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

Title:

The Fire Resistance Performance of an Asymmetrical, Non-Load Bearing, Partition Wall Assembly, Tested in Accordance with BS EN 1364-1: 2015

Date of Test:

06 June 2024

Issue 1

16 August 2024

WF Report No.

544439/R

Prepared for:

Lancaster insulation/MC Resources

34 Port Royal Avenue
Lune Ind. Est.
Lancaster
LA1 5QP

0249

Test Specimen

Summary of Tested Specimen

The specimen had overall nominal dimensions of 3035 mm high by 3040 mm wide by nominally 25 mm thick and was formed from a fire curtain referenced ‘Stone shield Fire control 5009’. The fire curtain was formed 21 micron thick basalt mineral wool core with 0.6 mm thick fibreglass, 12 µm thick foil, and 0.4 mm thick E-glass cloth layers to both outer faces. The barrier was through fixed using 1 mm thick galvanised steel angle. The barrier contained three vertical joints with 255 mm wide overlaps, which were adhered with ‘Fireproof Sealant Adhesive’, secured with 0.265 mm Ø steel thread and stainless stell staples at nominally 150 mm centres (see figure 5). The barrier was installed with one vertical edge unrestrained.

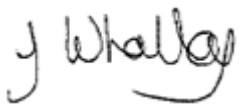
Detailed drawings of the test specimen(s) and a comprehensive description of the test construction based on a detailed survey of the specimen(s) and information supplied by the sponsor of the test are included in the Test Specimen and Schedule of Components sections of this report.

Performance Criteria and Test Results

Integrity	It is required that the specimen retains its separating function, without: ▪ causing ignition of a cotton pad when applied ▪ permitting the penetration of a gap gauge as specified in BS EN 1363-1: 2020 ▪ sustained flaming on the unexposed surface **These requirements were satisfied for the periods shown below:**				
Sustained flaming	132 minutes*				
Gap gauge	132 minutes*	No failure*			
Cotton pad	132 minutes*				
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 the period shown below:**				
Specimen	18 minutes	Exceeded maximum temperature criteria	TC12		
Radiation	BS EN 1363-2: 1999 requires that the time for the measured radiation to exceed 5, 10, 15, 20 and 25 kW/m2 is reported.				
Radiation Performance	**5 kW/m^2**	**10 kW/m^2**	**15 kW/m^2**	**20 kW/m^2**	**25 kW/m^2**
	132 minutes*	132 minutes*	132 minutes*	132 minutes*	132 minutes*
	*Test was discontinued after a period of 132 minutes.				

Date of Test 06 June 2024

Signatories



Responsible Officer
***J. Whalley**
Senior Technical Officer

Approved
***S. Gilfedder**
Technical Officer

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

Report Issued: 16 August 2024

Revision History

Issue No:	Re-issue Date:
Revised By:	Approved By:
Reason for Revision:	

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Revised By:	Approved By:
Reason for Revision:	

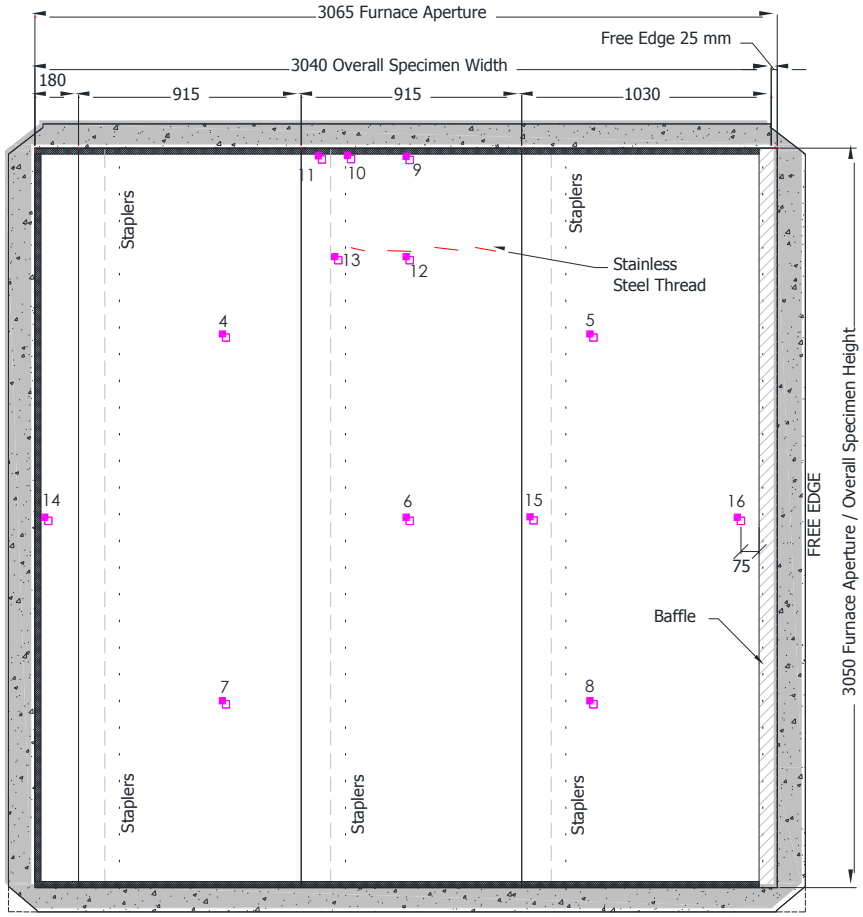
CONTENTS **PAGE NO.**

Test Conditions

Standard	BS EN 1364-1:2015 Fire resistance tests for non-loadbearing elements - Part 1: Walls.
Sampling	**Warringtonfire** was not involved in the sampling or selection of the tested specimen or any of the components. The results obtained during the test only apply to the test samples as received and tested by **Warringtonfire.**
Installation	The specimen was installed between the 03 and 05 of May 2024 and installed into a refractory concrete lined steel restraint frame, with one vertical edge unrestrained, by representative of the test sponsor.
Conditioning	The specimen's 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 16.5^{o}C to 25^{o}C and 35.5% to 64% respectively.
Instruction to Test	The test was conducted on the 06 June 2024 at the request of Lancaster insulation/MC Resources, the test sponsor. Mr. A. Clokey, Mr. B. Whitaker, and Mr. B. Rober, representative of the test sponsor witnessed the test.
Ambient Temperature	The ambient air temperature in the vicinity of the test construction was 21ºC at the start of the test with a maximum variation of -1ºC and +2ºC during the test.
Furnace	The furnace was controlled so that its mean temperature complied with the requirements of BS EN 1363-1: 2020 Clause 5.1 using nine plate thermometers, distributed over a plane 100 mm from the surface of the test construction.
Thermocouples	Thermocouples were provided to monitor the unexposed surface of the specimen. 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.
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 1 metre from the centre of the specimen.
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 EN 1363-1: 2020, clause 5.2.1 The calculated pressure differential relative to the laboratory atmosphere at the top of the specimen was 20 (± 5) Pa between 5 and 10 minutes and 20 (± 3) Pa thereafter.

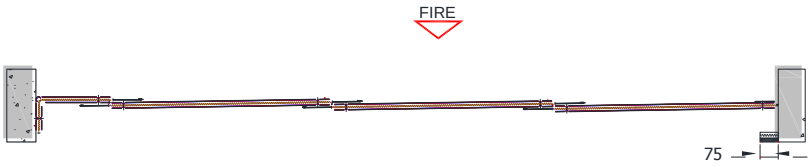
Test Specimen Drawings

Figure 1 – General Arrangement of Test Layout – Unexposed Face



▪ Positions of surface mounted thermocouples

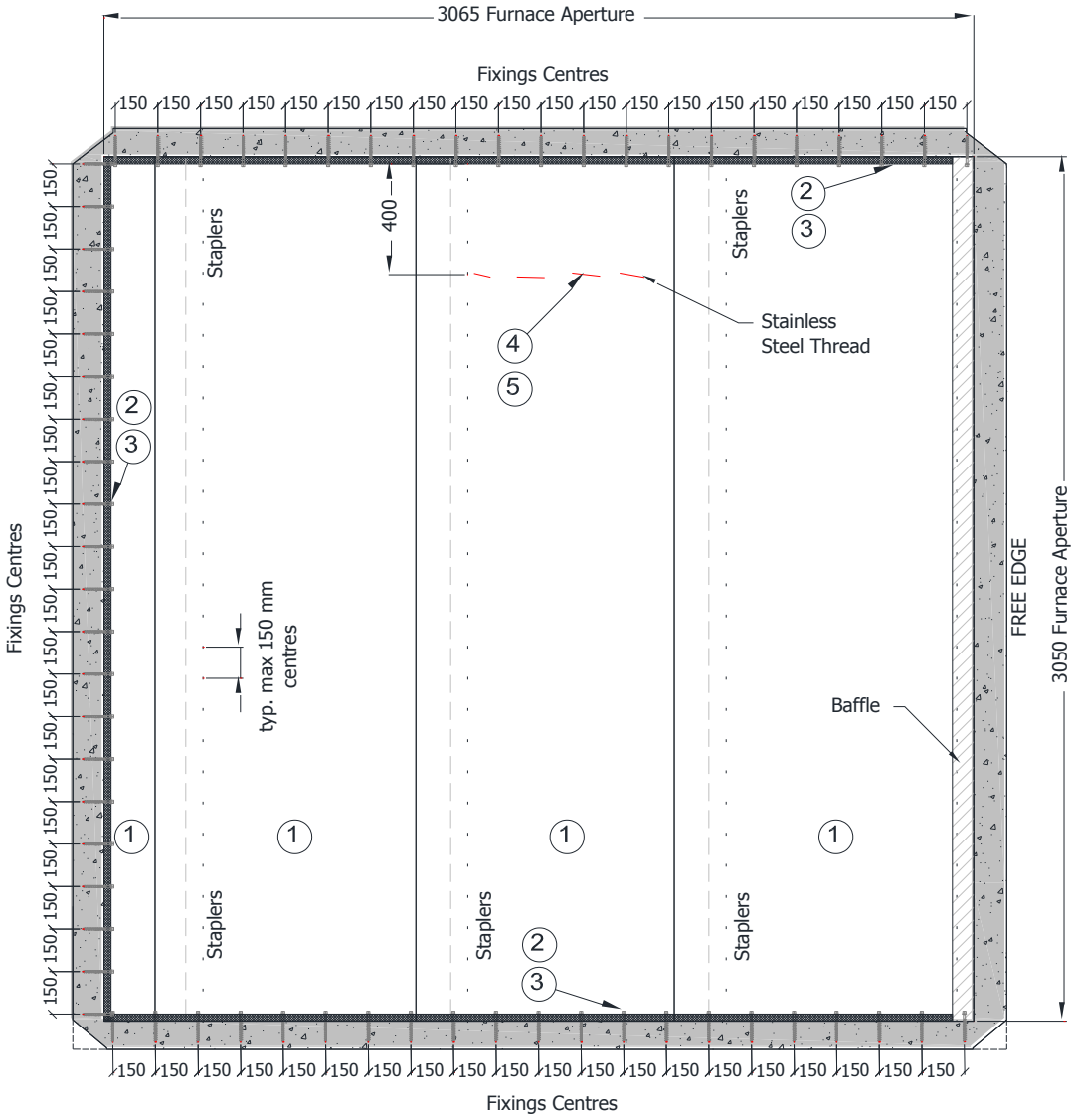
GENERAL ELEVATION OF TEST CONSTRUCTION
UNEXPOSED FACE



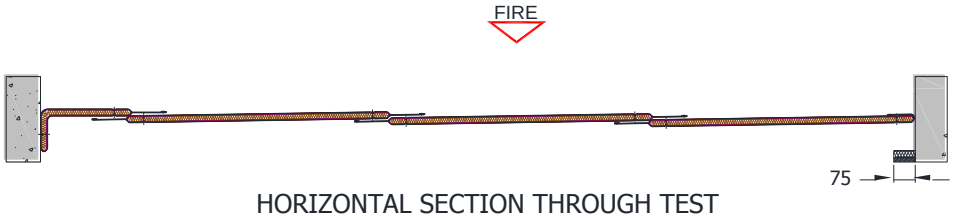
HORIZONTAL SECTION THROUGH TEST
CONSTRUCTION

Do not scale. All dimensions are in mm

Figure 2 – Elevation of Test Construction



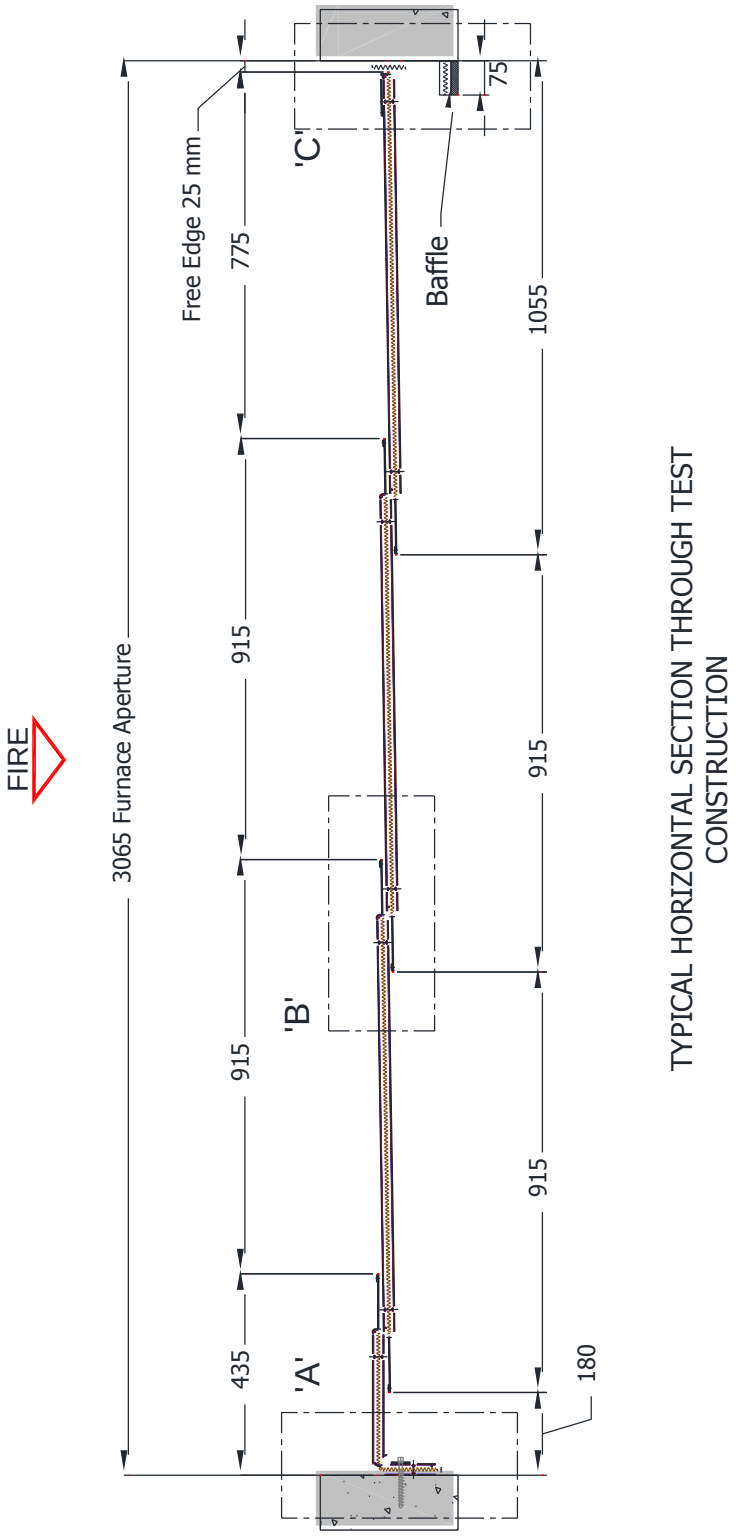
ELEVATION OF TEST CONSTRUCTION
UNEXPOSED FACE



HORIZONTAL SECTION THROUGH TEST
CONSTRUCTION

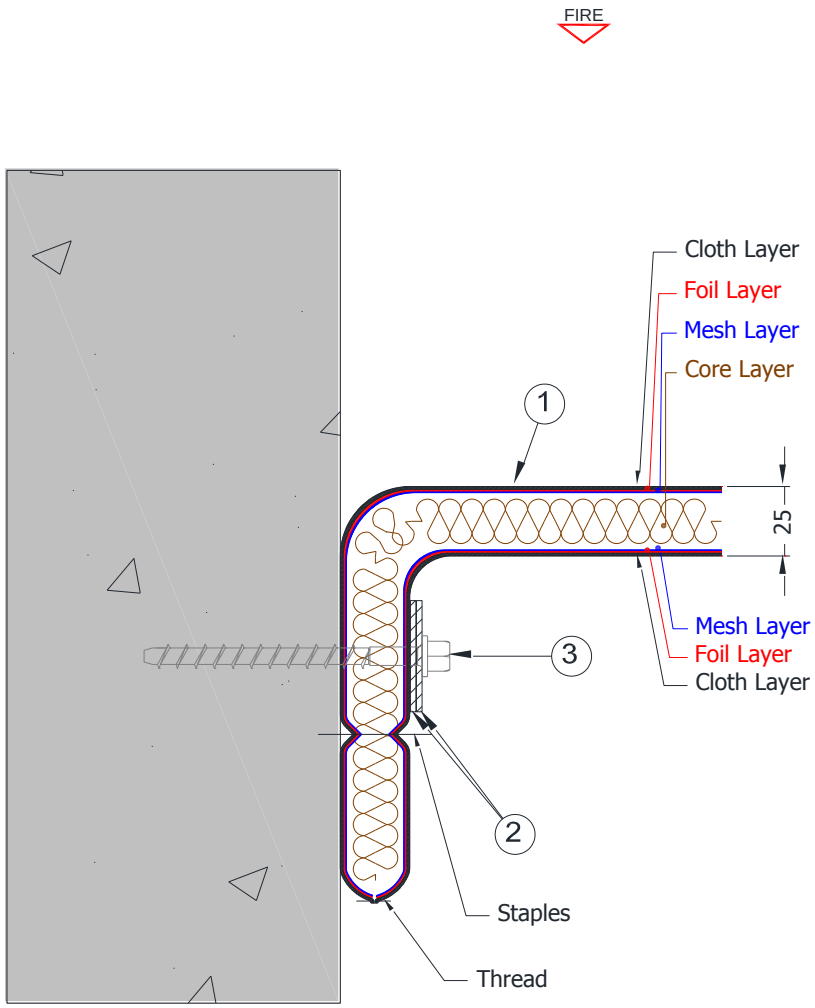
Do not scale. All dimensions are in mm

Figure 3 – Typical Horizontal Section through Test Construction



Do not scale. All dimensions are in mm

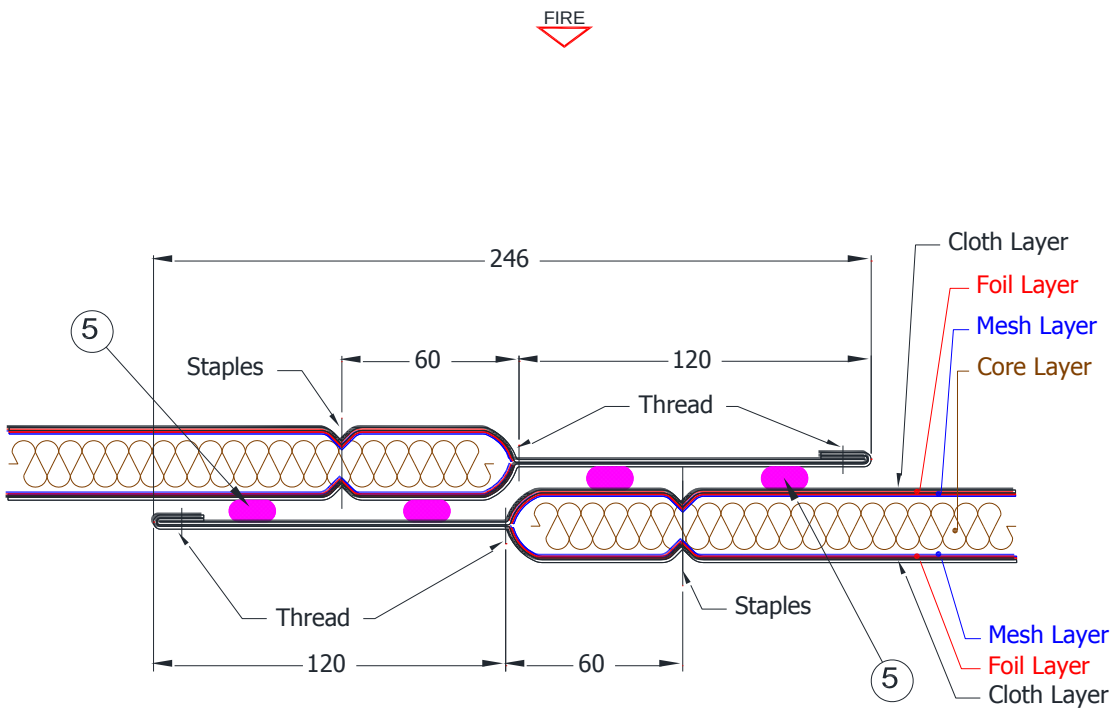
Figure 4 – Detail 'A'



DETAIL 'A'
Typical Method of Attaching Specimen
to Supporting Construction

Do not scale. All dimensions are in mm

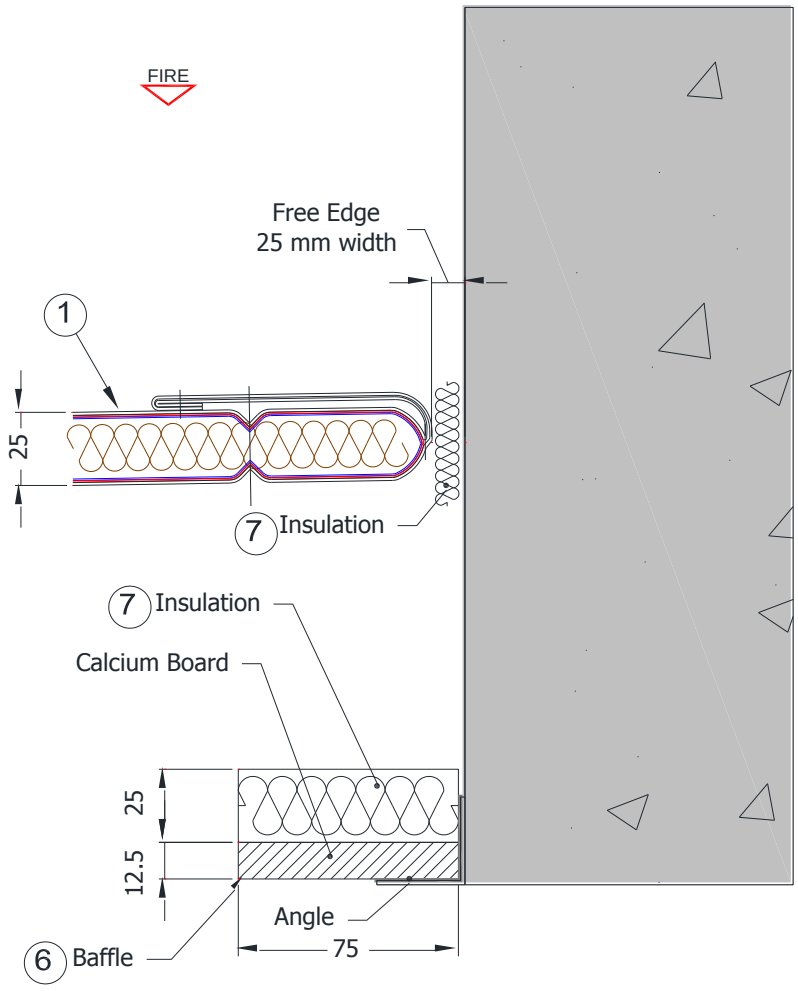
Figure 5 – Details 'B'



DETAIL 'B'
Typical View of Specimen Overlap

Do not scale. All dimensions are in mm

Figure 6 – Details 'C'



DETAIL 'C'
View of Specimen Free Edge

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)

Item		Description
1 Fire Fabric/Curtain		
Manufacturer	:	MC Resources
Reference	:	Stone shield Fire control 5009
Material		
i. Cloth Outer Layers	:	E-Glass Cloth
ii. Foil Layers	:	Aluminium foil
iii. Mesh Layers	:	Fiberglass
iv. Core Layer	:	Basalt Mineral Wool
v. Staples	:	Stainless steel
vi. Margins Thread	:	Stainless steel
Overall Nominal Thickness	:	25 mm
Curtain Panel Width	:	Approximate 1175 mm, Figure 3 for details
Fixing Method		
i. To Restrain Frame	:	Clamped to test frame with 2 layers of Fixing Bars and fixed with anker-bolts at 150 mm centres, see Figure 2 for details.
ii. Curtain Edges	:	Curtain panels were installed to provide a 255 mm overlap along the jointing edges and adhered together, margins were held with fabric thread, See Figure 4 for details.
Details of staples		
i. Type	:	Wide crown Staples
ii. Material	:	Stainless steel
iii. Size	:	16 mm width.
iv. Spacing	:	1 row of staples for each vertical edge at 150 mm centres
Details of Cloth (Outer Layer)		
i. Manufacturer	:	MC Resources
ii. Reference	:	FB420SLS
iii. Material	:	E-Glass Cloth, white colour
iv. Thickness	:	0.4 mm
v. Weight	:	420 g/cm^2 (stated)
Details of Foil Layer		
i. Manufacturer	:	MC Resources
ii. Reference	:	BCO Foil
iii. Material	:	12 Micron aluminium, glass fibre scrim, polythene
iv. Thickness	:	12 µm
v. Weight	:	71 g/cm^2 (stated)
Details of Mesh Layer		
i. Manufacturer	:	MC Resources
ii. Reference	:	MCR Fiberglass Mesh 160
iii. Material	:	Fiberglass
iv. Thickness	:	0.6 mm
v. Weight	:	160 g/cm^2 (stated)

Item		Description
1 Fire Fabric/Curtain continued		
Details of Core Layer		
i. Manufacturer	:	MC Resources
ii. Reference	:	4000BMF Basalt mineral fiber
iii. Material	:	Basalt Mineral Wool
iv. Thickness	:	21 mm
v. Density	:	128 g/cm³ (stated)
2 Fixing Bar		
Material	:	Galvanised steel
Overall Section Size	:	40 mm x 1 mm thick
Bar Length	:	1400 mm
Fixing method	:	Fixed around the perimeter of the test frame aperture, into test frame, using 8 mm diameter x 100 mm long concrete screw bolts at 150 mm centres starting 50 mm from the end.
3 Fixings		
Material	:	JCP Construction Products
Reference	:	JAB06/08100
Fixing Type & Material		Ankerbolt hex flange head M6/8 x 100, stainless steel
Overall Section Size	:	M8 x 100 mm Length
Spacing	:	150 mm centres starting 50 mm from the end
4 Steel Thread		
Material		Steel, grade AISI304L
Size		Diameter 0.265 mm
Stitching size	:	100 mm
Location	:	400 mm down from the top edge and covered with adhesive
5 Adhesive		
Manufacturer	:	MC Resources HT Sealant
Reference	:	Fireproof Sealant Adhesive
Batch No.	:	19842, date: 1/23
Material	:	High temperature Silicon
Application method	:	Cartridge-gunned with approximate 10 mm wavy continuous bead of adhesive
Supporting Construction - supplied by Warringtonfire		
6 Free Edge Baffle		
Angle		
i. Material	:	Galvanised Steel
ii. Section Size	:	30 mm x 30 mm
iii. Thickness	:	4 mm
iv. Fixing Method	:	Fixed to frame aperture and calcium board.
Calcium Board		
i. Manufacturer	:	Fermacell®
ii. Material	:	Calcium Silicate Board
iii. Size	:	12.5 mm thick x 75 mm wide x 2700 mm long
iv. Density	:	1317 kg/m3
v. Fixing method	:	Boards fixed to refractory lining via right angle brackets, to either side of the test construction to unexposed face

Item		Description
Calcium Silicate Board Fixings		
i. Type	:	Bolts with relevant nuts and washers
ii. Material	:	Steel
7 Insulation		
Manufacturer	:	Morgan Advanced Materials
Reference	:	Superwool Plus
Material	:	High temperature insulation wool
Thickness	:	50 mm, uncompressed
Density	:	96 kg/m^3 (stated)
Fixing Method	:	Compressed within the gap between the specimen frame

Test Observations

Time		All observations are from the unexposed face unless noted otherwise.
mins	secs	
00	00	**The test commences.**
00	10	Specimen does not make contact with the baffle.
02	23	Slight steam/smoke at staple locations.
03	22	Thermocouple 15 malfunctioning.
03	22	Thermocouple 15 adjusted.
05	36	Steam/smoke reduced overall.
10	30	Slight brown discolouration to barrier.
14	30	When viewed from the exposed face, barrier glows orange in colour. No significant visible change to vertical joints.
15	43	Flickers of flame visible behind the right vertical joint. Approximately 150 to 500 mm up from the base to the exposed face of the thin layer close to joint.
21	10	Cotton pad applied to area of glow behind left vertical join 500 mm above the base. Pad does not discolour or ignite.
23	30	Barrier continues to darken. Glowing continues behind the barrier at vertical joint locations.
30	00	Flickers of flame visible behind the vertical joints has ceased to occur.
33	30	Flickers of flame visible behind resume to the vertical joint closest to the fixed edge.
51	20	Slight glowing at the free edge between barrier and free edge packing.
60	00	Barrier continues to darken, no glowing visible.
73	50	When viewed from the exposed face, outer layer has detached.
90	00	Barrier continues to darken, no significant visible change to joints.
110	30	Slight increase to glowing at the free edge behind between barrier and free edge packing.
132	00	**Test discontinued at the request of the test sponsor.**

Test Photographs

The exposed face of the specimen prior to testing

The unexposed face of the specimen prior to testing

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

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

The unexposed face of the specimen after a test duration of 90 minutes

The unexposed face of the specimen after a test duration of 132 minutes

The exposed face of the specimen immediately after the test

Temperature and Deflection Data

Mean Furnace Temperature, Together With The Temperature/Time Relationship Specified In The Standard BS EN 1363-1: 2020

Time Minutes	Specified Furnace Temperature Deg. C	Actual Furnace Temperature Deg. C
0	20	37
4	544	554
8	646	644
12	706	703
16	748	754
20	781	785
24	809	810
28	832	831
32	852	848
36	869	876
40	885	885
44	899	901
48	912	913
52	924	925
56	935	936
60	945	945
64	955	954
68	964	963
72	973	970
76	981	978
80	988	986
84	996	992
88	1003	999
92	1009	1005
96	1016	1017
100	1022	1026
104	1028	1033
108	1033	1038
112	1039	1042
116	1044	1047
120	1049	1053
124	1054	1057
128	1059	1060
132	1063	1064

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

Time Minutes	T/C Number 210 Deg. C	T/C Number 211 Deg. C	T/C Number 212 Deg. C	T/C Number 213 Deg. C	T/C Number 214 Deg. C	Mean Temp Deg. C
0	27	26	27	26	28	26
4	38	36	42	37	31	36
8	43	54	76	55	55	56
12	72	91	112	91	116	96
16	106	118	145	133	156	131
19	129	150	173	161	189	160
20	137	164	180	167	198	168
24	163	205	194	167	222	190
28	175	222	203	169	234	200
32	178	233	211	173	240	207
36	177	240	215	175	243	210
40	179	244	217	181	248	213
44	186	246	219	190	249	218
48	190	242	222	195	250	219
52	191	239	225	198	256	221
56	194	241	229	204	260	225
60	197	242	231	207	268	228
64	200	242	231	211	271	231
68	202	241	234	212	277	233
72	204	239	233	216	280	234
76	207	241	237	220	285	238
80	208	240	237	222	290	239
84	211	242	239	226	295	242
88	211	244	240	228	298	244
92	212	244	242	230	301	245
96	214	245	243	232	302	247
100	218	248	247	239	309	252
104	221	251	250	243	312	255
108	225	254	252	249	317	259
112	225	254	252	248	317	259
116	227	255	253	251	318	260
120	231	257	257	256	323	264
124	232	259	260	259	324	266
128	232	260	261	258	324	267
132	234	261	263	261	326	269

Individual Temperatures Recorded On The Unexposed Surface Of The Specimen

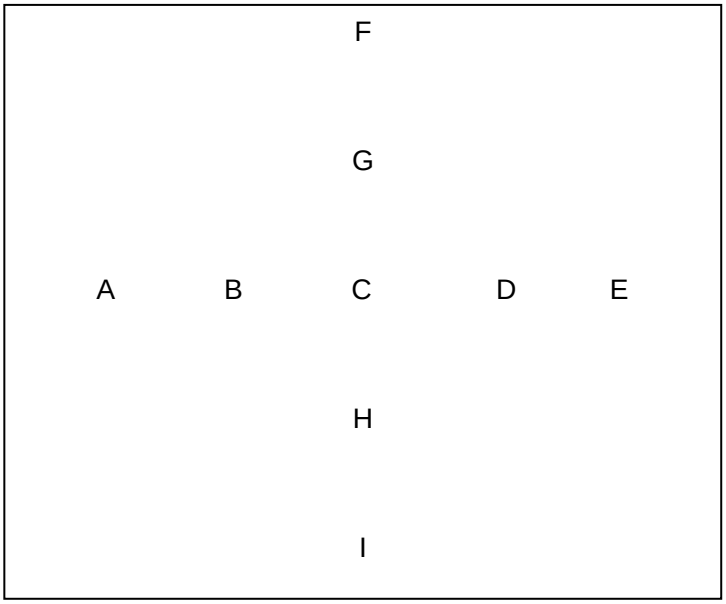
Time Minutes	T/C Number 9 Deg. C	T/C Number 10 Deg. C	T/C Number 11 Deg. C	T/C Number 12 Deg. C	T/C Number 13 Deg. C	T/C Number 14 Deg. C	T/C Number 15 Deg. C	T/C Number 16 Deg. C
0	28	27	28	32	29	26	20	27
4	40	37	45	55	33	32	*	38
8	53	50	62	98	40	37	45	42
12	69	67	88	130	51	43	73	55
16	98	91	110	187	72	58	113	90
18	107	104	116	210	85	69	124	110
19	110	106	123	220	91	74	140	112
20	115	108	134	227	97	79	158	117
24	143	129	192	248	108	97	221	157
28	169	157	222	256	123	106	255	175
32	190	176	238	260	148	117	257	178
36	202	186	240	266	166	133	253	181
40	213	195	246	275	173	149	252	191
44	224	201	251	283	176	157	252	202
48	235	209	259	290	177	161	253	208
52	247	216	270	293	179	164	255	213
56	256	225	278	293	182	170	259	220
60	263	234	287	293	186	174	263	227
64	268	242	295	294	189	179	267	233
68	275	250	300	295	193	184	271	237
72	279	259	307	296	198	189	273	239
76	285	268	314	298	203	194	277	245
80	289	273	317	299	209	196	280	248
84	293	278	322	301	216	199	285	252
88	297	288	327	303	220	202	288	255
92	302	293	333	304	225	205	290	257
96	305	296	335	305	228	208	292	259
100	311	304	342	309	233	213	297	266
104	316	311	349	312	240	217	302	272
108	321	313	351	313	245	221	308	278
112	324	317	353	314	249	225	310	277
116	327	319	356	315	252	228	312	280
120	328	325	360	318	254	234	315	287
124	333	325	362	320	257	239	318	291
128	334	335	370	321	260	242	320	292
132	334	337	373	323	261	246	322	293

*Thermocouple malfunction

Recorded Heat Radiation Intensity From The Specimen

Time Minutes	Radiation Intensity kW/m^2
0	0.293
4	0.098
8	0.293
12	0.717
16	0.88
20	1.271
24	1.564
28	1.597
32	1.695
36	1.564
40	1.793
44	1.727
48	1.858
52	1.825
56	1.923
60	1.923
64	2.119
68	2.184
72	2.184
76	2.184
80	2.314
84	2.314
88	2.412
92	2.347
96	2.379
100	2.738
104	2.607
108	2.705
112	2.64
116	2.738
120	2.803
124	2.901
128	2.836
132	2.901

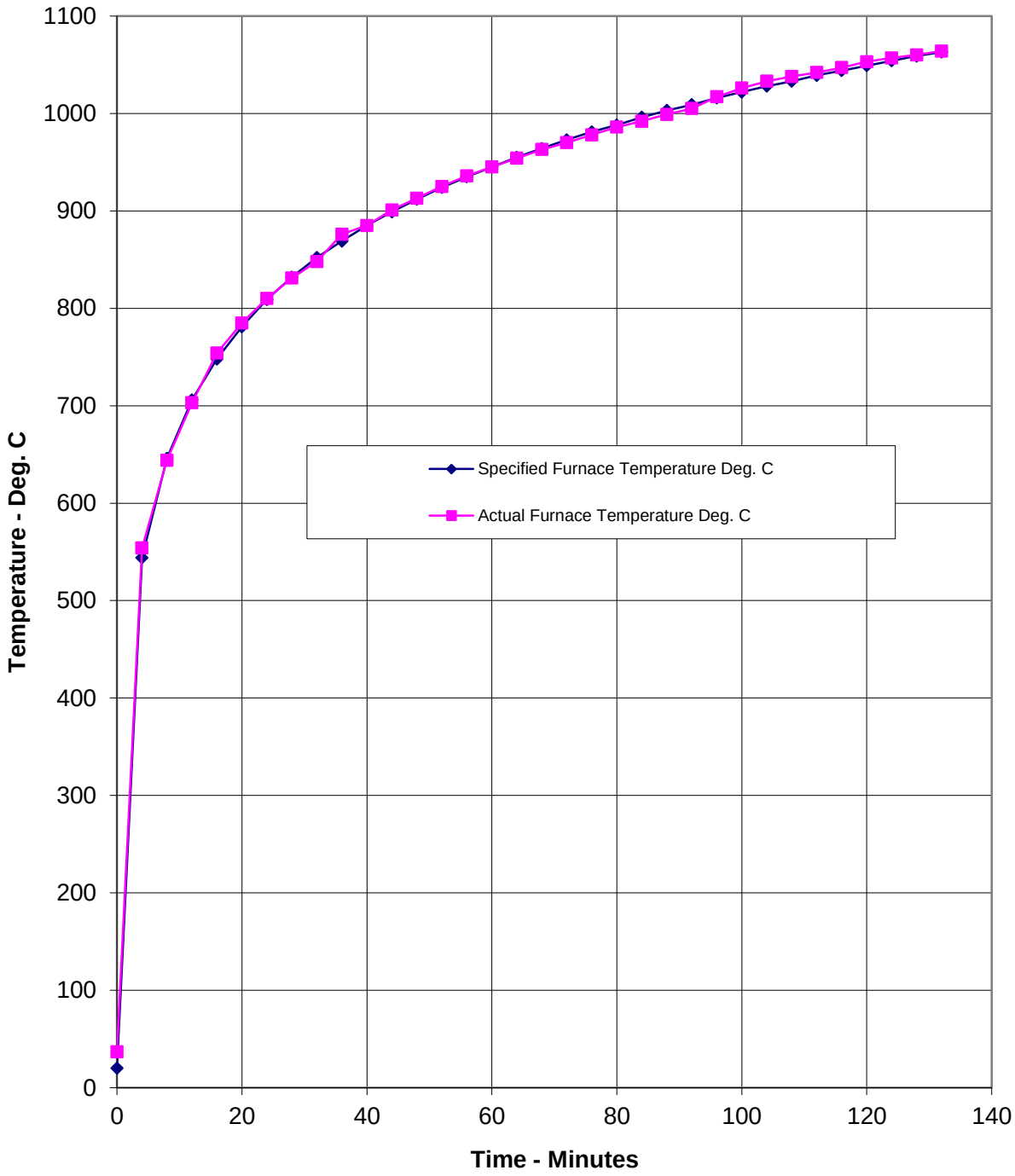
Deflection Of The Specimen During The Test



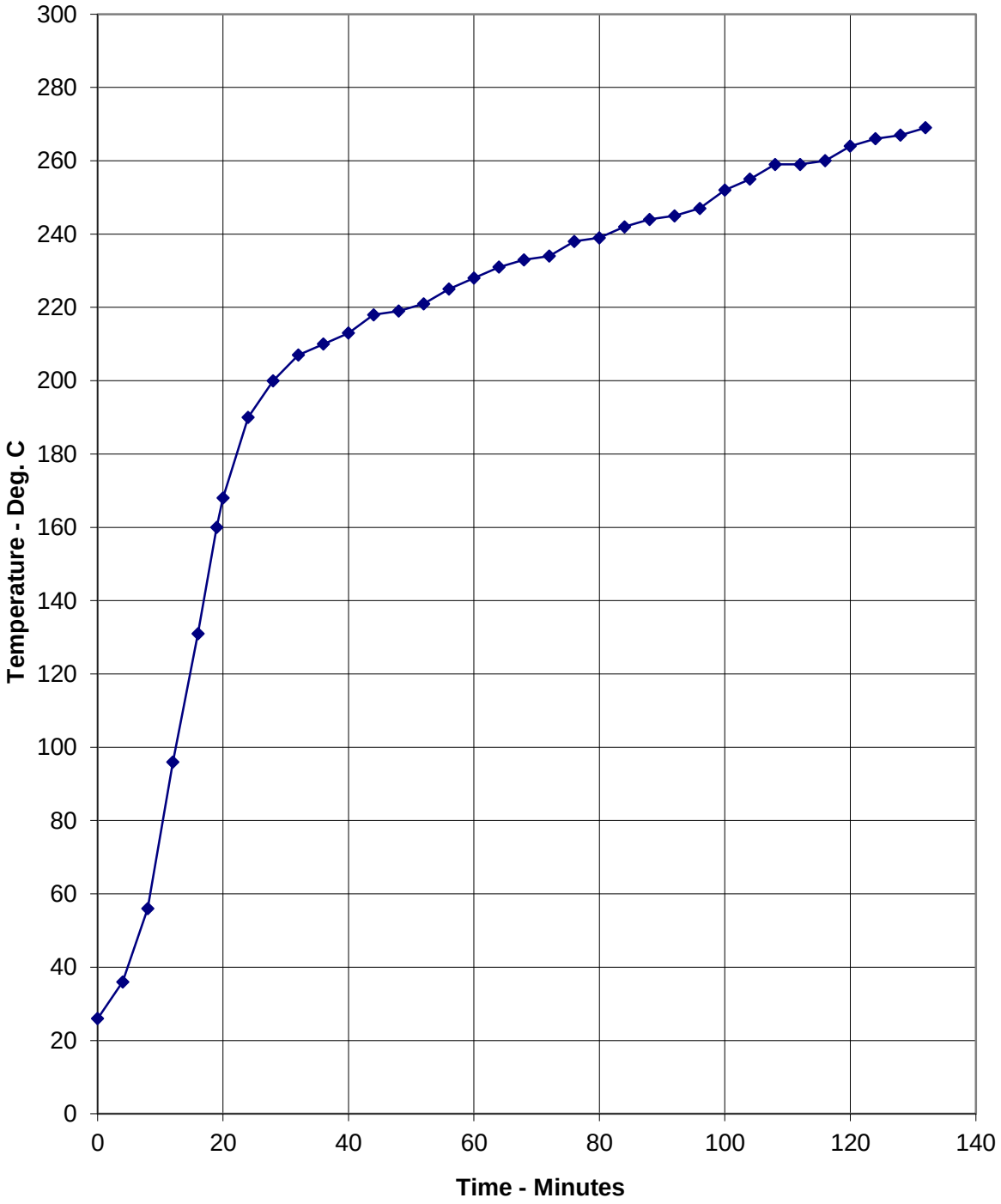
Time Minutes	A	B	C	D	E	F	G	H	I
0	0	0	0	0	0	0	0	0	0
10	-2	-18	-18	-17	0	1	-15	-7	3
20	-9	-19	-24	-27	-5	3	-19	-12	1
30	-5	-28	-31	-27	-6	4	-22	-13	2
40	-3	-26	-34	-29	-10	4	-31	-7	6
50	-9	-32	-32	-28	-14	6	-23	-6	7
60	-3	-35	-35	-26	-15	5	-36	-8	6
70	-1	-35	-25	-28	-18	-2	-26	-4	6
80	-3	-29	-29	-21	-20	7	-27	-1	7
90	-1	-24	-26	-19	-20	7	-25	-2	6
100	-3	-23	-30	-25	-17	9	-27	-1	8
110	-1	-23	-25	-16	-12	3	-27	1	8
120	-5	-26	-26	-20	-17	5	-23	2	8
130	-2	-19	-28	-19	-1	7	-12	7	14

Positive deflections indicate movement towards the furnace chamber

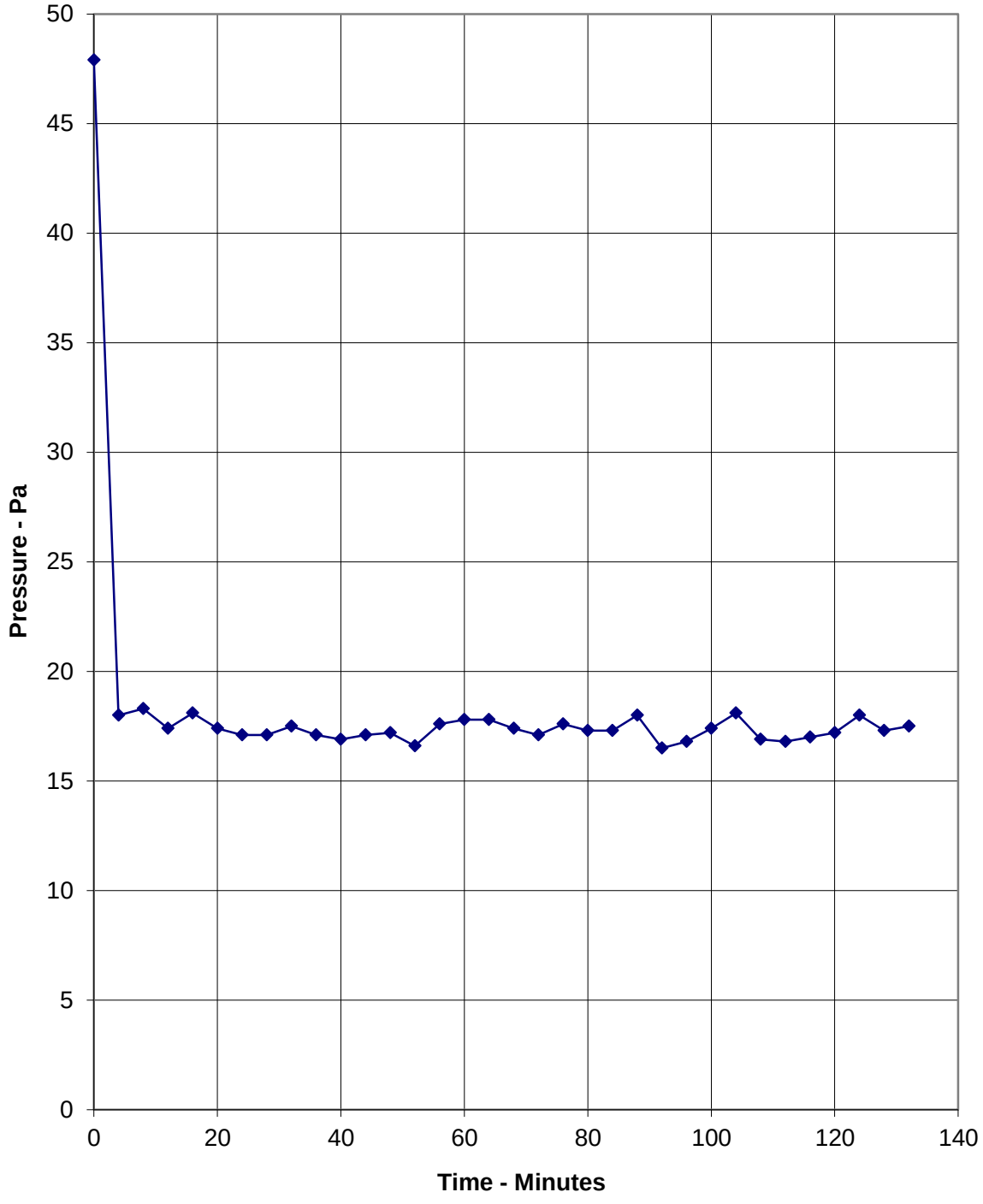
Graph Showing Mean Furnace Temperature, Together With The Temperature/Time Relationship Specified In The Standard BS EN 1363-1: 2020



Graph Showing Mean Temperature Recorded On The Unexposed Surface Of The Specimen



Graph Showing Recorded Furnace Pressure 300 mm Below The Head Of The Specimen



On-going Implications

Limitations

This report details the method of construction, the test conditions and the results obtained when the specific elements of construction described herein were tested following the procedure outlined in BS EN 1363-1: 2020, and where appropriate BS EN 1363-2: 1999. Any significant deviation with respect to size, constructional details, loads, stresses, edge or end conditions other than those allowed under the field of direct application in the relevant test method is not covered by this report. Annex A of BS EN 1363-1: 2020, provides guidance information on the application of fire resistance tests and the interpretation of test data.

Because of the nature of fire resistance testing and the consequent difficulty in quantifying the uncertainty of measurement of fire resistance, it is not possible to provide a stated degree of accuracy of the result.

EGOLF

Certain aspects of some fire test specifications are open to different interpretations. 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

Field of Direct Application

General

The results of the fire test are directly applicable to similar constructions where one or more of the changes listed below are made and the construction continues to comply with the appropriate design code for its stiffness and stability, except with respect to the construction types covered in Annex A (Glazed elements) and Annex B (Horizontally spanning elements) where specific direct field of application rules are given.

a) decrease in height;

b) increase in the thickness of the wall;

c) increase in the thickness of component materials;

d) decrease in linear dimensions of boards or panels but not thickness;

e) decrease in stud spacing;

f) decrease in distance of fixing centres;

g) increase in the number of horizontal joints, of the type tested, when tested with one joint not more than (500±150) mm from the top edge;

h) increase in the number of vertical joints, of the type tested;

i) the use of installations such as electrical sockets, switches, etc. when tested as illustrated in Figures 9, 10 and 11 with the installations not more than 500 mm from the top edge;

j) horizontal and/or vertical joints, of the type tested.

For framing systems or systems with visible profiles on the unexposed side, intended to be used for EI classification, no increase in width and depth is allowed in case no temperature measurements on the unexposed side of the profiles were made during the test.

The field of direct application for glazed elements or non-loadbearing walls incorporating glazing is given in Annex A.

The field of direct application for non-loadbearing external and internal walls designed to span horizontally between two independently proven fire resisting vertical structural elements is given in Annex B.

Extension of width

For test specimens tested without a supporting construction, the width of an identical construction may be increased if the specimen was tested at a minimum of nominally 3 m wide with one vertical edge without restraint.

For test specimens tested with a supporting construction, the width of an identical construction may be increased if the specimen was tested at a minimum of nominally 2,8 m wide with one vertical edge without restraint.

In case of EW classification, an increase in width of an identical construction is only allowed when the average unexposed surface temperature of any discrete area of the test specimen remains below 300°C or the measured radiation remains below 6 kW/m2. In any other case, no increase in width is allowed.

Extension of height

The height of the construction may be increased by 1,0 m under the following conditions:

a) minimum tested height is 3 m when tested without a supporting construction or 2,8 m when tested with a supporting construction

b) the maximum deflection of the test specimen was not in excess of 100 mm (see 9.3)

c) the expansion allowances are increased pro-rata

In case of EW classification, an increase in height of an identical construction is only allowed when the average unexposed surface temperature of any discrete area of the test specimen remains below 300°C or the measured radiation remains below 6 kW/m2. In any other case, no increase in height is allowed.

Supporting Constructions

The following rules for the field of application apply.

Standard supporting constructions

a) For specimens tested in the test frame without any supporting construction, the result is applicable to high density rigid supporting constructions with at least the same fire resistance as the test specimen.

b) For specimens tested with any standard supporting construction as defined in EN 1363-1, the result is applicable to any other supporting construction of the same type (flexible or rigid) that has the same or a greater classified fire resistance (thicker, denser, more layers of boards, as appropriate) than the one used in the test and the same horizontal and/or vertical orientation, i.e.:

• only vertical if the specimen was tested with the standard supporting construction fixed along the vertical edge (see Figure 17, b1);

• only horizontal if the specimen was tested with the standard supporting construction fixed along the horizontal edge (see Figure 17, b2);

• both if the specimen was tested with the standard supporting fixed along both the horizontal and the vertical edge (see Figure 17, b3).

Non-standard supporting constructions

The result of a test on a non-loadbearing wall tested in a non-standard supporting construction is only applicable to that construction.