:2010) of a simulated construction, where adjacent structures abut.

Test Results:

Specimen	Integrity (minutes)		Insulation (minutes)
	Cotton Pad	Sustained flaming	
A	80	80	34
B	65	65	31
C	105	105	25
D	80	102#	25

The test was discontinued after a period of 105 minutes.

Specimen blanked off.