

Title:

The Fire Resistance
Performance Of Six
Specimens Of Wall
Mounted And Six
Specimens Of Floor
Mounted Linear Gap
Sealing Systems, Tested
In Accordance With BS
EN 1366-4: 2006

Report No:

182724/A



Prepared for:

Nullifire Limited

Torrington Avenue
Coventry
West Midlands
CV4 9TJ

Date:

7th May 2009

Note: This report is additional to
that issued as WF No. 181967,
dated 29th April 2009. The original
report remains valid and is not
replaced by this additional test
report.

Notified Body No:

0833



0249

Summary

Objective

A fire resistance test has been conducted to assess the ability of six vertically orientated specimens and six horizontally orientated specimens of linear gap sealing systems, to reinstate the fire resistance of a blockwork wall and a pre-cast, aerated concrete floor incorporating timber and mild steel sections when tested in accordance with BS EN 1366-4: 2006.

Sponsor

Nullifire Ltd, Torrington Avenue, Coventry, West Midlands, CV4 9TJ

Summary of the Tested Specimen

For the purpose of the test the floor specimens were referenced A to F and the wall specimens were referenced G to L.

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 blockwork arranged to provide four 12 mm wide by 1000 mm long and two 30 mm wide by 1000 mm long linear gaps.

The section of floor had overall dimensions of 2240 mm long by 1730 mm wide by 150 mm thick and was made up of autoclaved aerated concrete lintels arranged to provide two 12 mm wide by 1000 mm long, two 30 mm wide by 1000 mm long and two 50 mm wide by 1000 mm long linear gaps.

Each gap was sealed with Acrylic based intumescent sealant referenced "M701 Intumescent Acrylic Sealant". Each seal was cartridge gunned into the gaps. Specimens I and K incorporated a softwood timber gap facing, Specimen J incorporated a hardwood timber gap facing and Specimens D, E, F and L incorporated a mild steel angle gap facing. Specific details of each of the seals are given in the table below:

Specimen	Gap width	Seal details
A	12 mm	6 mm deep, cartridge gunned then trowelled flush with the unexposed face and faced on the exposed side with 13 mm diameter polyethylene backing rod
B	30 mm	15 mm deep, cartridge gunned then trowelled flush with the unexposed face and faced on the exposed side with 30 mm diameter polyethylene backing rod
C	50 mm	25 mm deep, cartridge gunned then trowelled flush with the unexposed face and faced on the exposed side with 2 no. 25 mm diameter polyethylene backing rod

Specimen	Gap width	Seal details
D	12 mm	6 mm deep, cartridge gunned then trowelled flush with the unexposed face and faced on the exposed side with 13 mm diameter polyethylene backing rod
E	30 mm	15 mm deep, cartridge gunned then trowelled flush with the unexposed face and faced on the exposed side with 30 mm diameter polyethylene backing rod
F	50 mm	25 mm deep, cartridge gunned then trowelled flush with the unexposed face and faced on the exposed side with 2 no. 25 mm diameter polyethylene backing rod
G	12 mm	6 mm deep, cartridge gunned then trowelled flush with both faces of the cavity. Both unexposed and exposed gap seals were faced internally with 13 mm diameter polyethylene backing rods
H	30 mm	15 mm deep, cartridge gunned then trowelled flush with both faces of the cavity. Both unexposed and exposed gap seals were faced internally with 30 mm diameter polyethylene backing rods
I	12 mm	6 mm deep, cartridge gunned then trowelled flush with both faces of the cavity. Both unexposed and exposed gap seals were faced internally with 13 mm diameter polyethylene backing rods
J	12 mm	6 mm deep, cartridge gunned then trowelled flush with both faces of the cavity. Both unexposed and exposed gap seals were faced internally with 13 mm diameter polyethylene backing rods
K	30 mm	15 mm deep, cartridge gunned then trowelled flush with both faces of the cavity. Both unexposed and exposed gap seals were faced internally with 30 mm diameter polyethylene backing rods
L	12 mm	6 mm deep, cartridge gunned then trowelled flush with both faces of the cavity. Both unexposed and exposed gap seals were faced internally with 13 mm diameter polyethylene backing rods

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

Test Results

Reference	Integrity (mins)		Insulation (mins)
	Cotton Pad	Sustained flaming	
A	301*	301*	196
B	301*	301*	81
C	301*	301*	74
D	288	301*	43
E	301*	301*	41
F	290	301*	35
G	301*	301*	222
H	301*	301*	301*
I	97	108	75
J	153	153	152
K	114	114	114
L	301*	301*	80

* The test duration. The test was discontinued after a period of 301 minutes.

Date of Test

23rd April 2009

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Signatories



Responsible Officer

D. Yates*

Testing Officer



Approved

C. Johnson*

Senior Certification Engineer



Head of Department

S. Hankey*

Operations Manager

* For and on behalf of Bodycote **warringtonfire**.

Report Issued

Date : 7th May 2009

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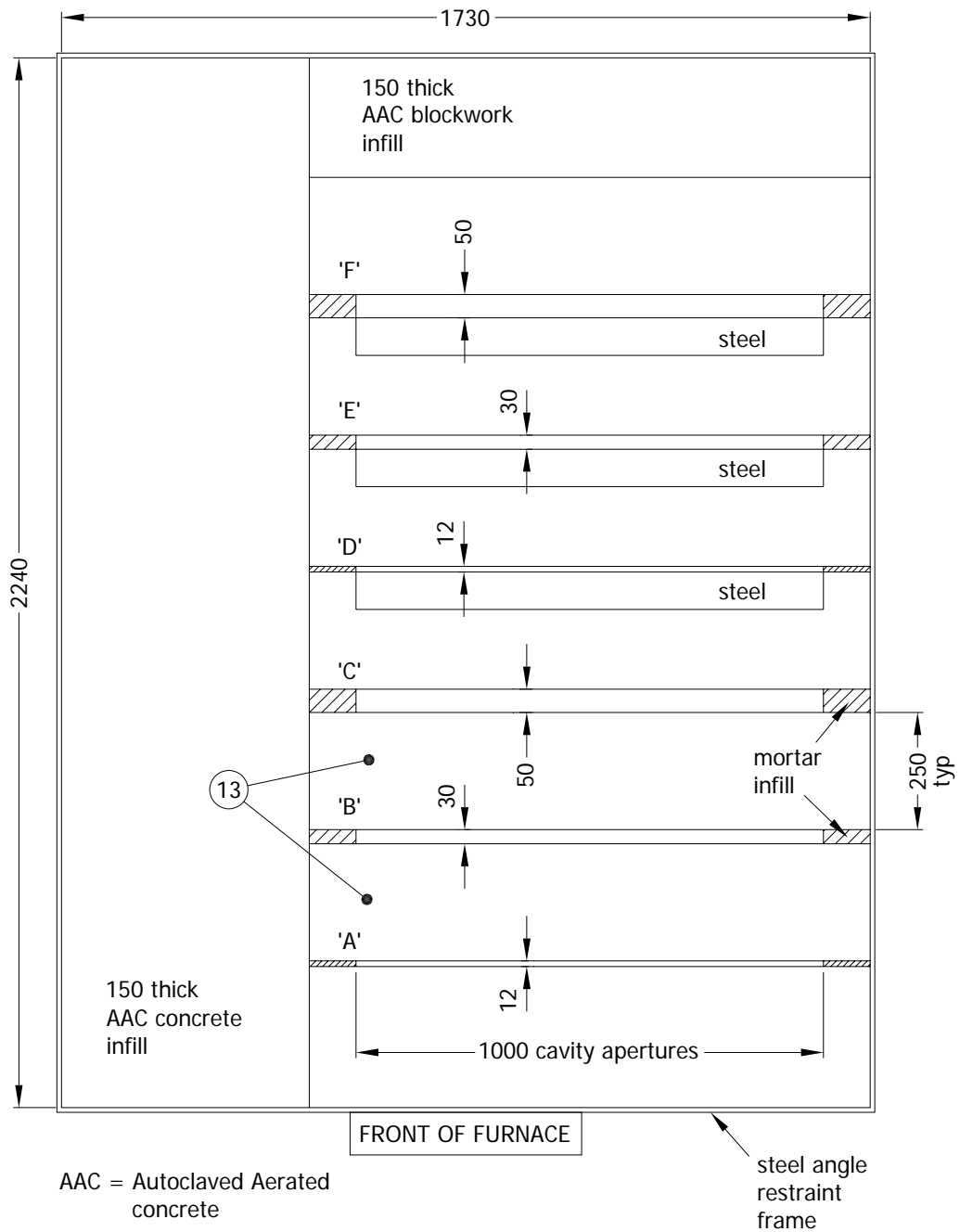
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Test Procedure

Introduction	<p>Walls and floors often incorporate gaps to accommodate expansion, contraction or other movement of the structure. 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.</p> <p>The specimens were judged on their ability to comply with the performance criteria for integrity and insulation, as required by BS EN 1366-4: 2006.</p>
Fire Test Study Group/EGOLF	<p>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.</p>
Instruction To Test	<p>The test was conducted on the 23rd April 2009 at the request of the sponsor of the test.</p> <p>The test was witnessed by Mr. G. Southerington and Mr. C. Abbott.</p>
Test Specimen Construction	<p>A comprehensive description of the test construction 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.</p>
Installation	<p>Bodycote warringtonfire supplied the wall and floor constructions. The gap sealing systems were provided and installed by a representative of the test sponsor on the 20th March 2009.</p>
Sampling	<p>A representative of Warrington Certification Limited selected and sampled the intumescent seals on the 11th March 2009.</p>
Conditioning	<p>The specimens' storage, construction, and test preparation took place in the test laboratory over a total, combined time of 34 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 10°C to 26°C and 30% to 72% respectively.</p>

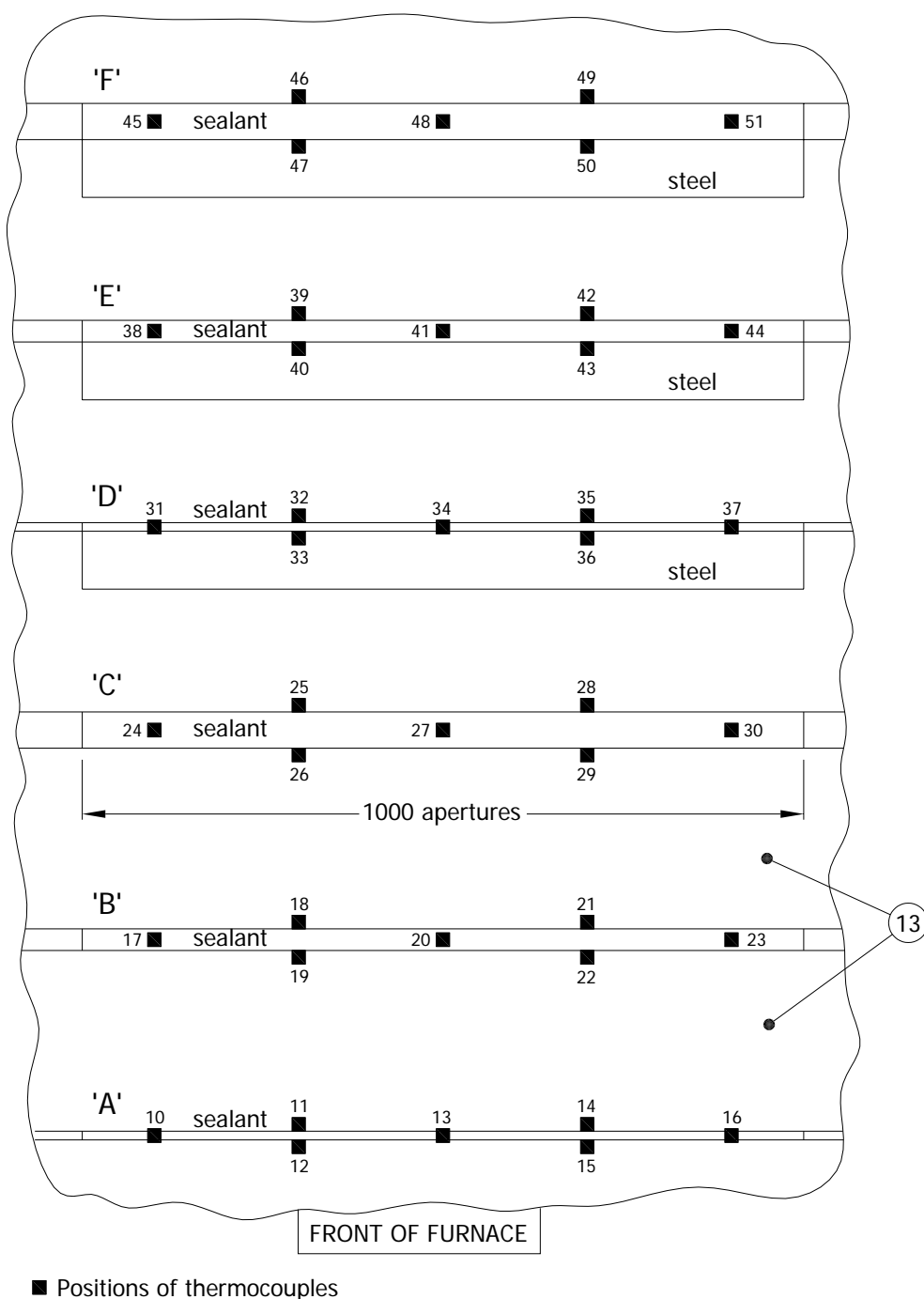
Test Specimen

Figure 1- General Plan of Floor Test Specimens from Unexposed Face



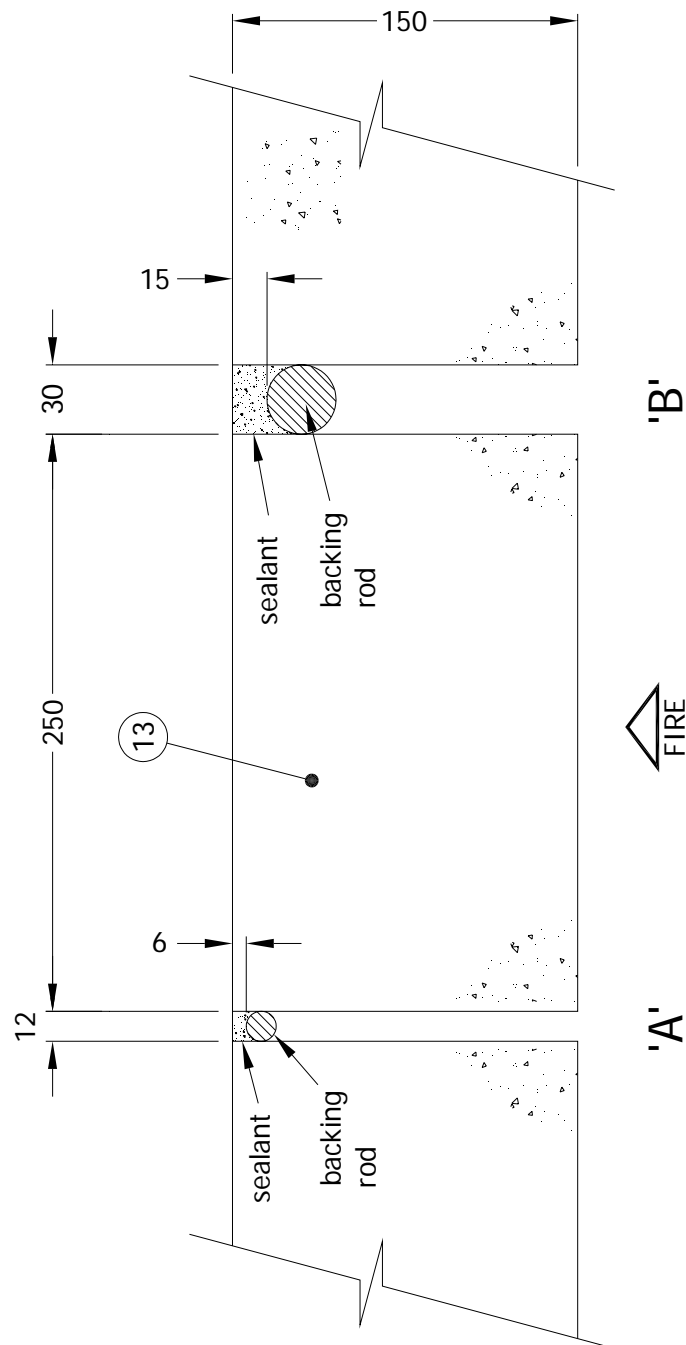
Do not scale. All dimensions are in mm

Figure 2 – Enlarged View showing Unexposed Face Thermocouples for Floor Test Specimens



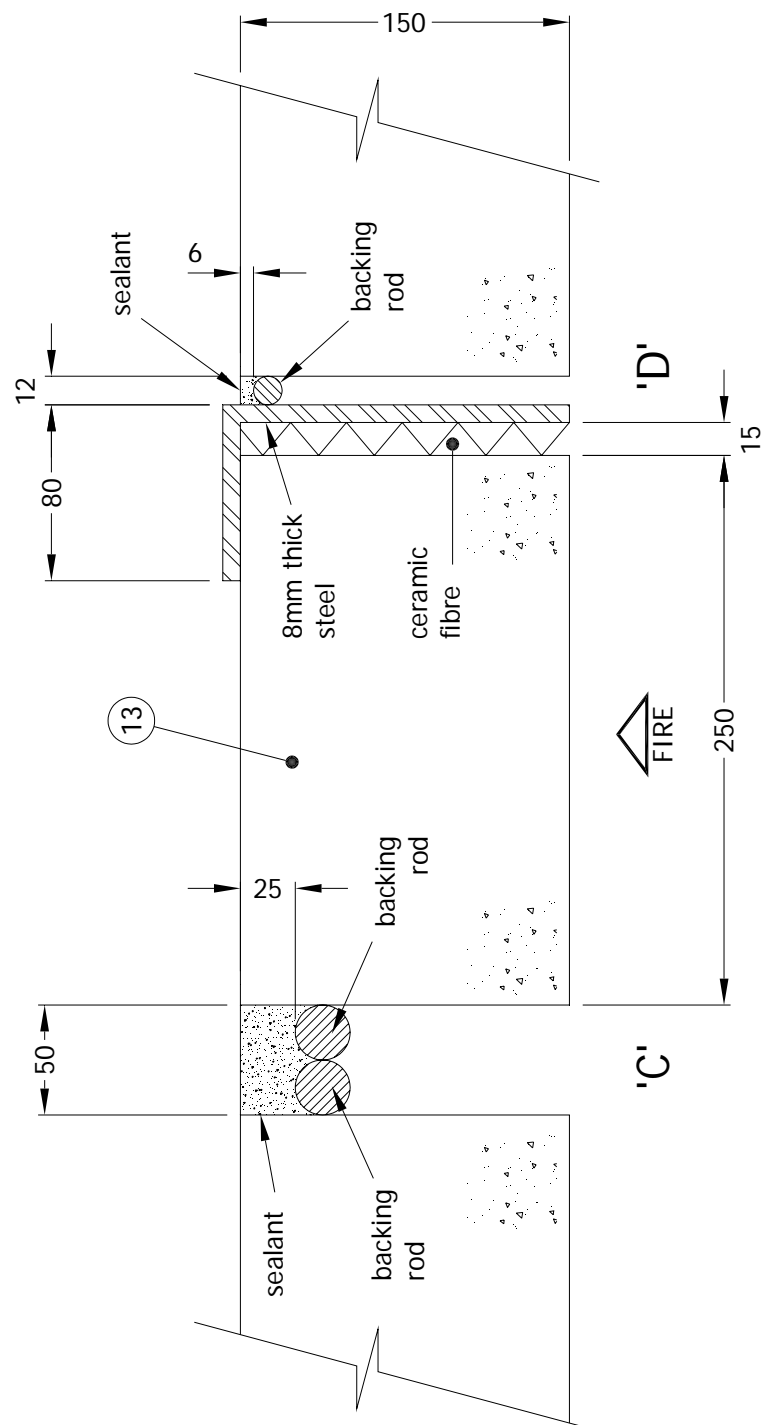
Do not scale. All dimensions are in mm

Figure 3 – Section Through Floor Specimens 'A' and 'B' (items 1 and 2)



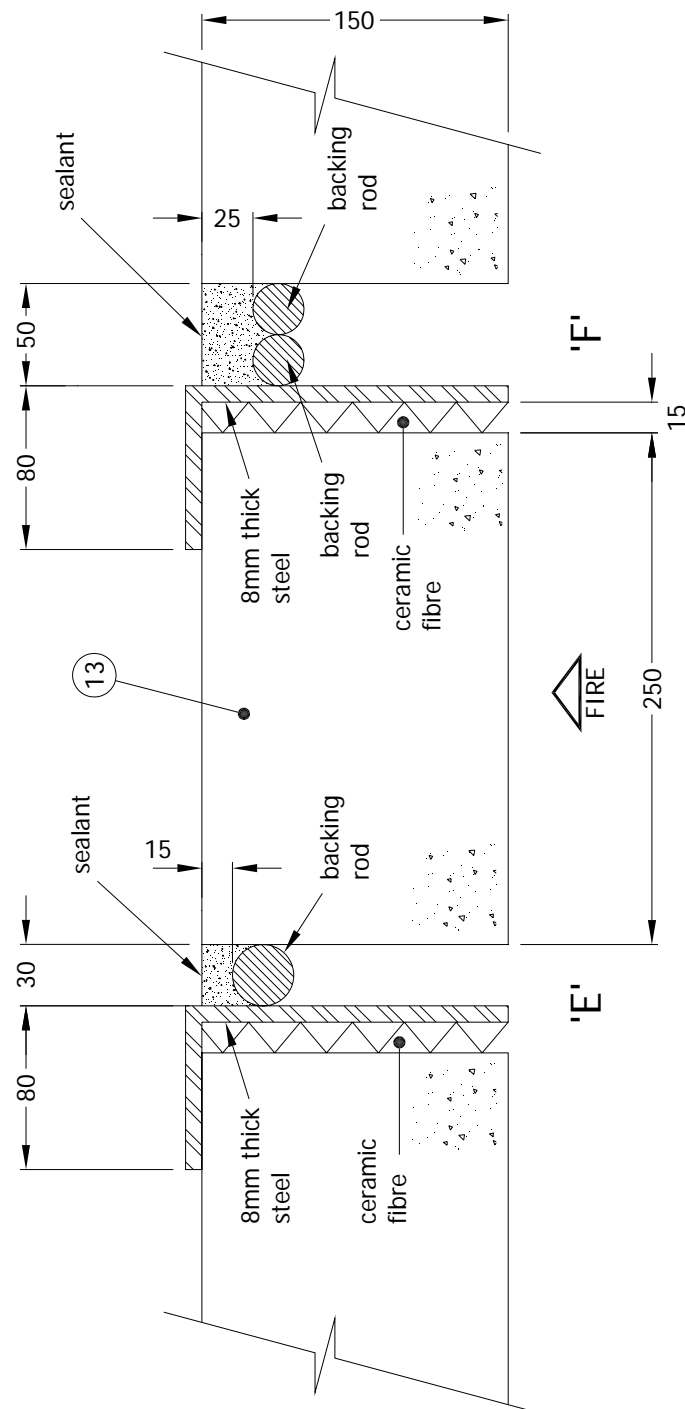
Do not scale. All dimensions are in mm

Figure 4 – Section Through Floor Specimens 'C' and 'D' (items 3 and 4)



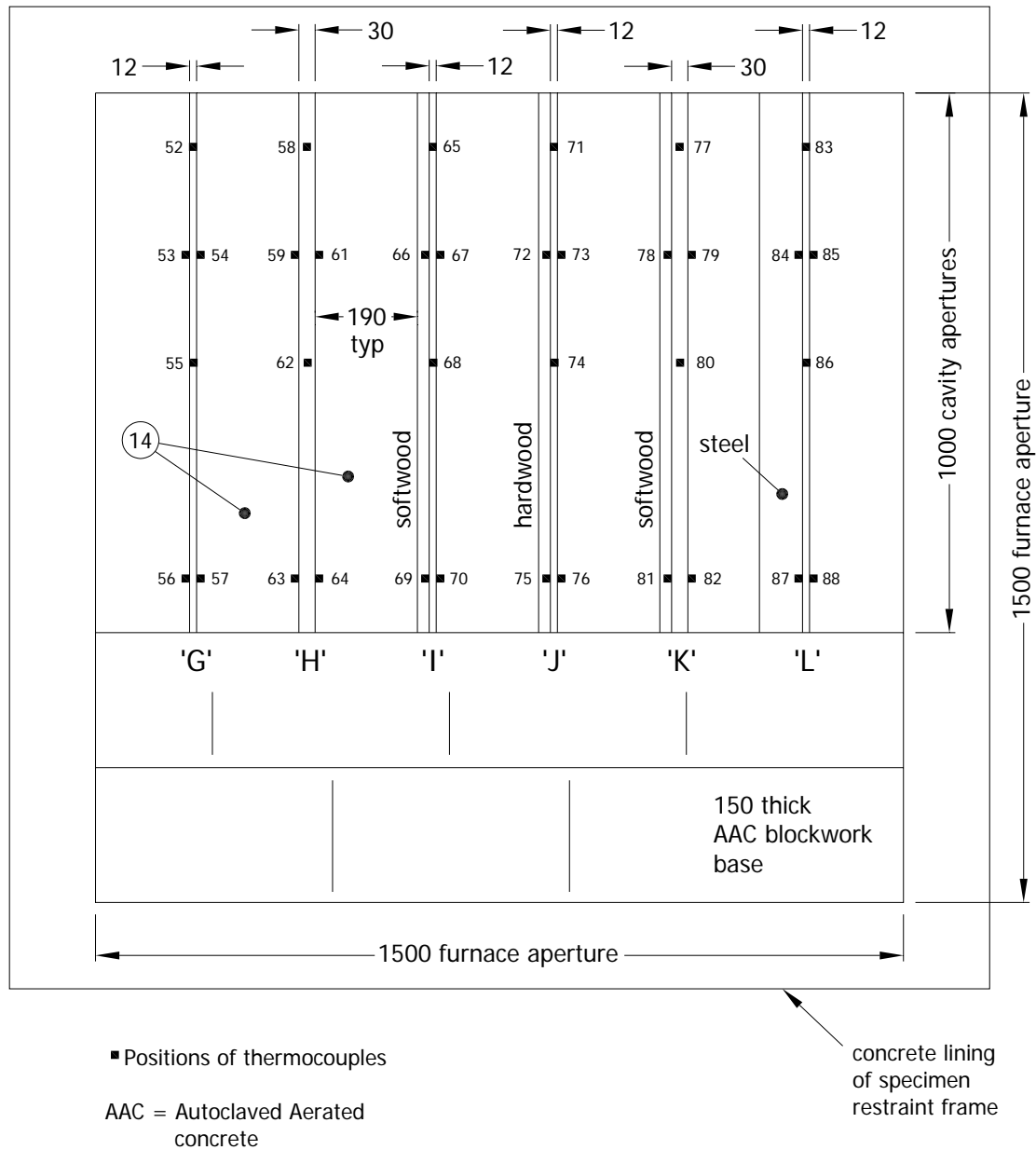
Do not scale. All dimensions are in mm

Figure 5 – Section Through Floor Specimens 'E' and 'F' (items 5 and 6)



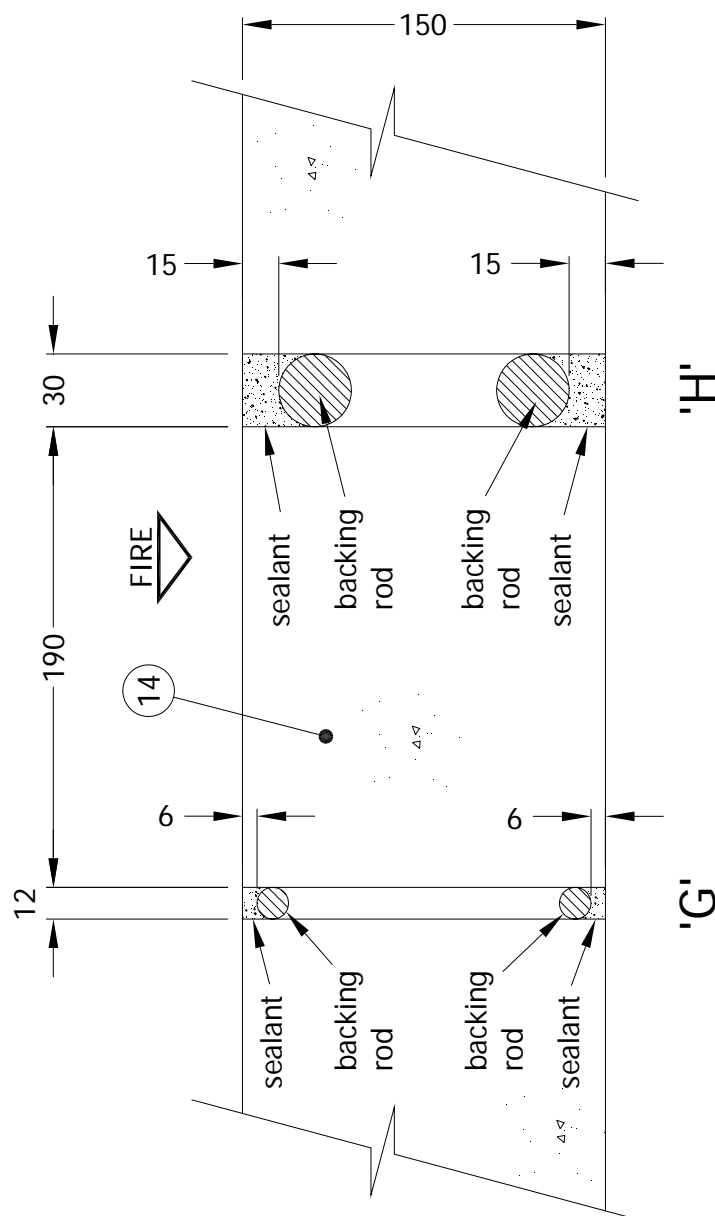
Do not scale. All dimensions are in mm

Figure 6 – General Elevation of Wall Test Specimens and Thermocouples at Unexposed Face



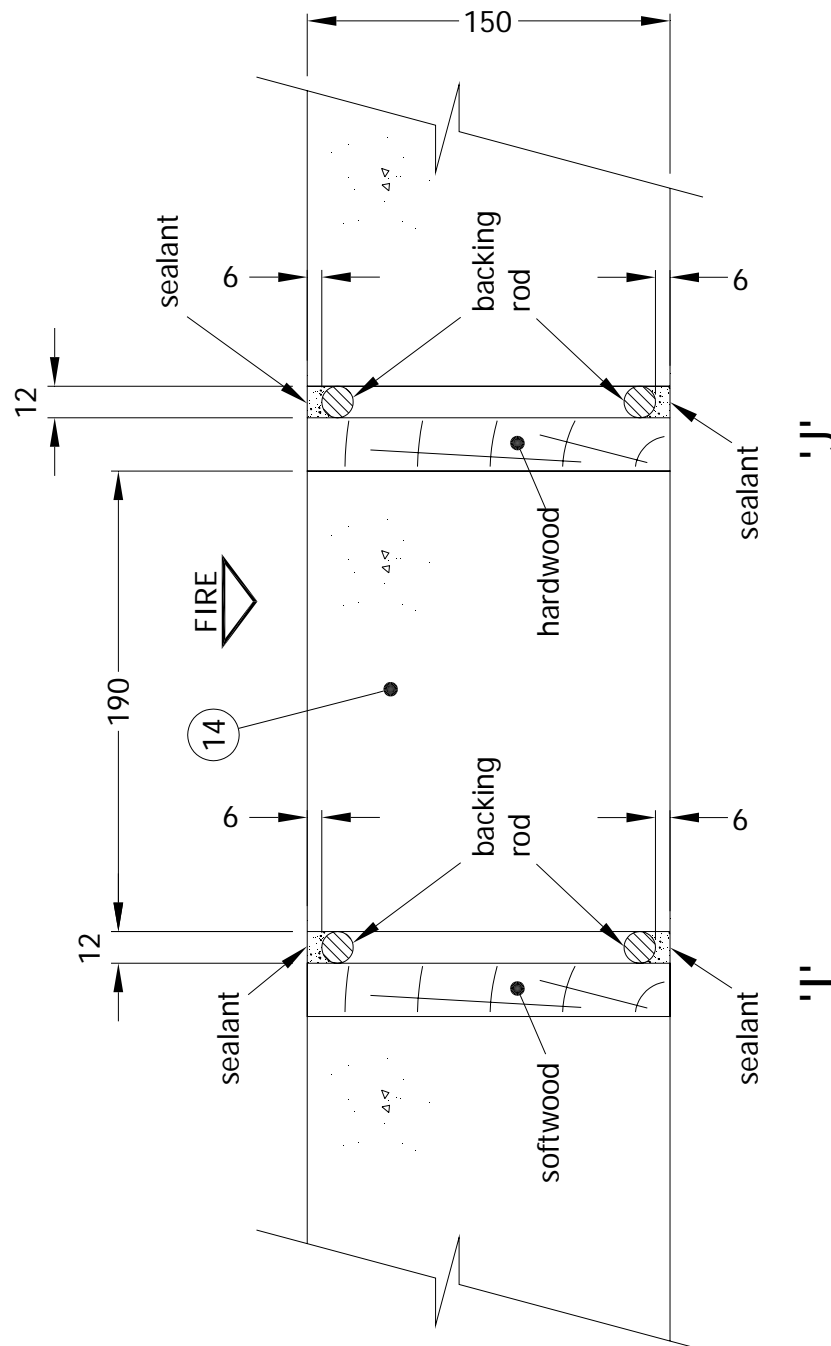
Do not scale. All dimensions are in mm

Figure 7 – Section Through Wall Specimens 'G' and 'H' (items 7 and 8)



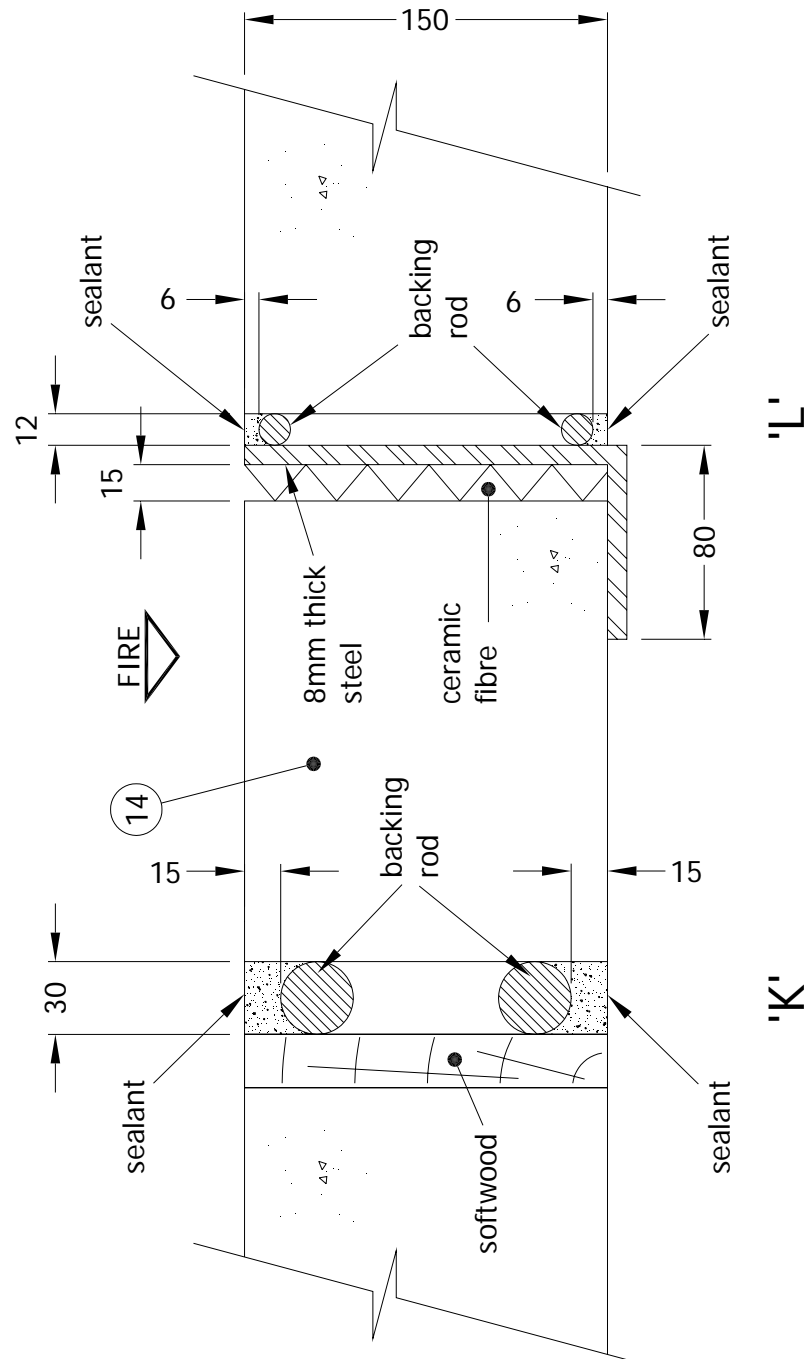
Do not scale. All dimensions are in mm

Figure 8 – Section Through Wall Specimens 'I' and 'J' (items 9 and 10)



Do not scale. All dimensions are in mm

Figure 9 – Section Through Wall Specimens 'K' and 'L' (items 11 and 12)



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)

<u>Item</u>	<u>Description</u>
Details of Floor Joint Seals (items 1 to 6)	
1. Specimen 'A'	
Details of Sealant	
Manufacturer	: Nullifire Limited
Reference	: M701 Intumescent Acrylic Sealant
Material	: Acrylic Sealant
Overall section size of sealant	: 12 mm wide x 6 mm deep x 1000 mm long
Application method	: Cartridge gunned at unexposed face of cavity
Overall size of cavity	: 12 mm wide x 150 mm deep x 1000 mm long
Details of Backing rod	
Material	: Polyethylene
Size	: 13 mm diameter
Fixing method	: Friction fit within cavity
Details of Gap facing	: Masonry (item 13)
2. Specimen 'B'	
Details of Sealant	
Manufacturer	: Nullifire Limited
Reference	: M701 Intumescent Acrylic Sealant
Material	: Acrylic Sealant
Overall section size of sealant	: 30 mm wide x 15 mm deep x 1000 mm long
Application method	: Cartridge gunned at unexposed face of cavity
Overall size of cavity	: 30 mm wide x 150 mm deep x 1000 mm long
Details of Backing rod	
Material	: Polyethylene
Size	: 30 mm diameter
Fixing method	: Friction fit within cavity
Details of Gap facing	: Masonry (item 13)
3. Specimen 'C'	
Details of Sealant	
Manufacturer	: Nullifire Limited
Reference	: M701 Intumescent Acrylic Sealant
Material	: Acrylic Sealant
Overall section size of sealant	: 50 mm wide x 25 mm deep x 1000 mm long
Application method	: Cartridge gunned at unexposed face of cavity
Overall size of cavity	: 50 mm wide x 150 mm deep x 1000 mm long
Details of Backing rod	
Material	: Polyethylene
Size	: 2 no. rods, each 25 mm diameter
Fixing method	: Friction fit within cavity
Details of Gap facing	: Masonry (item 13)

Item**Description****4. Specimen 'D'**

Details of Sealant	
Manufacturer	: Nullifire Limited
Reference	: M701 Intumescent Acrylic Sealant
Material	: Acrylic Sealant
Overall section size of sealant	: 12 mm wide x 6 mm deep x 1000 mm long
Application method	: Cartridge gunned at unexposed face of cavity
Overall size of cavity	: 12 mm wide x 150 mm deep x 1000 mm long
Details of Backing rod	
Material	: Polyethylene
Size	: 13 mm diameter
Fixing method	: Friction fit within cavity
Details of Gap facing	: Steel/Masonry (item 13)
Details of steel	
Thickness	: 8 mm
Fixing method to masonry	: 3 no. 5.5 mm diameter x 75 mm long screws
Details of insulation infill	
Material	: Ceramic fibre insulation
Fixing method	: Friction fit within void behind steel facing. See Figure 4.

5. Specimen 'E'

Details of Sealant	
Manufacturer	: Nullifire Limited
Reference	: M701 Intumescent Acrylic Sealant
Material	: Acrylic Sealant
Overall section size of sealant	: 30 mm wide x 15 mm deep x 1000 mm long
Application method	: Cartridge gunned at unexposed face of cavity
Overall size of cavity	: 30 mm wide x 150 mm deep x 1000 mm long
Details of Backing rod	
Material	: Polyethylene
Size	: 30 mm diameter
Fixing method	: Friction fit within cavity
Details of Gap facing	: Steel/Masonry (item 13)
Details of steel	
Thickness	: 8 mm
Fixing method to masonry	: 3 no. 5.5 mm diameter x 75 mm long screws
Details of insulation infill	
Material	: Ceramic fibre insulation
Fixing method	: Friction fit within void behind steel facing. See Figure 5.

6. Specimen 'F'

Details of Sealant	
Manufacturer	: Nullifire Limited
Reference	: M701 Intumescent Acrylic Sealant
Material	: Acrylic Sealant
Overall section size of sealant	: 50 mm wide x 25 mm deep x 1000 mm long
Application method	: Cartridge gunned at unexposed face of cavity
Overall size of cavity	: 50 mm wide x 150 mm deep x 1000 mm long
Details of Backing rod	
Material	: Polyethylene
Size	: 2 no. rods, each 25 mm diameter

<u>Item</u>	<u>Description</u>
6. continued	
Fixing method	: Friction fit within cavity
Details of Gap facing	: Steel/Masonry (item 13)
Details of steel	
Thickness	: 8 mm
Fixing method to masonry	: 3 no. 5.5 mm diameter x 75 mm long screws
Details of insulation infill	
Material	: Ceramic fibre insulation
Fixing method	: Friction fit within void behind steel facing. See Figure 5.

Details of Wall Joint Seals (items 7 to 12)

7. Specimen 'G'

Details of Sealant	
Manufacturer	: Nullifire Limited
Reference	: M701 Intumescent Acrylic Sealant
Material	: Acrylic Sealant
Overall section size of sealant	: 12 mm wide x 6 mm deep x 1000 mm long
Application method	: Cartridge gunned at both faces of cavity
Overall size of cavity	: 12 mm wide x 150 mm deep x 1000 mm long
Details of Backing rod	
Material	: Polyethylene
Size	: 13 mm diameter
Fixing method	: Friction fit within cavity
Details of Gap facing	: Masonry (item 14)

8. Specimen 'H'

Details of Sealant	
Manufacturer	: Nullifire Limited
Reference	: M701 Intumescent Acrylic Sealant
Material	: Acrylic Sealant
Overall section size of sealant	: 30 mm wide x 15 mm deep x 1000 mm long
Application method	: Cartridge gunned at both faces of cavity
Overall size of cavity	: 30 mm wide x 150 mm deep x 1000 mm long
Details of Backing rod	
Material	: Polyethylene
Size	: 30 mm diameter
Fixing method	: Friction fit within cavity
Details of Gap facing	: Masonry (item 14)

9. Specimen 'I'

Details of Sealant	
Manufacturer	: Nullifire Limited
Reference	: M701 Intumescent Acrylic Sealant
Material	: Acrylic Sealant
Overall section size of sealant	: 12 mm wide x 6 mm deep x 1000 mm long
Application method	: Cartridge gunned at both faces of cavity
Overall size of cavity	: 12 mm wide x 150 mm deep x 1000 mm long
Details of Backing rod	
Material	: Polyethylene
Size	: 13 mm diameter
Fixing method	: Friction fit within cavity
Details of Gap facing	: Timber/Masonry (item 14)

Item**Description****9. continued**

Details of Timber

Material	:	Softwood
Thickness	:	22 mm
Fixing method to masonry	:	6 no. screws

10. Specimen 'J'

Details of Sealant

Manufacturer	:	Nullifire Limited
Reference	:	M701 Intumescent Acrylic Sealant
Material	:	Acrylic Sealant
Overall section size of sealant	:	12 mm wide x 6 mm deep x 1000 mm long
Application method	:	Cartridge gunned at both faces of cavity
Overall size of cavity	:	12 mm wide x 150 mm deep x 1000 mm long
Details of Backing rod		
Material	:	Polyethylene
Size	:	13 mm diameter
Fixing method	:	Friction fit within cavity
Details of Gap facing	:	Timber/Masonry (item 14)
Details of Timber		
Material	:	Hardwood
Thickness	:	22 mm
Fixing method to masonry	:	6 no. screws

11. Specimen 'K'

Details of Sealant

Manufacturer	:	Nullifire Limited
Reference	:	M701 Intumescent Acrylic Sealant
Material	:	Acrylic Sealant
Overall section size of sealant	:	30 mm wide x 15 mm deep x 1000 mm long
Application method	:	Cartridge gunned at both faces of cavity
Overall size of cavity	:	30 mm wide x 150 mm deep x 1000 mm long
Details of Backing rod		
Material	:	Polyethylene
Size	:	30 mm diameter
Fixing method	:	Friction fit within cavity
Details of Gap facing	:	Timber/Masonry (item 14)
Details of Timber		
Material	:	Softwood
Thickness	:	22 mm
Fixing method to masonry	:	6 no. screws

12. Specimen 'L'

Details of Sealant

Manufacturer	:	Nullifire Limited
Reference	:	M701 Intumescent Acrylic Sealant
Material	:	Acrylic Sealant
Overall section size of sealant	:	12 mm wide x 6 mm deep x 1000 mm long
Application method	:	Cartridge gunned at both faces of cavity
Overall size of cavity	:	12 mm wide x 150 mm deep x 1000 mm long

<u>Item</u>	<u>Description</u>
12. continued	
Details of Backing rod	
Material	: Polyethylene
Size	: 13 mm diameter
Fixing method	: Friction fit within cavity
Details of Gap facing	: Steel/Masonry (item 14)
Details of steel	
Thickness	: 8 mm
Fixing method to masonry	: 3 no. 5.5 mm diameter x 75 mm long screws
Details of insulation infill	
Material	: Ceramic fibre insulation
Fixing method	: Friction fit within void behind steel facing. See Figure 9.
13. Concrete Floor	
Material	: Autoclaved aerated concrete lintels
Density	: 670 kg/m ³
Thickness	: 150 mm
Bedding material	: Ordinary sand/cement mortar mix
14. Blockwork Wall	
Material	: Autoclaved aerated concrete blocks
Density	: 760 kg/m ³
Thickness	: 150 mm
Bedding material	: Ordinary sand/cement mortar mix

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 EN 1363-1: 1999 Clause 5.1 using three plate thermometers, distributed over a plane 100 mm from the surface of the vertical test construction and three plate thermometers, distributed over a plane 100 mm from the surface of the horizontal test construction
Thermocouple Allocation	<p>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:</p> <p>The locations and reference numbers of the various unexposed surface thermocouples are shown in Figures 2 and 6.</p>
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 specimens in the wall assembly, the differential pressure was calculated to be 15 (± 2) Pa. and at a position 100 mm below the underside of the floor assembly was calculated to be 20 (± 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 15°C at the start of the test with a maximum variation of +6°C during the test.
00	00	The test commences.
01	00	Slight smoke/steam release begins to issue from Specimens I, J and K.
08	00	Smoke release begins from Specimens H and continues from Specimens I, J and K.
08	30	Flames issue from the timber substrates of Specimens I, J and K viewed from the exposed face.
14	00	The sealant begins to separate from the timber substrate of Specimen I at a small area approximately 25 mm from the head of the specimen.
30	00	No significant visible change.
35	30	Thermocouple number 50 of Specimen F records a temperature rise in excess of 180° C. Insulation failure of Specimen F is deemed to occur.
41	16	Thermocouple number 40 of Specimen E records a temperature rise in excess of 180° C. Insulation failure of Specimen E is deemed to occur.
42	00	Water release is evident from the perimeter (non steel) edge of the seal to Specimen E between thermocouples 38 & 39. The surface of the seal appears cracked and begins to swell.
43	09	Thermocouple number 36 of Specimen D records a temperature rise in excess of 180° C. Insulation failure of Specimen D is deemed to occur.
48	30	The seal to Specimen L begins to swell away from the furnace chamber.
50	00	Viewed from the exposed face, flames continue to issue from the timber substrates of Specimens I, J and K.
58	30	The cracks within the seal of Specimen E increase in size however, there are no areas of glowing or through gaps visible within the cracks at present.
60	00	No significant visible change. All specimens continue to satisfy the integrity criteria. All specimens excluding Specimens D, E and F continue to satisfy the insulation criteria.
68	00	Specimens D, E and F begin to discolour brown adjacent to the steel substrate. All specimens within the floor assembly have swollen away from the furnace chamber by approximately 5 mm for Specimens D & E and 2 mm for Specimens A, B, C and F.

Time		
mins	secs	
71	00	The water release from Specimen E mentioned at 42 mins has stopped.
74	00	Thermocouple number 24 of Specimen C records a temperature rise in excess of 180° C. Insulation failure of Specimen C is deemed to occur.
75	00	Thermocouple number 65 of Specimen I records a temperature rise in excess of 180° C. Insulation failure of Specimen I is deemed to occur.
80	00	Thermocouple number 87 of Specimen L records a temperature rise in excess of 180° C. Insulation failure of Specimen L is deemed to occur.
81	00	Thermocouple number 20 of Specimen B records a temperature rise in excess of 180° C. Insulation failure of Specimen B is deemed to occur.
97	20	An area of glowing can be seen at the head of Specimen I between the seal and timber substrate. A cotton pad is applied and glowing can be seen within the pad. Cotton pad integrity failure of Specimen I is deemed to occur.
102	30	Specimens D, E and F begin to discolour black adjacent to the steel substrate
108	00	A sustained flame is visible at the head of Specimen I as the timber substrate ignites. Sustained flame integrity failure of Specimen I is deemed to occur. An area of glowing is visible between the timber substrate and the seal of Specimen K. A cotton pad is applied but fails to ignite.
113	00	Flames spread along the timber substrate of Specimen I, the specimen is blanked off to allow the test to continue.
114	30	A cotton pad is applied to the area of glowing at the head of Specimen K and ignites. On removal of the pad a sustained flames is evident from the same location. Cotton pad and sustained flaming integrity failure of Specimen K is deemed to occur. The specimen is blanked off to allow the test to continue.
120	00	All specimens excluding Specimens I and K continue to satisfy the integrity criteria.
130	00	Brown discolouration spreads throughout the seals of Specimens B to F of the floor construction.
152	00	Thermocouple number 71 of Specimen J records a temperature rise in excess of 180° C. Insulation failure of Specimen J is deemed to occur.
153	00	A sustained flame is visible at the head of Specimen J as the timber substrate burns through and ignites. Cotton pad and sustained flaming integrity failure of Specimen J is deemed to occur. The specimen is blanked off to allow the test to continue.
164	00	Smoke release has reduced significantly from Specimens G to L.

Time		
mins	secs	
165	00	Small cracks begin to form in the surface of the seal of Specimen F between thermocouple's 46 and 48. The seal to Specimen E continues to swell away from the furnace chamber now by approximately 10 mm in places. Small areas of glowing around the non steel perimeter edges of Specimen D are evident as the seal appears to have shrunk slightly towards the ends of the seal.
180	00	All specimens excluding Specimens I, J and K continue to satisfy the integrity criteria.
195	00	The seal along the perimeter edges of Specimens B and C begin to separate from the test construction as the seal begins to shrink. Small cracks begin to form within the seal of Specimens B, C, D and F and smoke release issues from the cracks. No areas of glowing or through gaps are visible within Specimens A to F at present.
196	00	Thermocouple number 10 of Specimen A records a temperature rise in excess of 180° C. Insulation failure of Specimen A is deemed to occur.
222	00	Thermocouple number 52 of Specimen G records a temperature rise in excess of 180° C. Insulation failure of Specimen G is deemed to occur.
240	00	All specimens excluding specimens I, J and K continue to satisfy the integrity criteria.
248	00	The seal to Specimen D begins to separate from the steel substrate slightly and glowing can be seen in small areas along the length of the seal.
262	00	The cables to the surface thermocouples of Specimen H are damaged. A roving thermocouple is applied adjacent to thermocouple number 58 and records a temperature of 66° C, a roving thermocouple is applied adjacent to thermocouple number 62 and records a temperature of 62° C.
288	00	A cotton pad is applied to an area of glowing of Specimen D along steel edge and glowing is visible within the pad. Cotton pad integrity failure of Specimen D is deemed to occur. The heat radiating from the steel substrate of Specimen D would contribute to cotton pad integrity failure at this point.
290	00	A cotton pad is applied to Specimen F along steel edge and glowing is visible within the pad. Cotton pad integrity failure of Specimen F is deemed to occur. The heat radiating from the steel substrate of Specimen F was the cause of cotton pad integrity failure at this point.
298	00	A roving thermocouple is applied adjacent to thermocouple number 58 and records a temperature of 74° C, a roving thermocouple is applied adjacent to thermocouple number 62 and records a temperature of 71° C.
301	00	All specimens excluding D, F, I, J and K continue to satisfy the integrity criteria. The test is discontinued at the sponsor's request.

Test Photographs

The exposed face
of the floor
construction
prior to testing



The exposed face
of the wall
construction
prior to testing



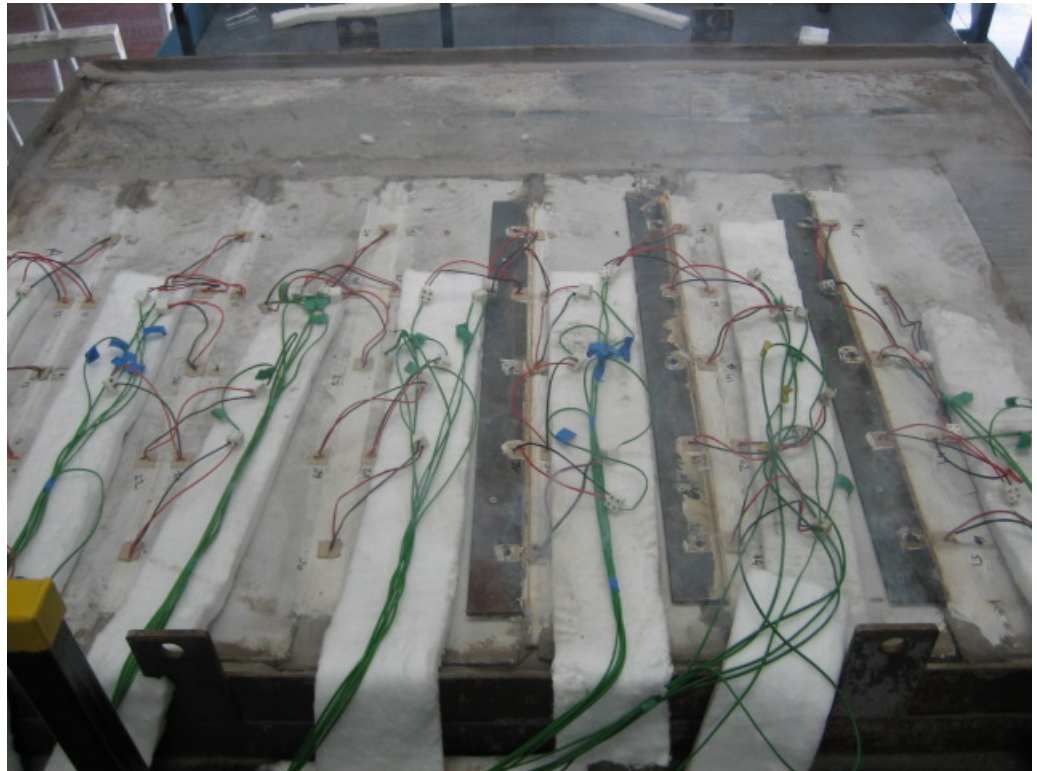
The unexposed
face of the floor
construction
prior to testing



The unexposed
face of the wall
construction
prior to testing



The unexposed
face of the floor
construction
after 60 minutes
of testing



The unexposed
face of the wall
construction
after 60 minutes
of testing



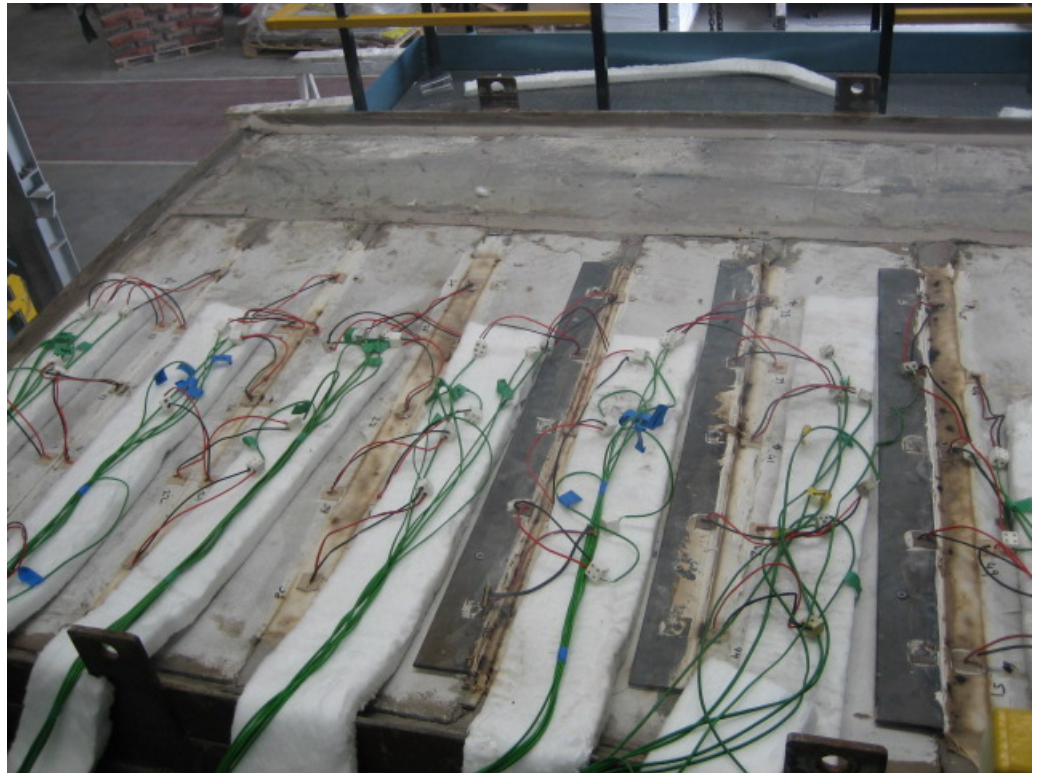
**Sustained
flaming integrity
failure of
Specimen I after
108 minutes of
testing**



**The unexposed
face of the wall
construction
after 153
minutes of
testing**



The unexposed
face of the floor
construction
after 153
minutes of
testing



The unexposed
face of the wall
construction
after 180
minutes of
testing



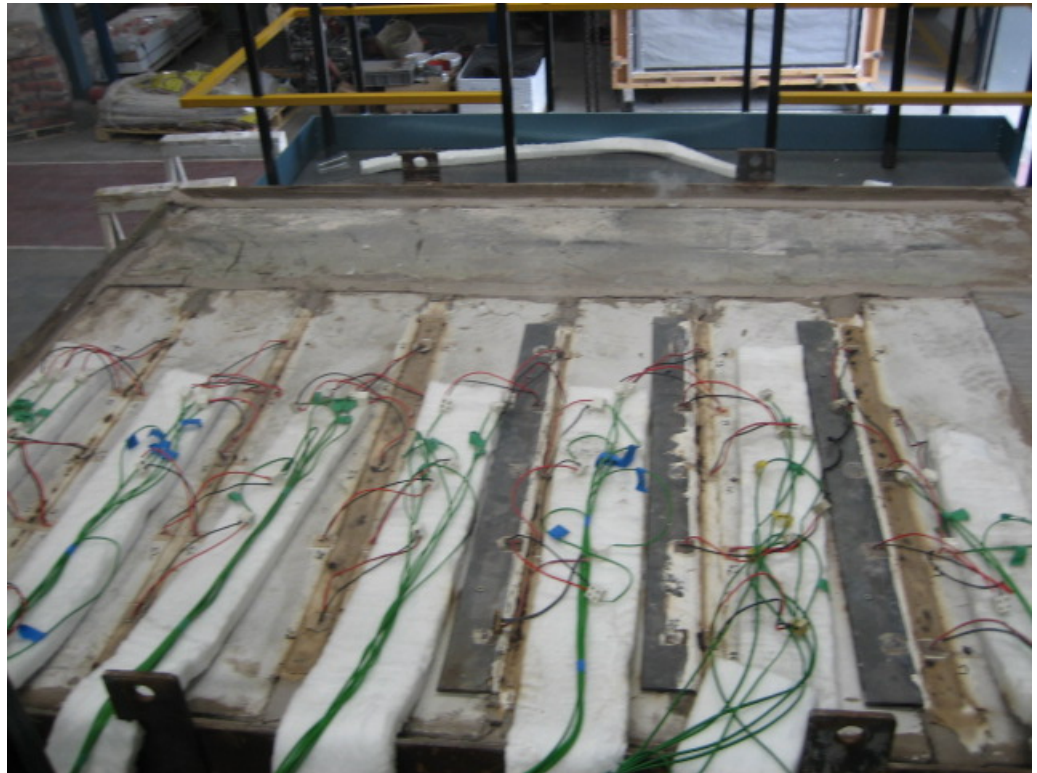
The unexposed
face of the floor
construction
after 180
minutes of
testing



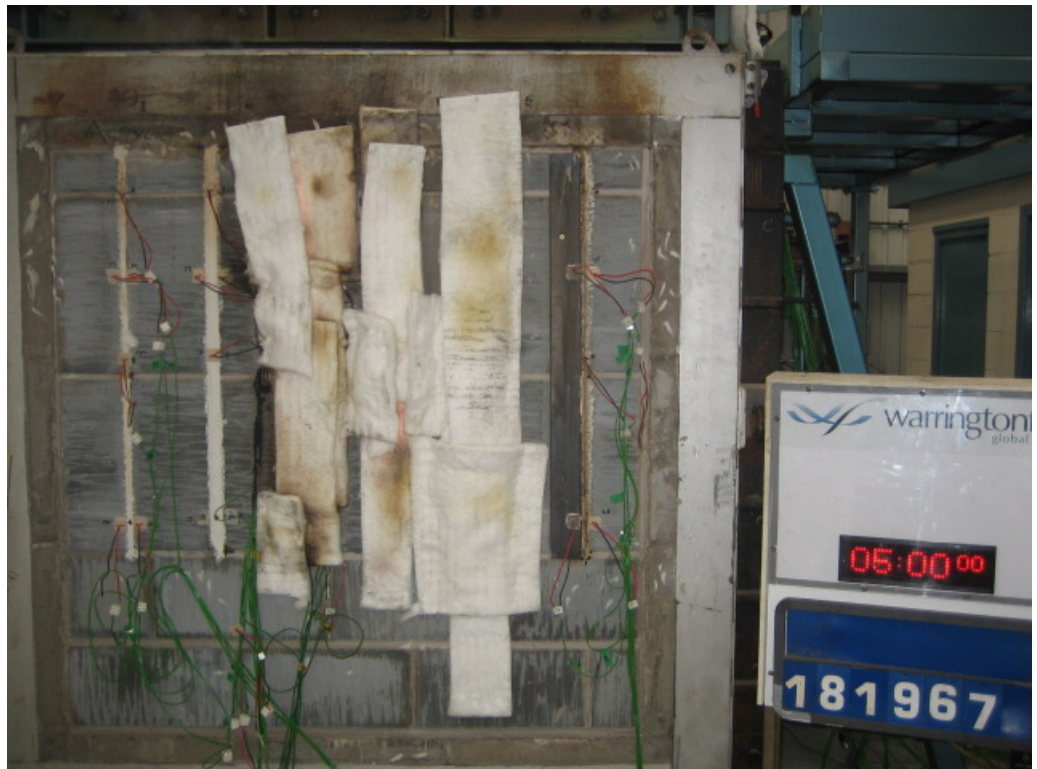
The unexposed
face of the wall
construction
after 240
minutes of
testing



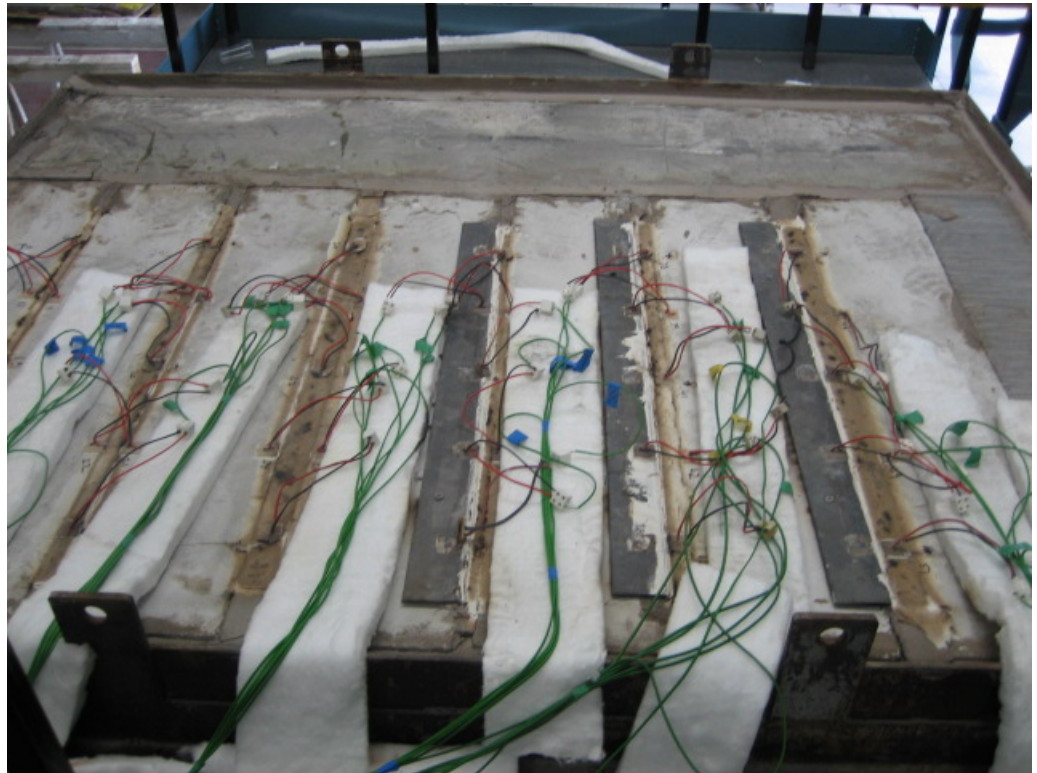
The unexposed
face of the floor
construction
after 240
minutes of
testing



The unexposed
face of the wall
construction
after 300
minutes of
testing



The unexposed
face of the floor
construction
after 300
minutes of
testing



The exposed face
of the wall
construction
immediately after
testing



The exposed face
of the floor
construction
after testing



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	20
10	678	701
20	781	789
30	842	839
40	885	882
50	918	916
60	945	943
70	968	966
80	988	984
90	1006	1001
100	1022	1016
110	1036	1030
120	1049	1043
130	1061	1056
140	1072	1066
150	1082	1076
160	1092	1084
170	1101	1094
180	1110	1103
190	1118	1111
200	1126	1118
210	1133	1124
220	1140	1132
230	1146	1138
240	1153	1145
250	1159	1151
260	1165	1157
270	1170	1163
280	1176	1167
290	1181	1174
300	1186	1178
301	1187	1179

**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	17	17	17	17	17	17	17
10	27	19	18	21	18	18	18
20	48	29	25	40	27	26	33
30	64	40	34	59	41	38	49
40	75	49	43	71	54	52	62
50	84	60	52	82	69	65	72
60	91	74	62	88	79	76	85
70	94	81	71	89	84	83	76
80	103	85	79	94	86	88	73
90	119	88	83	105	89	91	76
100	134	90	86	116	92	93	82
110	149	93	87	126	94	94	88
120	160	96	90	132	96	95	94
130	168	98	93	138	98	97	101
140	174	102	95	134	99	98	100
150	180	113	104	143	108	102	114
160	182	123	114	144	115	106	116
170	185	132	125	147	123	112	120
180	191	146	142	162	135	120	130
190	194	155	159	161	142	129	132
200	201	169	165	179	154	141	139
210	197	178	168	181	164	151	142
220	193	189	169	177	172	161	143
230	195	197	173	178	181	174	151
240	194	203	175	174	188	189	154
250	191	209	178	172	194	200	159
260	194	216	182	179	205	208	168
270	191	222	185	183	211	212	173
280	194	222	186	178	216	211	173
290	194	230	191	184	222	216	182
300	194	235	195	189	225	217	188
301	196	235	194	188	226	218	192

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

Time Mins	T/C Number 17 Deg. C	T/C Number 18 Deg. C	T/C Number 19 Deg. C	T/C Number 20 Deg. C	T/C Number 21 Deg. C	T/C Number 22 Deg. C	T/C Number 23 Deg. C
0	17	17	17	17	17	17	17
10	26	21	20	39	20	19	42
20	54	42	37	77	38	35	78
30	77	67	57	94	61	54	95
40	91	82	76	105	79	72	103
50	98	88	86	127	87	81	124
60	102	91	92	157	92	87	154
70	113	94	97	179	95	90	174
80	131	97	100	196	98	94	188
90	148	100	103	210	100	98	203
100	161	111	109	224	102	101	216
110	173	124	118	238	109	108	227
120	184	137	128	249	122	118	237
130	194	148	136	260	132	129	246
140	203	158	146	267	140	138	250
150	212	167	152	277	149	148	261
160	219	174	161	284	157	154	265
170	226	182	169	291	164	159	270
180	228	188	175	298	173	167	278
190	234	194	183	302	178	170	281
200	238	201	188	308	182	175	287
210	228	206	191	312	186	180	293
220	219	212	200	317	189	183	296
230	219	217	206	322	194	188	303
240	224	221	210	327	197	192	309
250	227	227	215	331	202	197	318
260	233	231	218	336	208	202	333
270	239	237	222	343	215	206	348
280	249	255	227	357	223	208	363
290	257	277	229	383	240	213	389
300	270	307	235	407	260	216	408
301	271	311	235	411	263	217	412

**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	17	17	17	17	17	17	17
10	51	33	23	39	24	22	38
20	81	67	48	68	52	44	67
30	93	90	74	85	77	70	82
40	101	98	87	92	87	83	89
50	119	113	94	96	93	90	95
60	157	138	98	105	98	94	104
70	187	156	109	124	106	97	127
80	207	174	129	154	122	101	152
90	223	189	146	175	139	117	171
100	235	200	160	190	154	131	185
110	245	211	173	200	167	143	194
120	256	222	182	208	179	154	202
130	267	234	188	216	190	164	210
140	273	241	196	222	196	169	214
150	281	253	198	228	207	176	223
160	287	261	203	235	214	180	230
170	290	268	208	240	219	184	233
180	285	273	211	246	227	189	244
190	282	277	215	249	232	193	248
200	285	281	218	252	238	196	256
210	289	285	219	256	244	200	260
220	292	287	224	259	249	203	265
230	299	288	228	262	256	205	270
240	296	288	233	267	261	210	276
250	297	290	235	270	266	212	285
260	286	291	243	274	273	219	298
270	283	295	260	282	279	229	309
280	287	296	288	290	282	236	322
290	278	302	312	302	289	257	349
300	274	307	331	311	294	281	361
301	274	306	332	311	295	285	364

**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	17	17	17	17	17	17	17
10	39	19	36	1	20	46	37
20	80	30	73	68	34	95	74
30	113	44	116	99	55	143	108
40	132	59	156	107	74	185	128
50	163	76	193	131	91	221	160
60	189	89	225	143	99	249	186
70	213	96	251	154	102	272	206
80	231	101	273	166	110	291	222
90	248	110	291	177	125	307	239
100	264	122	305	186	139	321	254
110	276	133	316	193	151	334	265
120	285	142	323	197	160	344	271
130	290	151	330	204	170	355	276
140	301	157	336	206	177	366	114
150	306	165	342	216	186	376	123
160	313	170	349	222	194	386	136
170	318	177	357	226	199	398	133
180	323	184	369	236	208	408	132
190	332	191	385	242	213	420	138
200	339	200	407	257	222	437	142
210	353	211	434	274	233	454	149
220	364	228	457	293	244	466	145
230	375	249	482	321	257	483	149
240	386	271	509	342	273	501	159
250	344	277	523	344	289	514	162
260	339	299	545	370	307	527	166
270	349	314	560	365	317	534	162
280	371	322	571	354	317	539	153
290	309	337	575	411	322	540	170
300	307	341	572	402	324	531	169
301	316	342	572	396	325	530	170

**Individual Temperatures Recorded On The Unexposed Surface Of Specimen E
And Adjacent To Specimen E**

Time Mins	T/C Number 38 Deg. C	T/C Number 39 Deg. C	T/C Number 40 Deg. C	T/C Number 41 Deg. C	T/C Number 42 Deg. C	T/C Number 43 Deg. C	T/C Number 44 Deg. C
0	17	18	17	17	17	17	17
10	24	19	41	22	18	38	27
20	53	28	89	44	22	84	54
30	77	41	141	66	34	131	79
40	95	54	191	82	51	178	94
50	104	71	235	94	69	217	100
60	120	82	271	99	81	248	110
70	149	91	297	114	86	271	121
80	169	93	319	135	90	291	135
90	184	94	336	150	92	307	154
100	196	95	349	160	95	321	170
110	207	97	359	172	95	332	177
120	214	100	367	180	96	341	183
130	217	103	375	187	97	348	190
140	224	111	381	201	97	355	197
150	226	114	387	206	99	364	208
160	231	119	392	210	102	372	213
170	236	125	397	216	105	380	215
180	239	130	403	220	110	388	220
190	245	135	409	223	121	393	224
200	250	139	417	228	131	399	231
210	255	148	427	240	147	406	237
220	256	157	443	249	158	413	238
230	257	168	454	257	168	418	244
240	261	180	462	267	182	425	248
250	263	188	467	268	186	429	258
260	266	194	472	272	195	433	259
270	271	201	477	276	198	437	260
280	275	209	482	285	205	441	255
290	271	212	486	280	208	445	264
300	269	220	491	288	215	451	266
301	268	220	492	286	215	451	267

**Individual Temperatures Recorded On The Unexposed Surface Of Specimen F
And Adjacent To Specimen F**

Time Mins	T/C Number 45 Deg. C	T/C Number 46 Deg. C	T/C Number 47 Deg. C	T/C Number 48 Deg. C	T/C Number 49 Deg. C	T/C Number 50 Deg. C	T/C Number 51 Deg. C
0	17	18	17	17	17	17	17
10	49	22	52	63	26	55	60
20	83	39	108	90	48	112	87
30	95	57	164	97	68	167	95
40	101	73	220	121	82	220	109
50	131	82	271	175	90	269	154
60	180	90	312	209	95	309	190
70	219	94	346	230	98	339	214
80	246	98	370	252	103	362	228
90	266	104	388	274	122	380	240
100	284	114	404	290	137	396	252
110	305	124	422	300	150	409	262
120	322	133	437	307	161	421	272
130	333	143	450	318	173	430	279
140	348	153	466	328	181	442	285
150	354	163	475	341	190	454	292
160	364	171	488	354	199	472	298
170	374	178	504	364	206	491	304
180	274	186	515	375	212	504	309
190	298	193	529	382	219	521	314
200	402	200	547	385	228	541	321
210	407	203	563	380	231	556	319
220	415	211	569	377	235	560	323
230	418	216	577	368	241	569	323
240	418	223	587	363	245	575	321
250	413	230	584	359	252	573	326
260	411	236	588	359	257	576	324
270	411	241	588	360	260	575	324
280	343	244	587	358	261	572	318
290	334	249	577	360	266	570	313
300	334	251	570	329	263	566	309
301	319	249	568	328	264	565	309

**Individual Temperatures Recorded On The Unexposed Surface Of Specimen G
And Adjacent To Specimen G**

Time	T/C	T/C	T/C	T/C	T/C	T/C
Mins	Number	Number	Number	Number	Number	Number
	52	53	54	55	56	57
	Deg. C	Deg. C	Deg. C	Deg. C	Deg. C	Deg. C
0	16	16	16	16	16	16
10	17	16	16	16	16	16
20	18	16	16	17	17	17
30	26	17	17	18	17	17
40	38	19	20	21	18	19
50	50	23	24	27	22	24
60	86	29	30	36	29	33
70	92	38	39	47	39	44
80	91	60	66	58	47	53
90	92	69	73	76	54	60
100	94	73	76	85	59	66
110	101	75	78	89	63	69
120	106	77	79	89	67	72
130	111	79	80	85	69	73
140	124	81	82	86	71	74
150	126	82	83	90	72	75
160	129	83	83	94	74	76
170	139	84	84	97	75	79
180	146	84	85	101	76	79
190	156	85	86	106	78	80
200	168	87	88	111	78	81
210	181	88	88	116	79	81
220	193	90	90	120	79	81
230	206	91	91	129	81	83
240	222	93	93	141	83	84
250	233	94	95	153	84	86
260	248	97	96	167	86	87
270	262	101	99	180	88	89
280	278	109	105	196	89	90
290	293	118	114	210	90	90
300	310	127	125	225	92	91
301	312	128	125	226	92	91

Individual Temperatures Recorded On The Unexposed Surface Of Specimen H And Adjacent To Specimen H

Time	T/C	T/C	T/C	T/C	T/C	T/C
Mins	Number	Number	Number	Number	Number	Number
	58	59	61	62	63	64
	Deg. C	Deg. C	Deg. C	Deg. C	Deg. C	Deg. C
0	16	16	17	17	17	17
10	16	17	18	17	18	17
20	16	21	18	18	18	18
30	17	27	18	18	18	18
40	17	34	19	18	18	19
50	17	37	21	20	20	21
60	17	24	23	26	24	26
70	18	25	29	34	31	34
80	18	26	36	52	39	43
90	18	28	44	66	48	54
100	19	30	53	73	62	67
110	19	31	65	76	69	73
120	19	37	73	78	72	76
130	20	54	79	79	74	77
140	20	41	86	81	75	78
150	21	41	87	81	75	78
160	22	45	90	82	76	79
170	22	50	94	83	76	80
180	23	54	94	83	77	80
190	24	66	98	85	78	82
200	24	75	104	88	79	83
206	25	80	108	90	80	83
207	25	96	110	92	80	83
208	27	*	124	94	80	84
209	*		*	111	80	85
210				*	*	*
220						
230						
240						
250						
260						
270						
280						
290						
300						
301						

*Thermocouple cable damaged causing malfunction

**Individual Temperatures Recorded On The Unexposed Surface Of Specimen I
And Adjacent To Specimen I**

Time	T/C	T/C	T/C	T/C	T/C	T/C
Mins	Number	Number	Number	Number	Number	Number
	65	66	67	68	69	70
	Deg. C	Deg. C	Deg. C	Deg. C	Deg. C	Deg. C
0	18	17	18	17	17	17
5	18	18	18	22	18	18
10	19	18	18	26	19	19
15	21	18	19	28	23	25
20	29	24	20	32	27	30
25	40	32	21	37	33	33
30	59	47	25	43	45	35
35	76	55	27	47	55	36
40	90	59	30	53	60	38
45	101	65	35	59	63	40
50	109	71	45	66	65	43
55	125	76	56	77	66	46
60	148	79	66	84	66	49
65	168	82	73	87	67	51
70	184	85	79	91	68	54
75	198	86	84	97	68	57
80	211	88	88	103	69	60
85	225	91	91	106	70	63
90	248	97	93	114	71	66
95	287	94	96	126	71	69
100	342	99	98	139	68	72
105	475	203	100	153	67	74
110	616	438	103	168	68	77
111	641	495	105	171	68	77
112	380	529	107	174	68	78
113	#	#	#	#	#	#

#Specimen blanked off to allow test to continue

**Individual Temperatures Recorded On The Unexposed Surface Of Specimen J
And Adjacent To Specimen J**

Time	T/C	T/C	T/C	T/C	T/C	T/C
Mins	Number	Number	Number	Number	Number	Number
	71	72	73	74	75	76
	Deg. C	Deg. C	Deg. C	Deg. C	Deg. C	Deg. C
0	17	17	18	17	17	18
5	17	18	18	18	18	18
10	16	18	18	18	18	18
15	14	18	18	19	18	19
20	12	18	19	20	18	19
25	28	19	19	22	18	19
30	35	21	21	26	18	19
35	45	23	24	30	19	20
40	52	26	27	34	24	20
45	57	28	30	39	38	22
50	58	33	31	43	44	25
55	65	44	33	47	50	28
60	66	58	36	51	54	31
65	68	66	39	54	57	34
70	72	72	41	56	60	37
75	75	73	44	57	57	40
80	74	76	48	59	60	44
85	73	79	50	60	61	46
90	65	78	55	61	62	49
95	59	81	60	62	61	51
100	62	81	65	64	62	53
105	61	80	69	65	62	55
110	64	79	75	66	60	57
115	65	79	77	68	58	58
120	69	79	80	73	59	60
125	71	80	84	79	59	60
130	77	80	87	85	60	62
135	86	79	90	91	62	63
140	81	79	94	97	62	64
145	86	83	96	110	57	65
150	98	84	99	125	59	67
151	103	85	100	128	60	67
152	114	86	101	132	59	67
153	#	#	#	#	#	#

#Specimen blanked off to allow test to continue

**Individual Temperatures Recorded On The Unexposed Surface Of Specimen K
And Adjacent To Specimen K**

Time Mins	T/C Number 77 Deg. C	T/C Number 78 Deg. C	T/C Number 79 Deg. C	T/C Number 80 Deg. C	T/C Number 81 Deg. C	T/C Number 82 Deg. C
0	18	18	18	17	18	18
5	18	18	18	28	18	18
10	19	18	18	31	18	18
15	21	18	18	33	18	18
20	26	18	18	39	18	18
25	41	18	19	46	18	19
30	50	19	19	51	19	19
35	56	20	20	54	20	20
40	62	22	22	57	22	21
45	66	27	25	60	26	23
50	71	36	27	62	29	25
55	75	55	29	62	33	28
60	80	67	32	61	38	31
65	84	72	35	65	43	34
70	89	76	38	69	47	37
75	97	78	41	71	52	41
80	101	79	45	72	56	48
85	105	80	50	73	61	52
90	111	80	56	75	67	57
95	120	80	62	75	72	61
100	132	81	69	77	77	65
105	144	81	74	79	81	67
110	140	84	78	81	86	71
112	145	83	79	81	87	72
113	144	83	79	81	88	72
114	#	#	#	#	#	#

#Specimen blanked off to allow test to continue

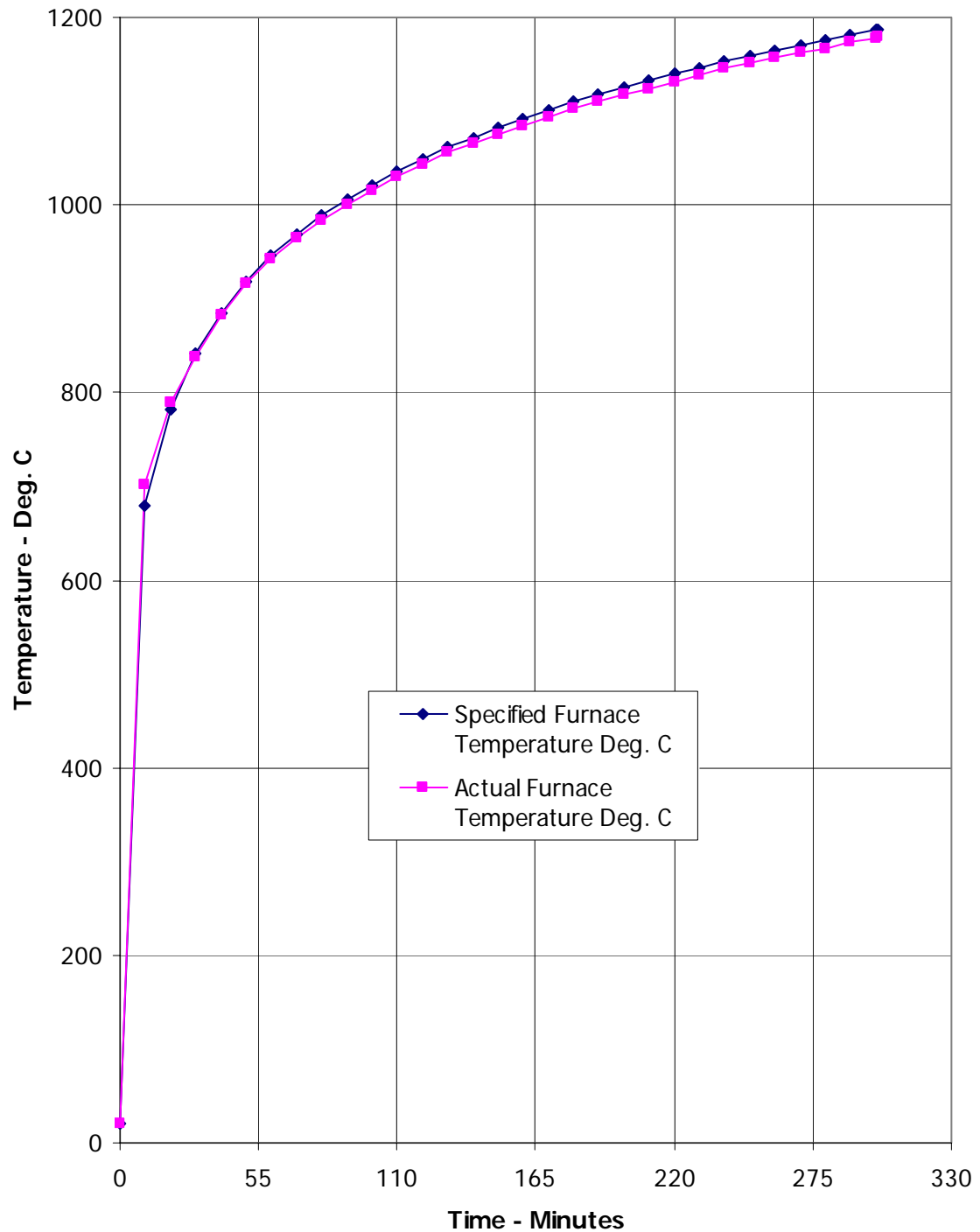
Individual Temperatures Recorded Adjacent To Specimen L

Time Mins	T/C Number 83 Deg. C	T/C Number 84 Deg. C	T/C Number 85 Deg. C	T/C Number 86 Deg. C	T/C Number 87 Deg. C	T/C Number 88 Deg. C
0	18	19	18	16	18	18
10	23	29	19	9	39	20
20	39	57	24	49	70	28
30	58	89	37	76	101	39
40	76	116	56	102	130	52
50	91	138	66	117	152	63
60	91	155	72	132	169	72
70	90	170	77	144	184	78
80	99	183	81	155	198	83
90	108	195	84	165	210	86
100	117	206	86	174	221	88
110	121	217	87	182	231	90
120	122	227	88	189	238	90
130	131	236	89	198	246	91
140	138	244	91	206	255	92
150	140	252	92	212	261	94
160	150	260	98	221	268	97
170	153	267	101	226	276	101
180	155	274	105	232	281	104
190	163	281	110	240	286	109
200	166	287	114	245	291	112
210	171	293	118	251	297	115
220	175	300	122	257	303	120
230	181	305	126	263	309	124
240	185	312	130	269	315	128
250	195	318	136	276	321	133
260	195	324	139	280	327	136
270	199	330	143	287	333	141
280	40	337	147	292	340	145
290	42	343	151	299	347	150
300	43	351	156	305	356	155
301	43	351	157	306	356	155

Table Showing Recorded Furnace Pressure at mid height of the wall assembly

Time Mins	Recorded Pressure Pascals
0	0.0
10	13.9
20	13.0
30	13.3
40	14.8
50	15.2
60	15.4
70	14.9
80	13.7
90	14.8
100	14.0
110	13.1
120	14.0
130	14.8
140	13.6
150	13.0
160	14.3
170	16.0
180	13.1
190	14.9
200	15.7
210	14.9
220	13.7
230	13.6
240	16.9
250	13.2
260	14.7
270	14.6
280	15.0
290	13.5
300	16.4
301	16.1

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 the specimen retains its separating function, without either causing ignition of a cotton pad when applied as specified in BS EN 1363-1: 1999, or resulting in sustained flaming on the unexposed surface. **These requirements were satisfied for the periods shown below:**

Specimen	Integrity (minutes)	
	Cotton pad	Sustained flames
A	301*	301*
B	301*	301*
C	301*	301*
D	288	301*
E	301*	301*
F	290	301*
G	301*	301*
H	301*	301*
I	97	108
J	153	153
K	114	114
L	301*	301*

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: 1999. **These requirements were satisfied for the periods shown below:**

Specimen	Insulation (minutes)
A	196
B	81
C	74
D	43
E	41
F	35
G	222
H	301*
I	75
J	152
K	114
L	80

* The test duration. The test was discontinued after a period of 301 minutes.

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.

Note: This report is additional to that issued as WF No. 181967, dated 29th April 2009. The original report remains valid and is not replaced by this additional test report.

Conclusions

Evaluation against objective

A fire resistance test has been conducted to assess the ability of six wall mounted and six floor mounted specimens of linear joint sealing systems, to reinstate the integrity and insulation performance (as defined in BS EN 1366-4: 2006) of a simulated wall construction, where adjacent structures abut.

Test Results:

Reference	Integrity (mins)		Insulation (mins)
	Cotton Pad	Sustained flaming	
A	301*	301*	196
B	301*	301*	81
C	301*	301*	74
D	288	301*	43
E	301*	301*	41
F	290	301*	35
G	301*	301*	222
H	301*	301*	301*
I	97	108	75
J	153	153	152
K	114	114	114
L	301*	301*	80

* The test duration. The test was discontinued after a period of 301 minutes.

Field of Direct Application

Orientation

The field of application regarding the orientation of the linear joint is given in Table 1.

Table 1 – Field of application regarding orientation

Tested orientation	Application
A	A, D, E ^a
B	B
C	C, D ^b
^a Orientation E will only be covered by test orientation A if shear movement was chosen and one face of the joint was fixed and the other face was moved. ^b Orientation D will only be covered by test orientation C if shear movement was chosen and one face of the joint was fixed and the other face was moved.	

Key

- A. Linear joint in a horizontal test construction.
- B. Vertical linear joint in a vertical test construction.
- C. Horizontal linear joint in a vertical test construction.
- D. Horizontal wall joint abutting a floor, ceiling or roof.
- E. Horizontal floor joint abutting a wall.

Table 1 only applies when both the supporting construction and the location of the seal within the linear joint remain unchanged.

Supporting construction

Test results obtained with autoclaved aerated concrete standard supporting constructions apply to concrete, block work and masonry separating elements of a thickness and density equal to or greater than that tested.

Test results obtained with timber standard supporting construction apply to timber separating elements of a thickness and density equal to or greater than that tested.

Test results obtained with the steel angle standard supporting construction apply to separating element constructions made of metals with a melting point higher than 1 000 °C.

Seal position

Test results are valid only for the position in which the seal was tested, except that where the linear joint seal was fitted flush with the surface of the supporting construction and is exposed to the fire.

**Mechanically
induced
movement**

The linear gap sealing systems were not tested for mechanically induced movement, therefore the movement capability of the linear joint seal must be less than $\pm 7.5 \%$



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