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Title:

The Fire Resistance Performance Of Three Specimens Of Wall Mounted And One Specimens Of Floor Mounted Linear Gap Sealing Systems, When Tested In General Accordance With EN 1366-4:2006+A1:2010

Date Of Test:

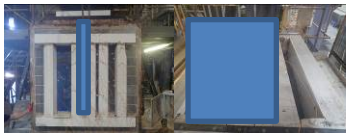
17th September 2020

Issue 1:

29th October 2020

WF Report No:

431809/R



Prepared for:

Timloc Building Products

Timloc House
Ozone park
Howden
DN14 7SD

Test Specimen

Summary of Tested Specimen

For the purpose of the test the wall specimens were referenced A to D and the floor specimens were referenced E to G.

The section of wall had overall dimensions of 1500 mm high by 1500 mm wide by 600 mm thick and was made up of aerated blockwork arranged to provide four linear gaps of varying widths which were all 1200 mm in length.

The section of floor had overall dimensions of 2150 mm long by 1750 mm wide by 600 mm thick and was made up of autoclaved aerated concrete lintels arranged to provide three linear gaps of varying widths which were all 1200 mm in length.

Specific details of each of the seals are given in the tables below:

Wall Specimens

Specimen	Substrate	Seal Details
A	Concrete to Concrete	300 mm wide linear gap, sealed with a rock wool fibre cavity barrier within a polythene sheath, and was referenced 'Earthwool Fabrication Slab' which had a stated density of 40 kg/m^3. The barrier had overall dimensions of 1175 mm high by 320 mm wide by 150 mm deep, and was fitted with 20 mm compression. The barrier was installed with a butt joint 200 mm from the head of the barrier.
B	Not subject of this test report.	
C	Concrete to Concrete	50 mm wide linear gap, sealed with a rock wool fibre cavity barrier within polythene sheath, and was referenced 'Earthwool Fabrication Slab' which had a stated density of 40 kg/m^3. The barrier had overall dimensions of 1175 mm high by 65 mm wide by 65 mm deep, and was fitted with 15 mm compression. The barrier was installed with a butt joint 200 mm from the head of the barrier.
D	Concrete to Concrete	150 mm wide linear gap sealed with a rock wool fibre cavity barrier within polythene sheath, and was referenced 'Earthwool Fabrication Slab' which had a stated density of 40 kg/m^3. The barrier had overall dimensions of 1175 mm high by 150 mm wide by 120 mm deep. The barrier was installed with a butt joint 200 mm from the head of the barrier.

Floor Specimens

Specimen	Substrate	Seal Details
E	Not subject of this test report.	
F	Not subject of this test report.	
G	Concrete to Concrete	150 mm wide linear gap, sealed with a rock wool fibre cavity barrier within polythene sheath, and was referenced 'Earthwool Fabrication Slab' which had a stated density of 40 kg/m^3. The barrier had overall dimensions of 1200 mm long by 150 mm wide by 120 mm deep. The barrier was installed with a butt joint at mid width of the barrier.

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 either causing ignition of a cotton pad when applied as specified in BS EN 1363-1: 2020, or resulting in sustained flaming on the unexposed surface.

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: 2020.

Test Results

Specimen	Integrity (minutes)		Insulation (minutes)
	Cotton Pad	Sustained flaming	
A	72	76#	72
B	Not subject of this test report.		
C	219	219	38
D	78	81#	59
E	Not subject of this test report.		
F	Not subject of this test report.		
G	67	71#	30

*Test was discontinued after a period of 220 minutes.

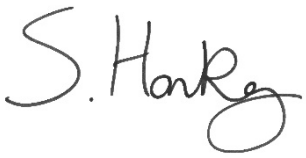
#Specimen blanked off.

Date of Test 17th September 2020

Signatories

Responsible Officer
J. Whalley*
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: 29th October 2020

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 1366-4: 2006 +A1:2010 Fire resistance tests for service installations – Part 4: Linear joint seals

Clause 7.3 of BS EN 1366-4: 2006 + A1: 2010 specifies the minimum distance on the exposed side between adjacent seals shall not be less than 200 mm. This requirement was not satisfied due to the reduced distance between the seals; therefore the test was conducted generally in accordance with the standard. Test results obtained are only valid to the Specimens as tested.

Additional guidelines were taken from TR31 to simulate the use of the cavity barrier within masonry 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 provided by the test sponsor.

Installation

Warringtonfire supplied the wall and floor constructions. The gap sealing systems were provided and installed by a representative of **Warringtonfire** on the 16th September 2020.

Conditioning

The specimen's 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 18°C to 28°C and 47.5% to 73.5% respectively.

Instruction to Test

The test was conducted on the 17th September 2020 at the request of Timloc Building Products, the test sponsor.

There were no representatives of the test sponsor present to witness the test.

Ambient Temperature

The ambient air temperature in the vicinity of the test construction was 22ºC at the start of the test with a maximum variation of +8ºC 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 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.

Thermocouples

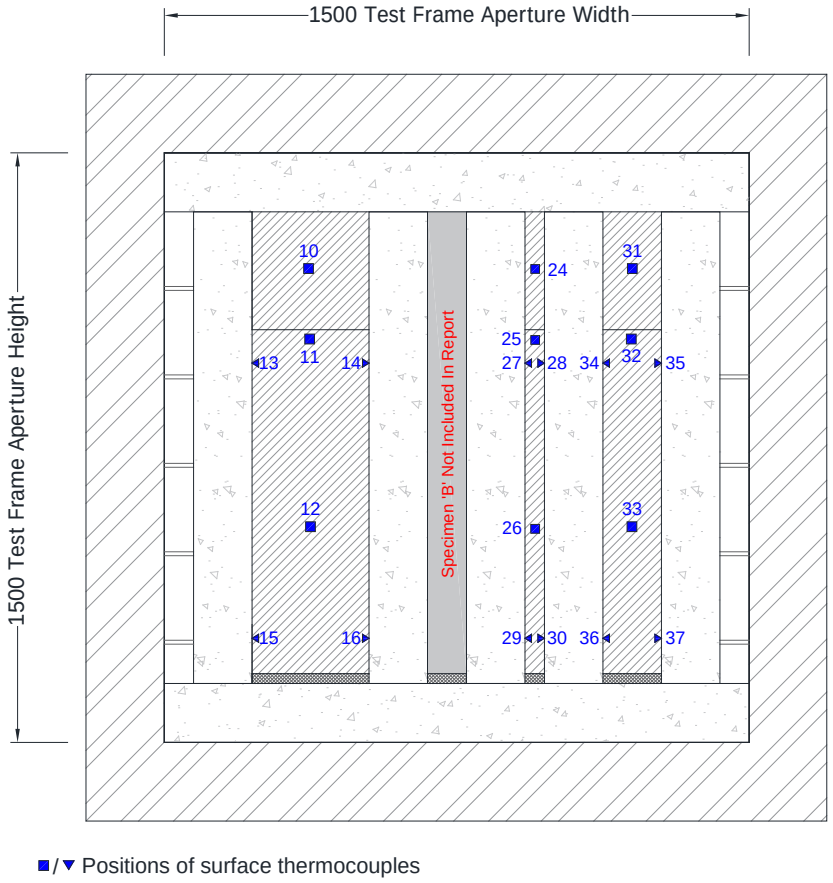
Thermocouples were provided to monitor the unexposed surface of the specimens. The output of all instrumentation was recorded at no less than one minute intervals. The locations and reference numbers of the various unexposed surface thermocouples are shown in Figures 1 and 6.

Furnace Pressure

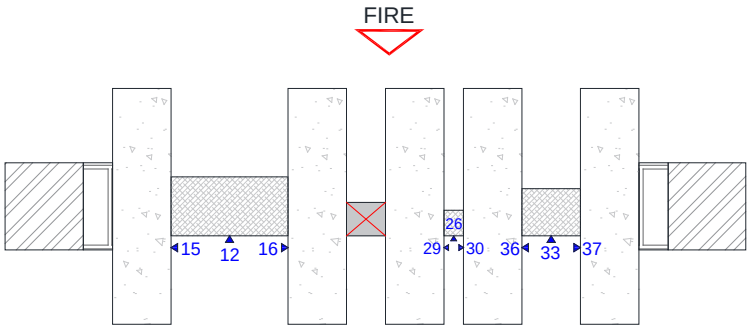
After the first five minutes of testing and for the remainder of the test, the furnace atmospheric pressure was controlled so that it complied with the requirements of BS EN 1363-1: 2020, clause 5.2.1 The calculated pressure differential relative to the laboratory atmosphere at mid height of wall specimens was 15 (± 5) and at position 100 mm below the underside of the floor assembly the differential pressure was calculated to be 20 (± 5) Pa between 5 and 10 minutes and (± 3) Pa respectively thereafter.

Test Specimen Drawings

Figure 1- General Elevation of Wall Construction



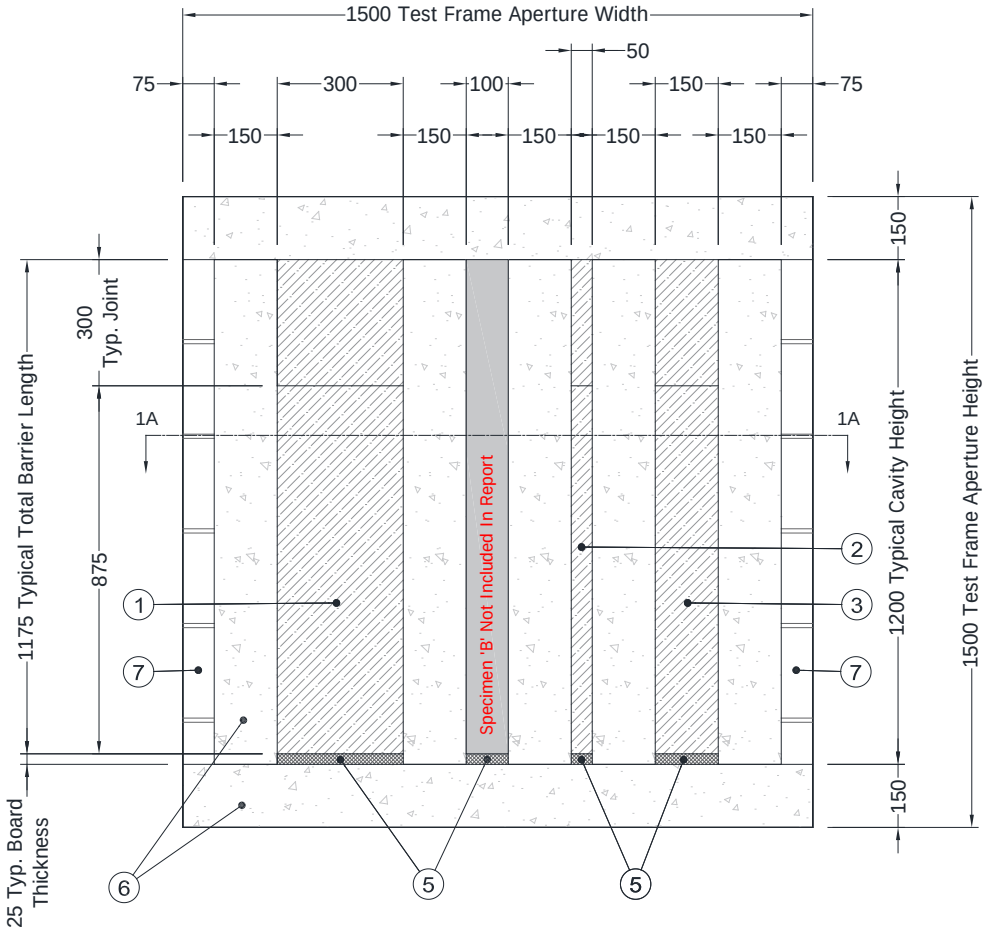
GENERAL ELEVATION OF WALL TEST CONSTRUCTION
SHOWING THERMOCOUPLE LOCATIONS



HORIZONTAL SECTION THROUGH WALL TEST CONSTRUCTION
SHOWING THERMOCOUPLE LOCATIONS

Do not scale. All dimensions are in mm

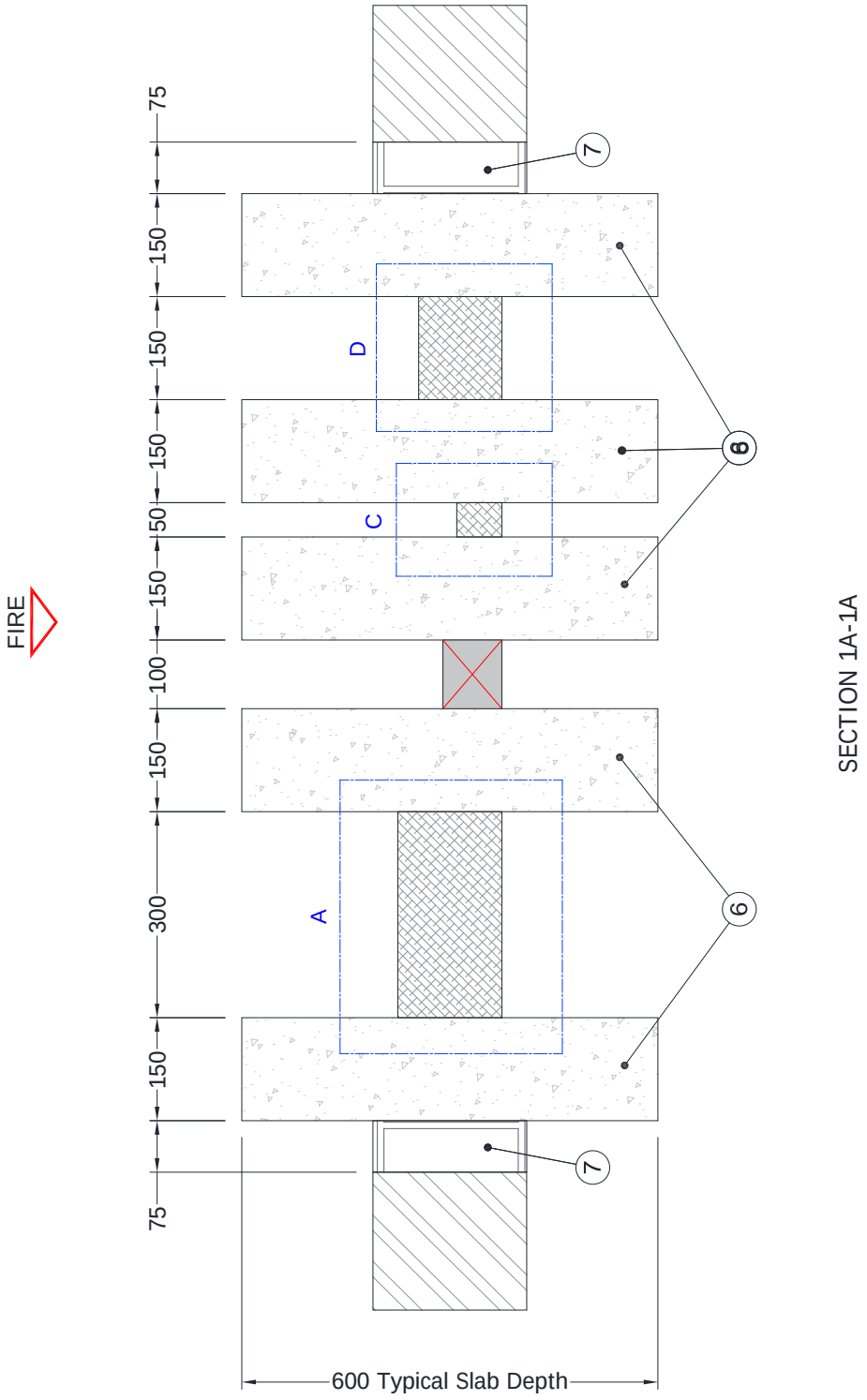
Figure 2 – General Elevation of Wall Construction



GENERAL ELEVATION OF WALL CONSTRUCTION AT UNEXPOSED FACE

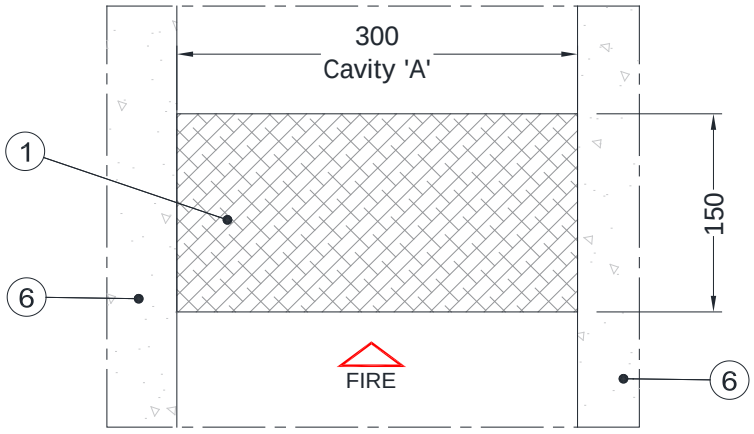
Do not scale. All dimensions are in mm

Figure 3 – Section 1A-1A



Do not scale. All dimensions are in mm

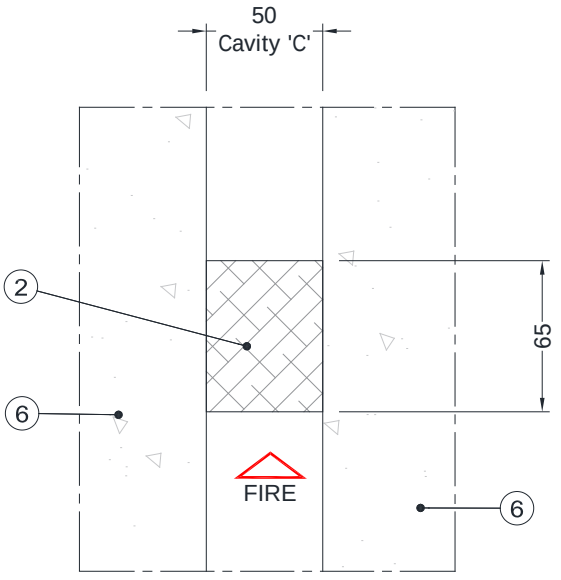
Figure 4 – Detail 'A'



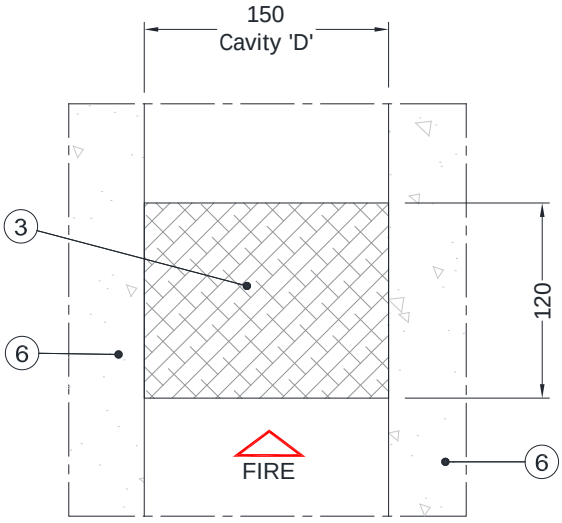
DETAIL 'A'

Do not scale. All dimensions are in mm

Figure 5 – Details ‘C’ & ‘D’



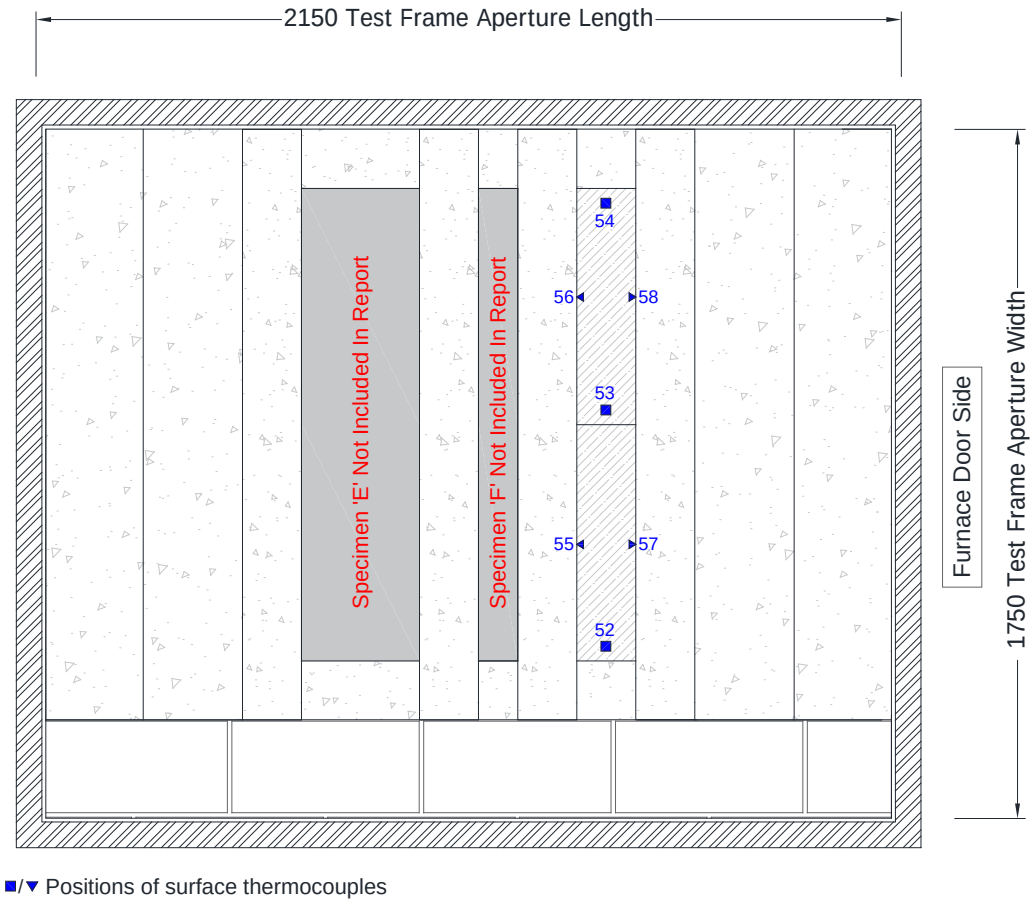
DETAIL 'C'



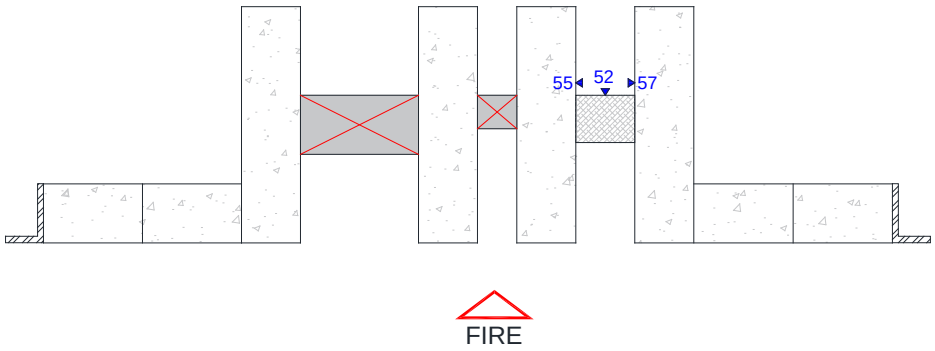
DETAIL 'D'

Do not scale. All dimensions are in mm

Figure 6 – General Plan View of Floor Construction



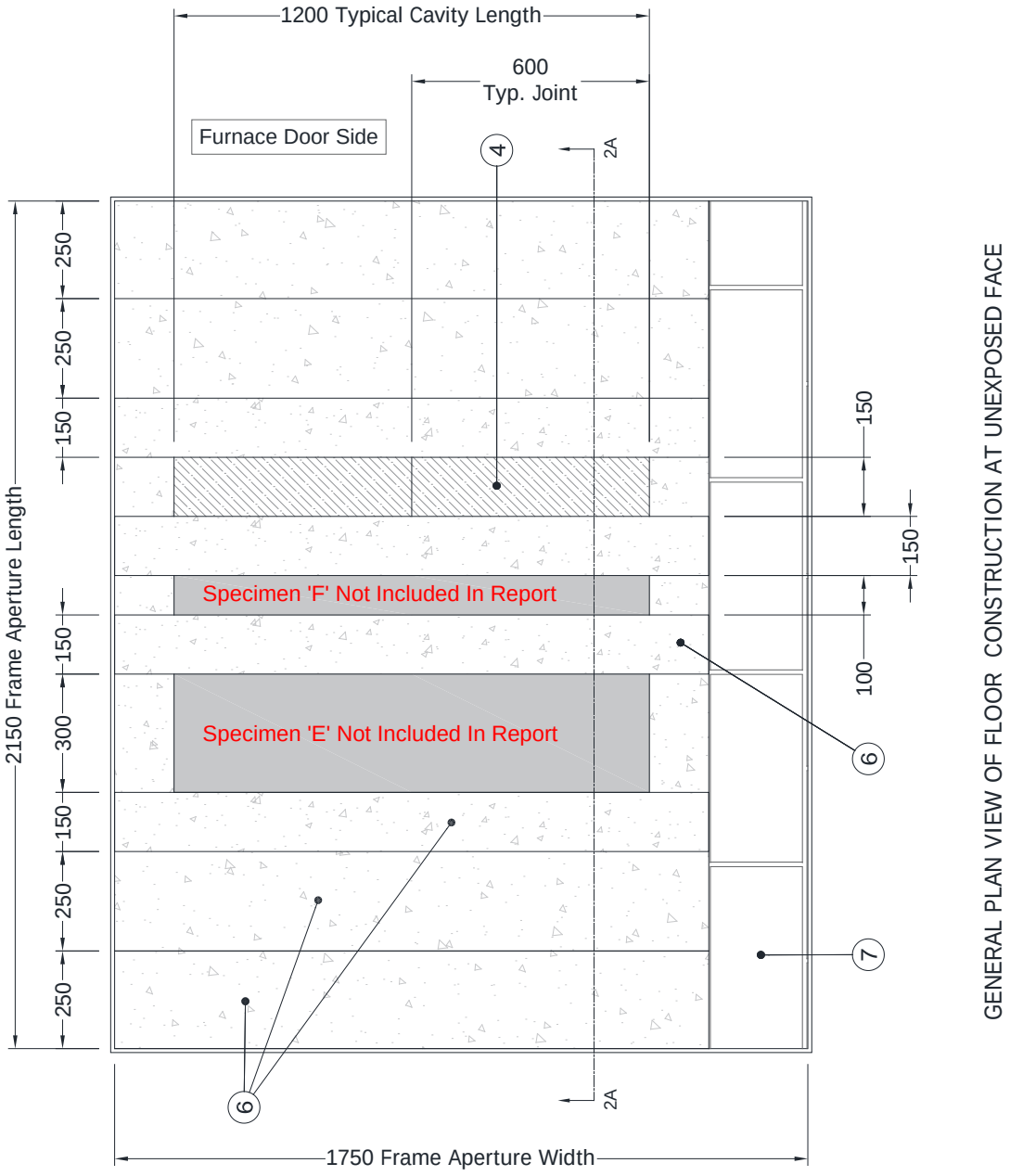
GENERAL PLAN VIEW OF FLOOR TEST CONSTRUCTION
SHOWING THERMOCOUPLE LOCATIONS



VERTICAL SECTION THROUGH FLOOR TEST CONSTRUCTION
SHOWING THERMOCOUPLE LOCATIONS

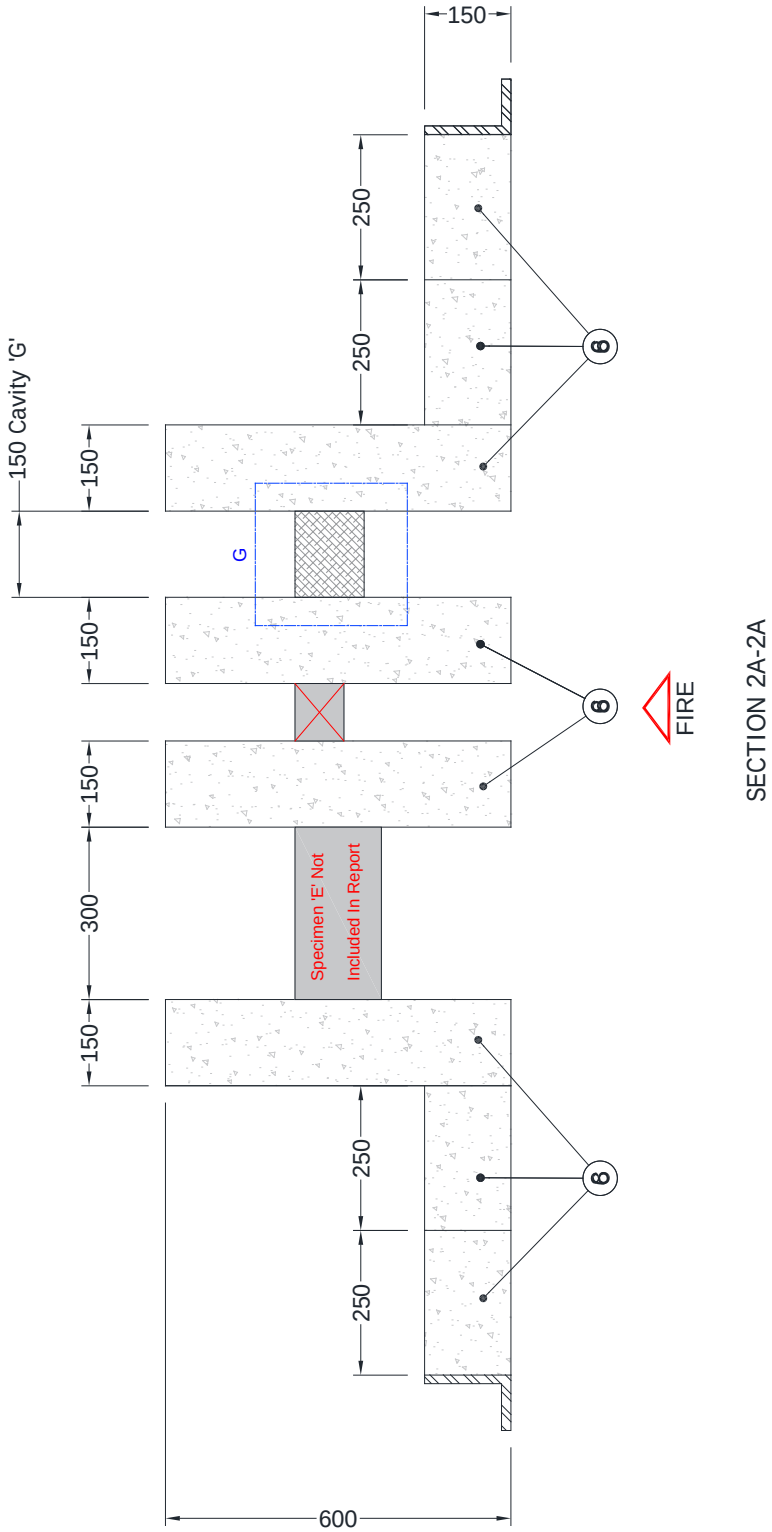
Do not scale. All dimensions are in mm

Figure 7 – General Plan View of Floor Construction



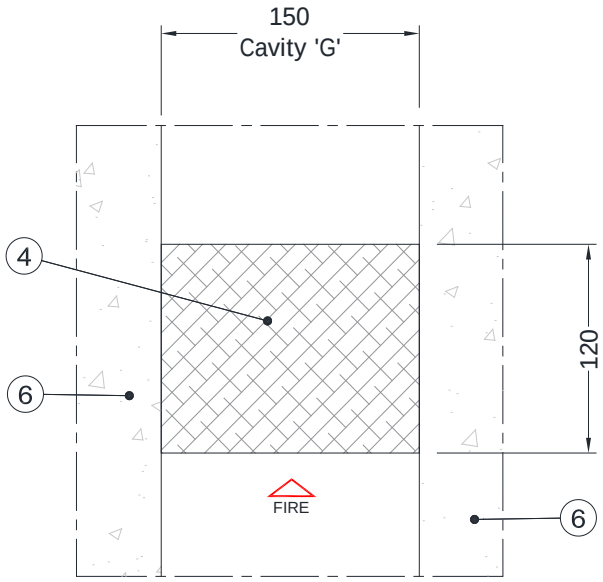
Do not scale. All dimensions are in mm

Figure 8 – Section 2A-2A



Do not scale. All dimensions are in mm

Figure 9 – Detail 'G'



DETAIL 'G'

Do not scale. All dimensions are in mm

Schedule of Components

(Refer to Figures 1 to 9)
(All values are nominal unless stated otherwise)
(All other details are as stated by the sponsor)

Item		Description
1. Cavity Barrier Specimen 'A'		
Manufacturer	:	Knauf Insulation Ltd
Reference	:	Earthwool Fabrication Slab
Material	:	Semi-rigid rock mineral wool slab wrapped in a polythene sheath
Stated density	:	40 kg/m^3
Aperture size	:	1175 mm high x 300 mm wide x 600 mm deep.
Specimen size	:	875 mm long x 320 mm wide x 150 mm deep and 300 mm long x 320 mm wide x 150 mm deep.
Fixing Method	:	Friction fitted and compressed mid depth of the cavity
Compression	:	20 mm.
2. Cavity Barrier Specimen 'C'		
Manufacturer	:	Knauf Insulation Ltd
Reference	:	Earthwool Fabrication Slab
Material	:	Semi-rigid rock mineral wool slab wrapped in a polythene sheath
Stated density	:	40 kg/m^3
Cavity size	:	1175 mm high x 50 mm wide x 600 mm deep.
Specimen size	:	875 mm long x 65 mm wide x 65 mm deep and 300 mm long x 65 mm wide x 65 mm deep.
Fixing Method	:	Friction fitted and compressed mid depth of the cavity
Compression	:	15 mm.
3. Cavity Barrier Specimen 'D'		
Manufacturer	:	Knauf Insulation Ltd
Reference	:	Earthwool Fabrication Slab
Material	:	Semi-rigid rock mineral wool slab wrapped in a polythene sheath
Stated density	:	40 kg/m^3
Cavity size	:	1175 mm high x 150 mm wide x 600 mm deep.
Specimen size	:	875 mm long x 150 mm wide x 120 mm deep and 300 mm long x 150 mm wide x 120 mm deep.
Fixing Method	:	Friction fitted mid depth of the cavity
Compression	:	No compression of the insulation slab.
4. Cavity Barrier Specimen 'G'		
Manufacturer	:	Knauf Insulation Ltd
Reference	:	Earthwool Fabrication Slab
Material	:	Semi-rigid rock mineral wool slab wrapped in a polythene sheath
Stated density	:	40 kg/m^3
Cavity size	:	1200 mm high x 150 mm wide x 600 mm deep.
Specimen size	:	600 mm long x 150 mm wide x 120 mm deep and 600 mm long x 150 mm wide x 120 mm deep.
Fixing Method	:	Friction fitted mid depth of the cavity
Compression	:	No compression of the insulation slab.

Item		Description
5. Base Packing - supplied by Warringtonfire		
Reference		Vicuclad Fire board
Material	:	Vermiculite
Density	:	600 kg/m^3
Thickness	:	25 mm
6. Concrete Lintel - supplied by Warringtonfire		
Material	:	Autoclaved aerated concrete slabs
Density	:	670 kg/m3
Thickness	:	150 mm
Overall size	:	200 mm wide x 1500 mm long
7. Masonry blockwork - supplied by Warringtonfire		
Material	:	Autoclaved aerated concrete blocks.
Thickness	:	150 mm.
Density	:	760 kg/m^3
Fixing method	:	Ordinary sand/cement mortar.

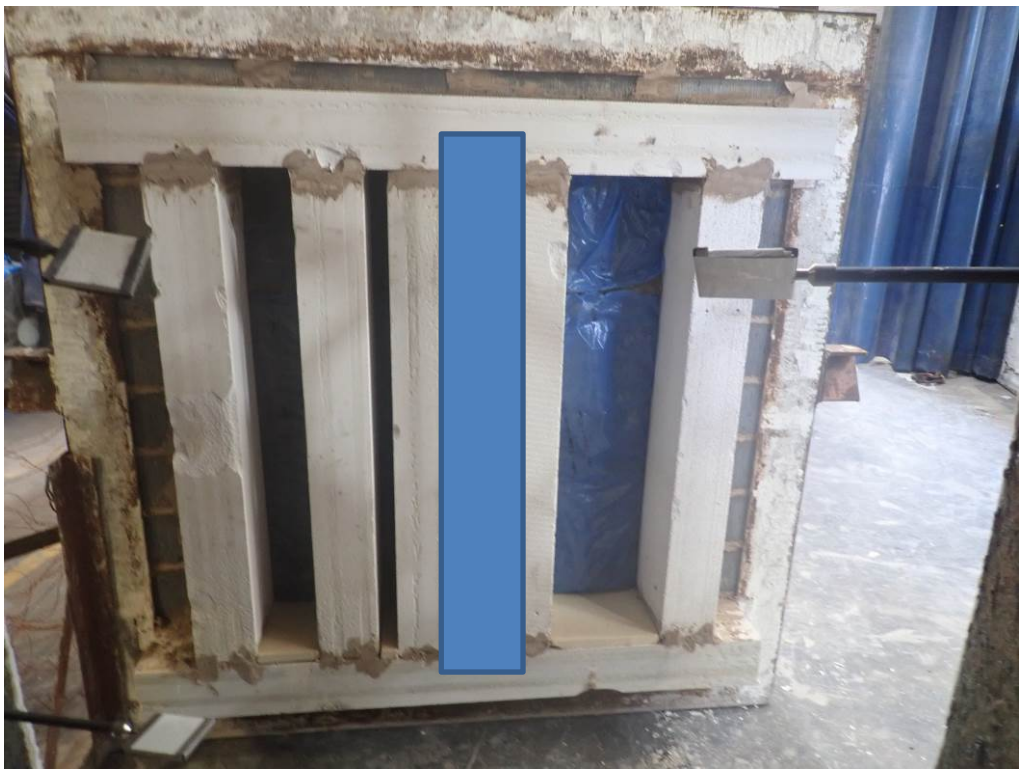
Test Observations

Time		All observations are from the unexposed face unless noted otherwise.
mins	secs	
00	00	**The test commences.**
00	33	Steam/smoke release can be seen from the splice location and the perimeter of Specimen G.
01	15	Steam/smoke release observed at the head of Specimen A.
02	51	Steam/smoke release from specimen A has stopped.
06	42	Specimen G is has dropped approximately 40 mm towards the heating conditions close to the location of thermocouple number 25.
08	38	Splice opens approximately 15 mm on the unexposed surface of Specimen G.
12	00	Specimen D is moving towards the heating conditions at the splice locations.
13	33	Steam/smoke release at the head of Specimen A resumes.
14	33	Sheathing starts to melt on Specimen G.
17	54	When viewed from the exposed face, the sheathing has melted away and the perimeters of Specimens A, C and D begin to darken.
19	36	Sheathing starts to melt wall specimens.
28	43	An approximate 5 mm gap has formed at the head of Specimen A.
33	77	Cotton pad applied to Specimen G above the perimeter close to the location of thermocouple number 52. Pad did not ignite or glow.
34	00	No significant visible change to Specimens C and D.
37	37	Insulation darkening at splice locations on Specimen A, B and G.
41	42	When viewed from the exposed face, Specimen D is opening at the splice location, as the specimen moves towards the heating conditions.
43	30	Cotton pad applied to head of Specimen A. pad discoloured but didn’t ignite.
52	40	Cotton pad applied to Specimen G above the perimeter close to the location of thermocouple number 52. Pad discolours but fails to ignite.
55	34	Cotton pad applied to the head of Specimen A. Pad discoloured but fails to ignite.
65	05	Glowing visible at the splice location on specimen G.

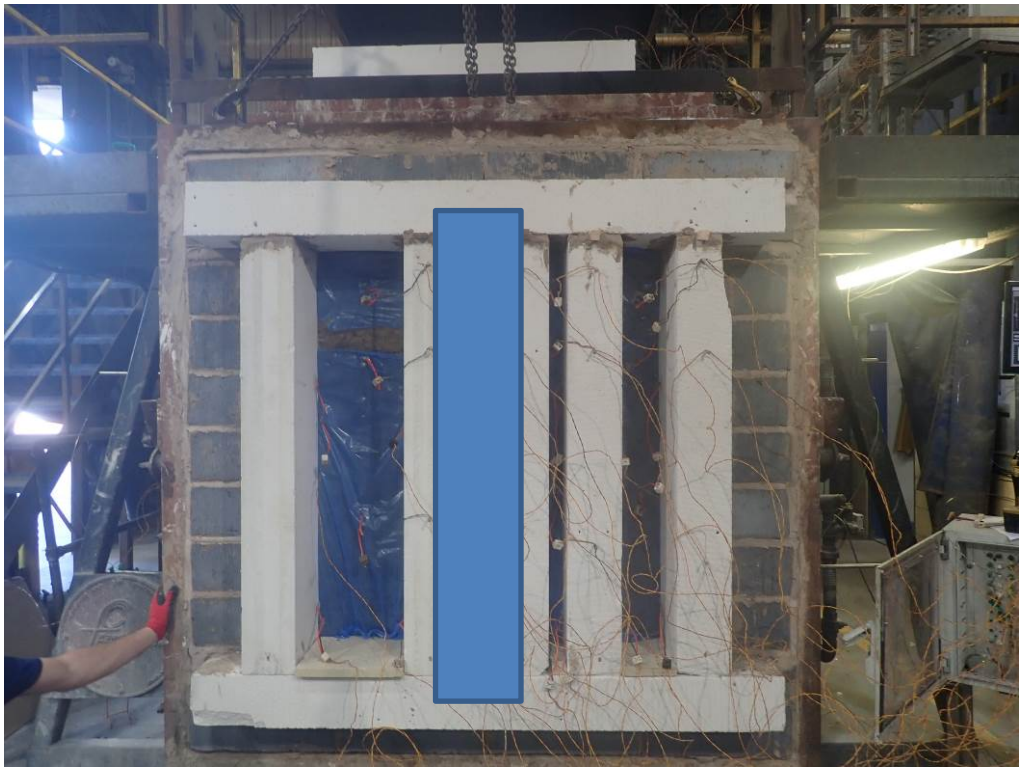
Time		
mins	secs	
67	17	**Cotton pad applied to splice location on Specimen G. Pad ignites, integrity failure deemed to have occurred.**
70	32	An approximately 5 mm wide gap has formed at the head of Specimen D.
71	06	**Specimen G blanked off to allow the test to continue.**
72	30	**Cotton pad applied to the head of Specimen A. Pad ignites, integrity failure deemed to have occurred.**
75	36	No significant visible change to Specimen C.
76	00	**Specimen A blanked off to allow the test to continue.**
78	26	**Cotton pad applied to the head of specimen D. Pad ignites, integrity failure deemed to have occurred.**
81	03	**Specimen D blanked off to allow the test to continue.**
94	16	When viewed from the exposed face, Specimen C continue to darken and contract around their perimeters.
102	11	Small area of glow is visible at the head of Specimen C.
142	37	When viewed from the exposed face, the gap at the head of Specimen C has increased to approximately 5 mm.
180	00	Addition small areas of glow forms along the vertical edges of Specimen C.
219	12	**Sustained flaming observed at the head of Specimen C, integrity failure deemed to have occurred.**
220	00	**Test discontinued for health and safety reasons.**

Test Photographs

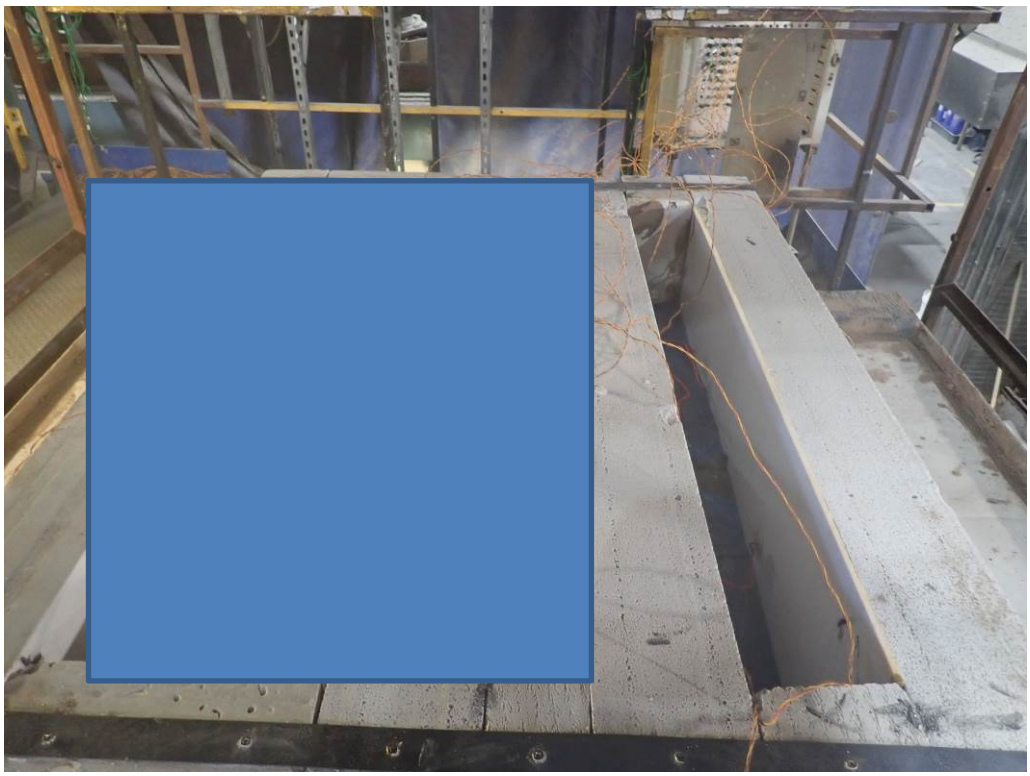
The exposed face of the wall assembly prior to testing



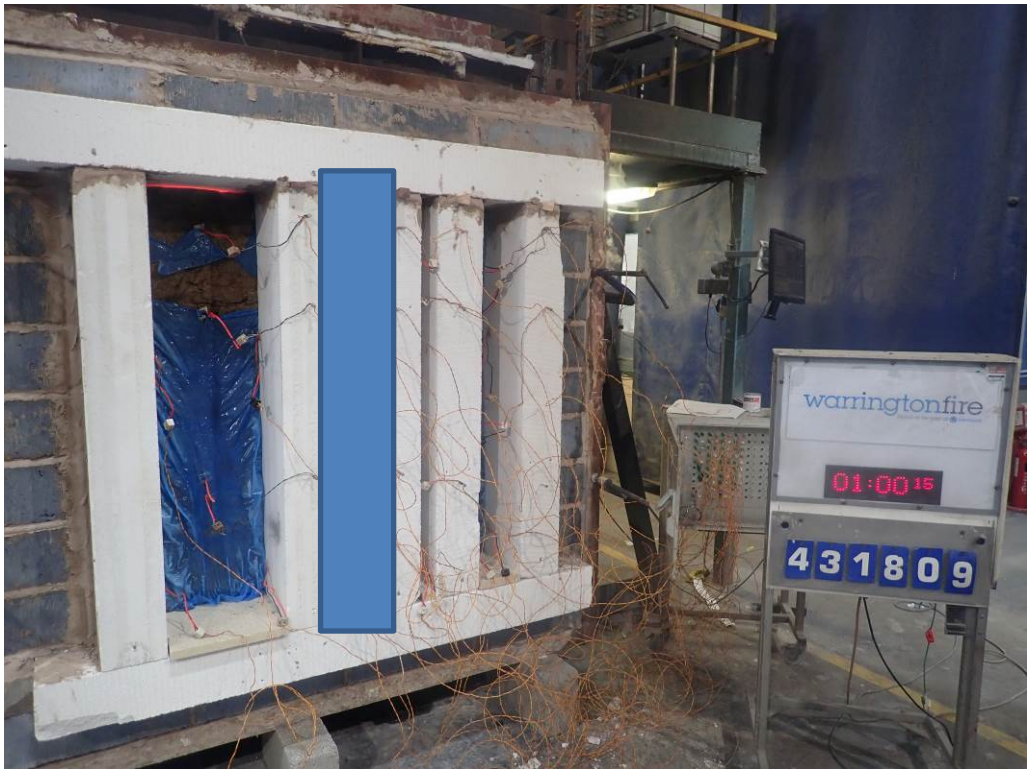
The unexposed face of the wall assembly prior to the start of the test



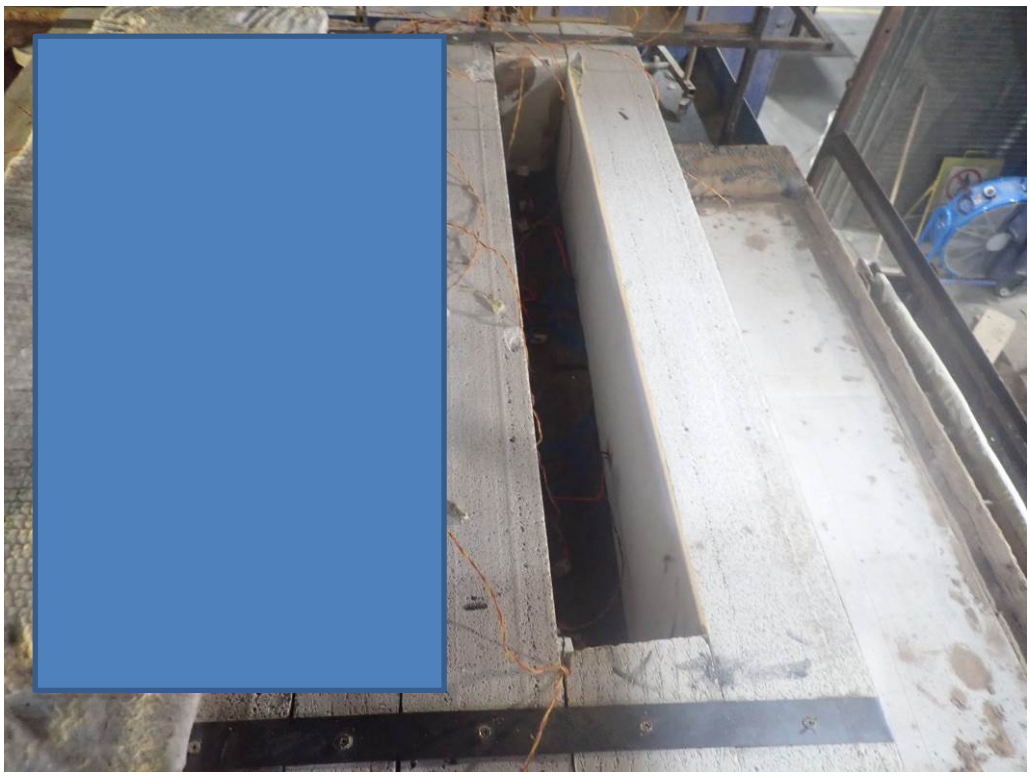
The unexposed face of the floor assembly prior to the start of the test



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

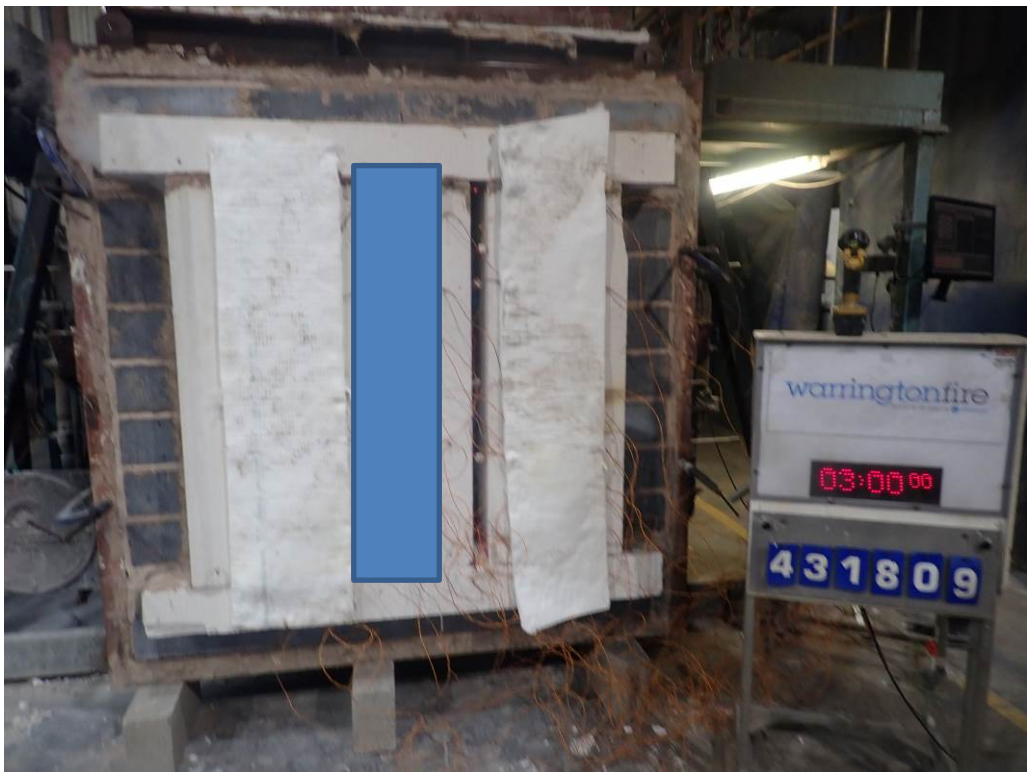


The unexposed face of the floor assembly after a test duration of 60 minutes

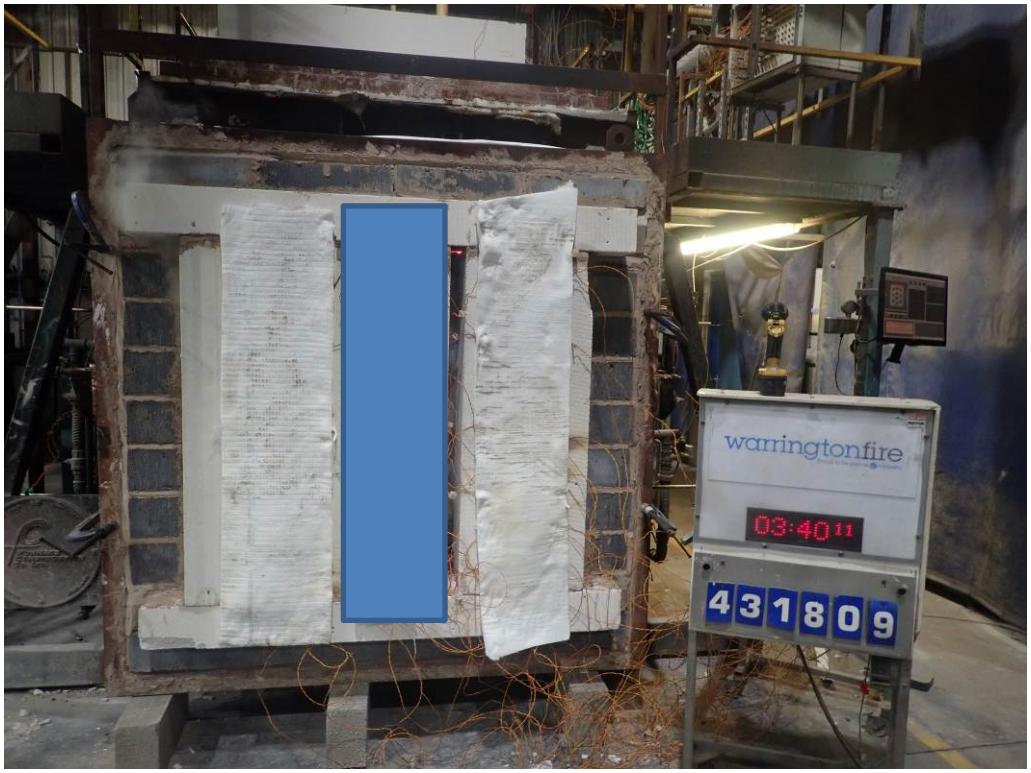


The unexposed face of the wall assembly after a test duration of 120 minutes

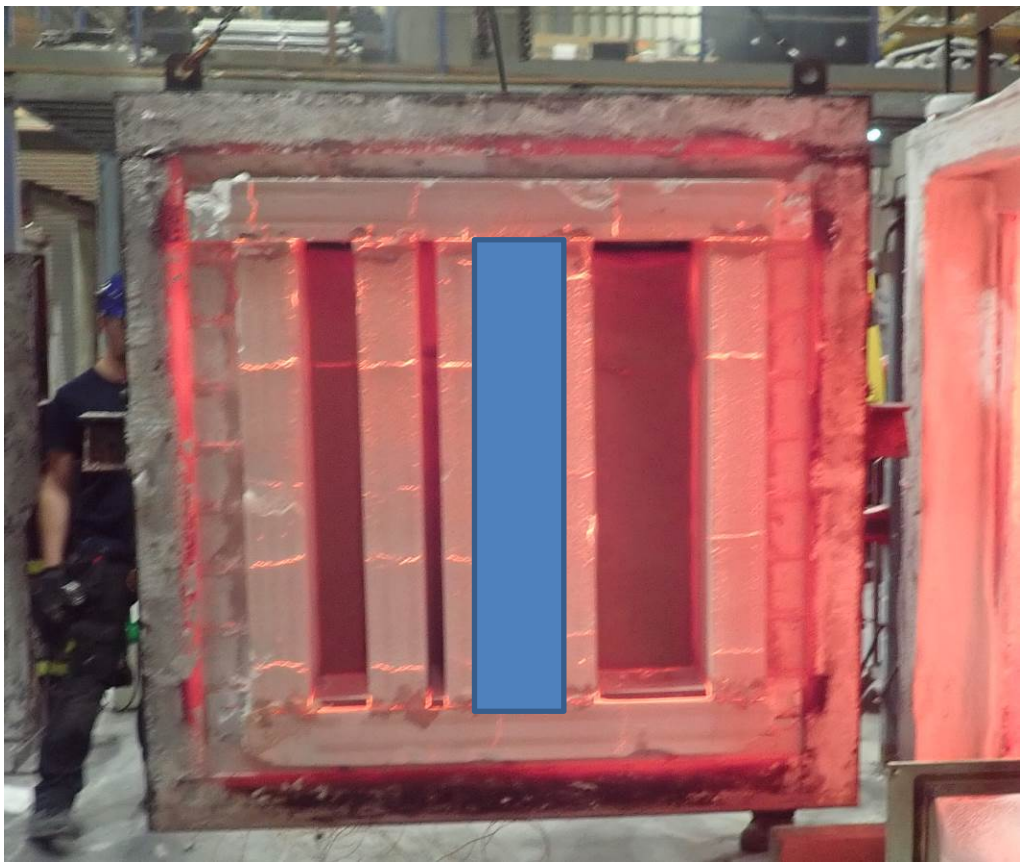
The unexposed face of the wall assembly after a test duration of 180 minutes



The unexposed face of the floor assembly after a test duration of 180 minutes



The exposed face of the wall assembly immediately after the test



The exposed face of the floor assembly immediately after the test

Temperature, Pressure and Deflection Data

Mean furnace temperature, together with the temperature/time relationship specified in BS EN 1363-1: 2020

Time Mins	Specified Furnace Temperature Deg. C	Actual Furnace Temperature Deg. C
0	20	28
10	678	667
20	781	762
30	842	832
40	885	873
50	918	906
60	945	932
70	968	957
80	988	977
90	1006	995
100	1022	1011
110	1036	1026
120	1049	1039
130	1061	1050
140	1072	1062
150	1082	1071
160	1092	1081
170	1101	1089
180	1110	1096
190	1118	1107
200	1126	1117
210	1133	1125
220	1140	1133

Individual temperatures recorded on the unexposed surface of Specimen A and adjacent to Specimen A

Time Mins	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	23	24	24	22	21	22	22
2	27	24	24	22	21	22	22
4	29	25	24	22	21	22	22
6	43	26	24	22	22	22	22
8	63	38	31	22	22	22	22
10	66	54	55	23	23	22	22
12	67	58	58	24	24	23	23
14	71	63	66	26	25	23	23
16	77	60	60	26	25	24	24
18	100	64	66	27	26	24	24
20	132	78	90	28	27	25	24
22	154	104	119	29	28	25	25
24	181	129	142	31	29	26	25
26	190	148	131	33	31	26	26
28	173	154	122	35	33	27	27
30	175	152	116	37	35	27	28
32	176	148	119	38	37	28	28
34	175	144	120	39	38	29	29
36	175	138	123	40	40	30	30
38	178	135	126	42	41	31	31
40	180	136	126	44	43	32	32
42	178	141	130	45	44	33	32
44	182	138	130	46	45	34	33
46	186	139	128	47	46	35	34
48	191	135	129	47	47	36	34
50	189	140	132	49	48	37	35
52	190	138	132	49	49	38	36
54	190	142	133	51	50	39	36
56	188	140	131	51	51	40	37
58	188	143	131	52	52	41	38
60	190	142	131	53	53	41	38
62	192	144	133	53	54	42	39
64	192	145	135	54	55	43	39
66	195	148	137	55	56	44	40
68	196	149	138	55	57	47	41
70	193	151	139	56	58	48	42
72	197	151	142	57	59	49	42
73	196	149	145	57	59	49	43
74	198	149	145	57	59	50	42
76	#	#	#	#	#	#	#

#Specimen blanked off

Individual temperatures recorded on the unexposed surface of Specimen C and adjacent to Specimen C

Time Mins	T/C Number 24 Deg. C	T/C Number 25 Deg. C	T/C Number 26 Deg. C	T/C Number 27 Deg. C	T/C Number 28 Deg. C	T/C Number 29 Deg. C	T/C Number 30 Deg. C
0	22	21	21	21	20	20	20
6	49	55	26	22	21	21	20
12	73	111	76	29	31	29	30
18	79	153	89	35	36	38	38
24	85	171	94	40	40	42	42
30	85	189	99	44	42	45	46
36	85	197	104	47	43	49	49
38	84	200	106	47	44	50	49
39	83	202	107	48	44	50	50
42	81	207	112	49	45	50	50
48	71	215	126	51	46	53	53
54	74	217	159	53	48	54	55
60	74	226	190	56	50	56	59
66	72	230	218	58	53	58	61
72	69	241	222	61	57	61	64
78	71	246	233	64	60	65	66
84	78	249	235	67	62	67	68
90	73	259	244	69	64	71	71
96	66	267	251	72	67	76	73
102	65	273	258	75	69	81	75
108	64	275	265	77	74	85	78
114	66	286	268	80	73	89	80
120	66	281	275	88	75	91	82
126	67	290	285	90	80	95	85
132	68	292	286	91	82	94	85
138	75	305	305	91	83	100	90
144	78	320	322	94	86	104	94
150	80	325	317	97	89	107	96
156	83	326	323	99	91	110	99
162	82	329	326	101	94	112	100
168	83	335	329	103	96	114	103
174	87	339	332	105	99	116	104
180	100	352	335	107	101	118	106
186	109	365	346	111	102	122	110
192	110	369	350	114	104	125	113
198	114	374	366	119	106	132	119
204	114	374	371	121	107	134	120
210	117	379	378	125	109	142	120
216	116	380	378	125	112	148	123
220	111	382	381	127	112	150	124

Individual temperatures recorded on the unexposed surface of Specimen D and adjacent to Specimen D

Time Mins	T/C Number 31 Deg. C	T/C Number 32 Deg. C	T/C Number 33 Deg. C	T/C Number 34 Deg. C	T/C Number 35 Deg. C	T/C Number 36 Deg. C	T/C Number 37 Deg. C
0	23	23	27	21	21	21	21
3	43	36	*	22	22	21	21
6	57	44	*	22	22	21	21
9	75	72	*	23	24	22	22
12	125	119	*	25	25	24	23
15	192	174	*	28	29	25	24
18	172	163	85	31	31	27	26
21	169	159	96	33	32	29	28
24	172	153	85	34	33	33	29
27	177	165	95	35	35	36	31
30	180	169	93	37	36	38	32
33	181	168	88	38	37	42	34
36	183	171	90	39	39	44	35
39	184	174	91	41	40	48	36
42	185	178	93	42	41	51	38
45	185	179	94	43	42	54	39
48	189	180	92	44	43	56	40
51	194	183	93	45	44	59	41
54	198	185	92	47	45	61	43
57	200	185	90	48	47	62	44
59	203	185	90	49	48	61	44
60	204	184	91	49	48	61	45
63	211	185	94	51	49	63	46
66	214	189	92	52	51	64	47
69	210	188	86	53	52	66	48
72	205	191	90	55	54	67	50
75	203	187	93	57	56	68	51
78	203	186	94	59	58	71	52
81	#	#	#	#	#	#	#

*Thermocouple malfunction

#Specimen blanked off

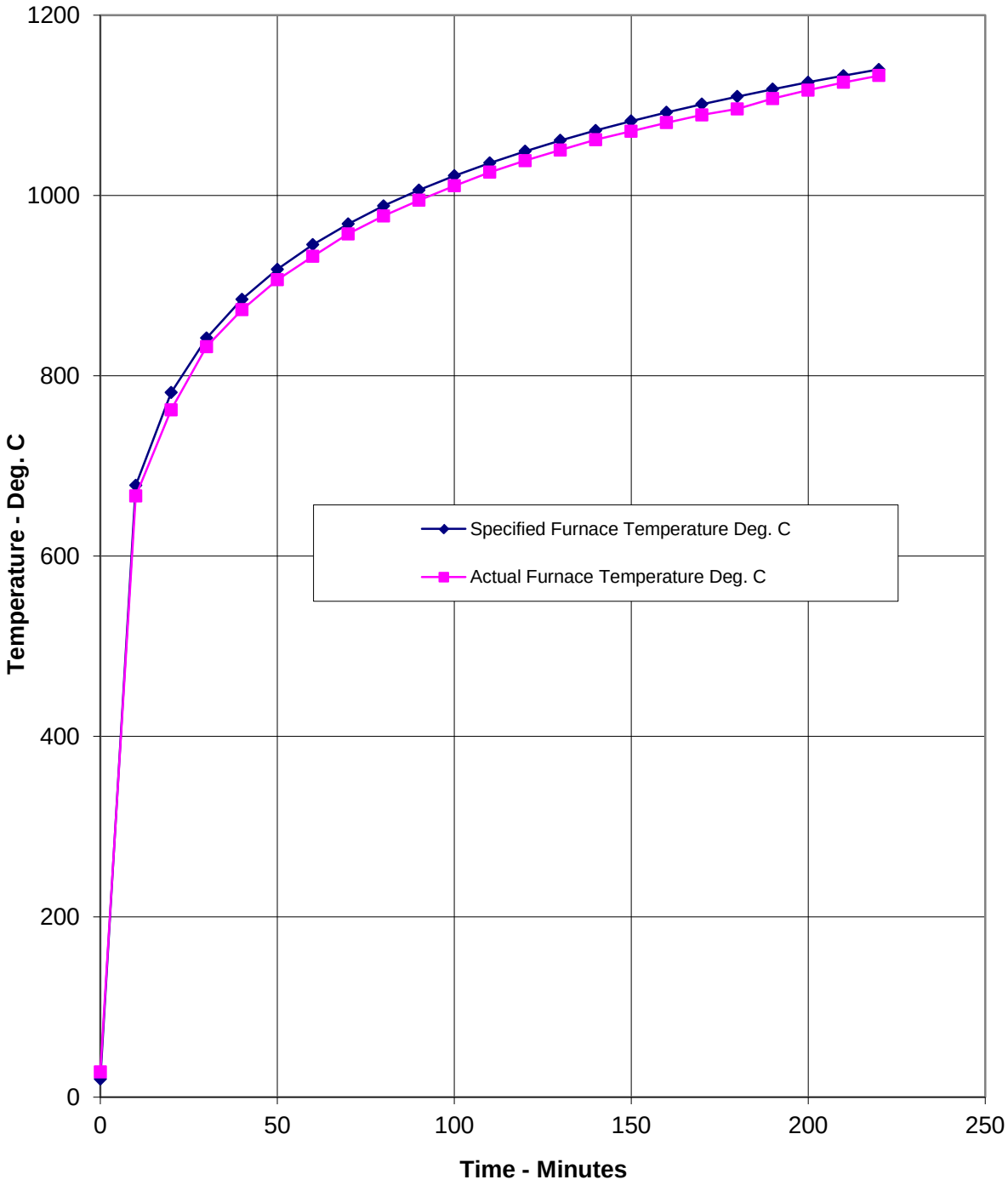
Individual temperatures recorded on the unexposed surface of Specimen G and adjacent to Specimen G

Time Mins	T/C Number 52 Deg. C	T/C Number 53 Deg. C	T/C Number 54 Deg. C	T/C Number 55 Deg. C	T/C Number 56 Deg. C	T/C Number 57 Deg. C	T/C Number 58 Deg. C
0	19	20	20	18	19	19	19
2	61	*	62	20	20	24	20
4	56	*	57	20	21	24	21
6	75	*	59	21	22	26	22
8	124	*	81	24	24	29	24
10	145	*	115	25	26	34	27
12	133	*	154	27	29	36	29
14	136	*	166	29	31	38	31
16	133	*	158	31	32	39	32
18	140	*	153	33	34	40	33
20	145	*	157	35	35	42	34
22	144	*	159	36	37	44	36
24	148	*	165	38	39	47	37
26	148	*	171	39	41	48	39
28	157	*	171	41	43	49	41
30	189	*	166	45	45	52	42
31	207	*	162	47	45	53	42
32	214	*	161	48	46	55	43
34	134	*	165	51	48	57	44
36	104	*	166	55	49	60	45
38	105	*	169	58	53	63	45
40	110	*	168	60	57	64	48
42	111	*	172	61	59	67	51
44	117	*	176	65	63	69	52
46	119	*	172	67	65	72	52
48	122	*	175	69	68	73	53
50	129	*	177	72	72	76	55
52	131	*	180	74	75	78	56
54	175	*	181	75	78	80	58
56	180	*	183	79	80	83	58
58	179	*	189	80	82	84	60
60	185	*	190	83	84	87	59
62	195	*	189	87	86	91	60
64	197	*	190	90	89	94	61
66	201	*	196	91	91	95	64
68	212	*	200	98	93	98	64
70	230	*	201	98	96	103	67
71	#	#	#	#	#	#	#

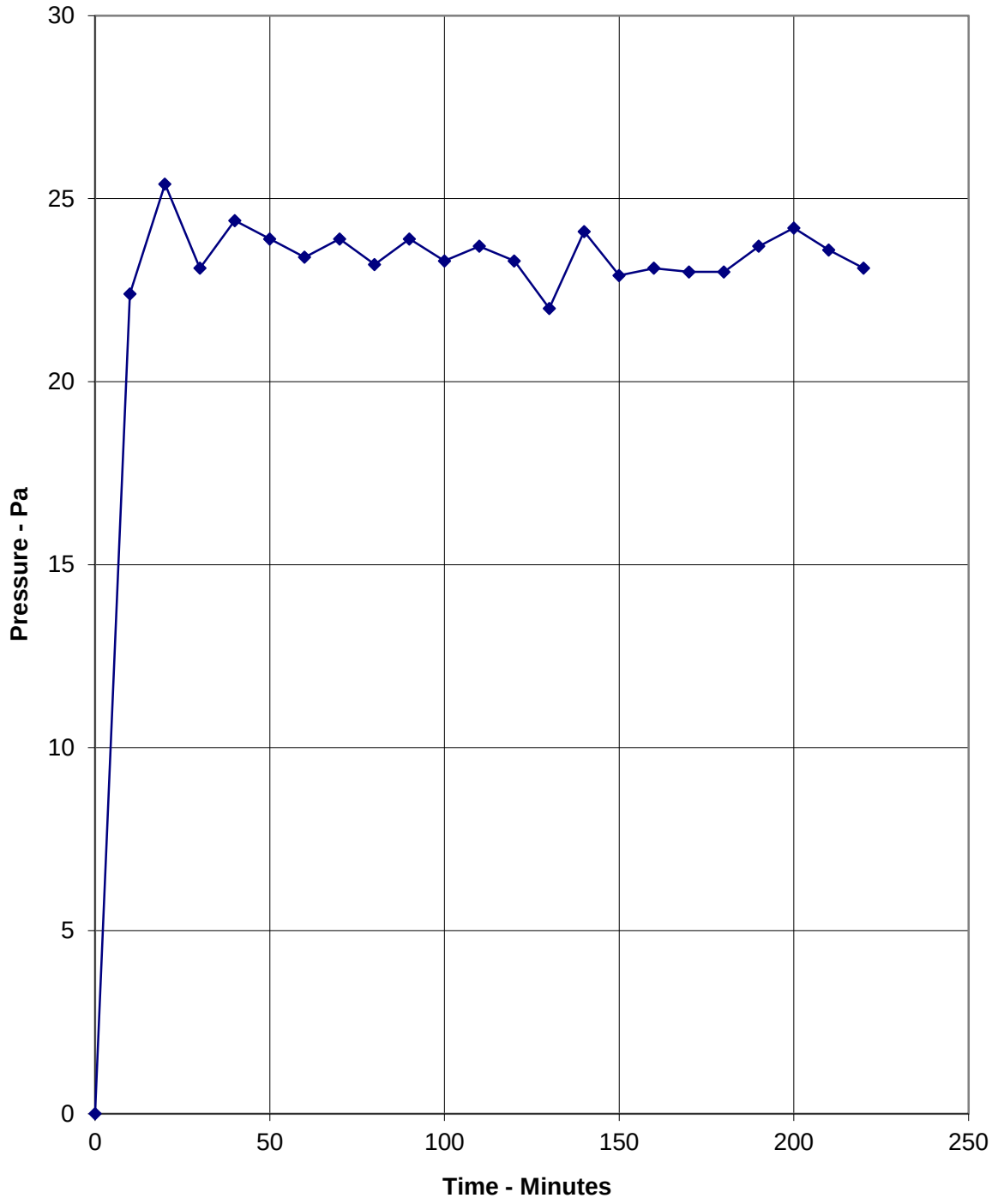
*Thermocouple malfunction

#Specimen blanked off

Graph showing mean furnace temperature, together with the temperature/time relationship specified in BS EN 1363-1: 2020



Graph showing recorded furnace pressure 230 mm above the head of the wall specimens



On-going 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.

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 has 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