The Building Test Centre
Fire Acoustics Structures

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Report Number: **BTC 21871F**

A FIRE RESISTANCE TEST ON A SFS EXTERNAL WALL SYSTEM WITH A 70 MM COLD-ROLLED STRUCTURAL STEEL STUD FRAMEWORK CLAD ON THE EXPOSED SIDE WITH A SINGLE LAYER OF 15 MM GYPROC FIRELINE WITH 50 MM ISOVER APR 1200 IN THE CAVITY AND 50 MM POLTERM INSULATION ON THE EXTERIOR, INCORPORTAING A 20 MM DEFLECTION HEAD, CONDUCTED IN ACCORDANCE WITH BS EN 1364-1: 2015.

Test Date: 19th July 2021

Report Issue Date: 3rd August 2021

www.btconline.co.uk

Customer: **British Gypsum**
East Leake
Loughborough
Leicestershire
LE12 6HX

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FOREWORD

This test report details a fire resistance test conducted on a metal stud partition clad on the exposed face with a single layer of Gyproc FireLine and clad on the unexposed face with an inner layer of Glasroc X Sheathing Board and an outer layer of 50 mm Isover Polterm Max, incorporating a 20 mm deflection head and 50 mm Isover Acoustic Partition Roll in the cavity.

The test sponsor was British Gypsum.

The test specimen was installed by Clark Building Installation Services. The construction of the specimen took place between the 14th and 15th July 2021. The Building Test Centre played no role in the design or selection of materials comprising the test specimen. This information is provided by the customer.

The test was conducted on the 19th July 2021.

This report details the method of construction, the test conditions and the results obtained when the specific element of construction described herein was tested following the procedures outlined in EN 1363-1, and where appropriate EN 1363-2. Any significant deviation with respect to size, constructional details, loads, stresses, edge of end conditions other than those allowed under the field of direct application in EN 1364-1 is not covered by this report.

“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.” (BS EN 1363-1: 2020, section 12.1)

REPORT AUTHORISATION

Report Author	Authorised by
Ryan Skilton CSci MRSC MSci. (Hons), Ph.D. *Scientist*	**Paul Miller** BSc. (Hons.) *Fire Test Manager*

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TEST REPORT AMENDMENTS

Page	Amendments	Date

Report Amendments Author	Amendments Authorised by
Name *Role*	**Name** *Role*

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TEST CONSTRUCTION

Description of Construction

The specimen was constructed in a refractory concrete lined steel restraint test frame with an opening of 3000 mm (high) x 3000 mm (wide).

A 75 mm x 38 mm x 1.2 mm gauge cold rolled structural steel channel was fixed to the base of the test aperture at 600 mm centres using 60 mm fire resistant fixings.

A 75 mm x 70 mm x 2.0 mm gauge cold rolled structural steel channel was fixed to the head of the test aperture at 600 mm centres using 60 mm fire resistant fixings.

70 mm x 50 mm x 1.2 mm gauge cold rolled structural steel studs were positioned at 600 mm centres between the channels. Each stud was cut 25 mm short and engaged into a 'Slip Klip' which was fixed to the head channel with 4 x 13 mm British Gypsum Wafer Head Jack-Point Screws.

The right hand stud viewed from the unexposed face was not fixed to the perimeter of the test frame, and the gap between the stud and the frame lining was filled with a 25 mm thick rock mineral fibre gasket (stud was cut 25 mm short).

At the left-hand edge a 70 mm x 50 mm x 1.2 mm gauge cold rolled structural steel stud was used to fix the partition to the test frame, using 60 mm fire resistance fixings at 600 mm centres (stud was cut 25 mm short).

Thermocouples were added to the studs at mid height on the web, hot and cold flanges of the central two studs.

50 mm Isover APR 1200 was placed within the stud cavity.

A Gypframe GFS1 Fixing Strap was positioned 25 mm below the bottom edge of the head channel on the exposed face side of the partition and fixed to each stud with two 13 mm British Gypsum Wafer Head Jack-Point Screws.

The exposed face of the specimen was clad with a single layer of 15 mm Gyproc FireLine. All the boards were reduced to leave a 25 mm gap at the head of the specimen.

The boards were fixed with 25 mm British Gypsum Jack-Point Screws at 300 mm centres around the perimeter and within the field of the boards to all framing members except the head channel. The uppermost board fixings were positioned 130 mm below the test frame concrete soffit.

All vertical joints were staggered, with a full board at the right-hand side of the exposed face (as viewed from the unexposed side). A horizontal joint was positioned at 2400 mm from the base on the exposed face boards. A Gypframe GFS1 Fixing Strap was used behind the horizontal board joint on the exposed face only.

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On the exposed face the 25 mm gap above the Gyproc FireLine boards was filled with a strip of Rockwool Flexi stone mineral wool insulation. A continuous bead of Gyproc Sealant was applied to the 25 mm legs of Gypframe GA4 Steel Angles and fixed to the head of the of the test aperture at 600 mm centres using 60 mm fire resistant fixings. The 50 mm legs extended down to cover the deflection head gap. A butt joint was added in the Gypframe GA4 Steel Angles 1000 mm from the fixed end.

The unexposed face of the specimen was clad with a single layer of 12.5 mm Glasroc X Sheathing Board. The boards were not cut short at the head. The boards were fixed with 25 mm Glasroc X Screws at 300 mm centres around the perimeter and within the field of the boards, except to the head channel. A horizontal joint was positioned at 2400 mm from the base on the unexposed face boards. The uppermost board fixings were positioned 130 mm below the test frame concrete soffit.

A continuous 6 mm bead of Glasroc X Sealant was applied along the vertical and horizontal edges of the board which had boards abutting against them. The Glasroc X Sheathing Boards were pushed up to the previous board so that the sealant ‘mushroomed’ out fully sealing the joint.

50 mm Isover Polterm Max was installed over the Glasroc X Sheathing Boards and fixed in position to the steel framework using with 70 mm diameter metal washer plates (IRD70x70-6,8) and 100 mm self-drilling stainless steel screws (SXC5-6,3 x 100 mm-A2) as per Figure 2 below. The Isover Polterm Max not cut short at the head.

All exposed face outer layer Gyproc FireLine board joints were taped and filled using Gyproc Paper Joint Tape and Gyproc Joint Filler as appropriate. All screw heads were spotted using Gyproc Joint Filler.

Note. The deflection head is constructed to 25 mm to accommodate a 20 mm downward deflection. This is due to the Rockwool Flexi in the head not being able to completely compress.

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Test Construction Drawings

Cross Section Through the Head Prior to the Isover Polterm Installation

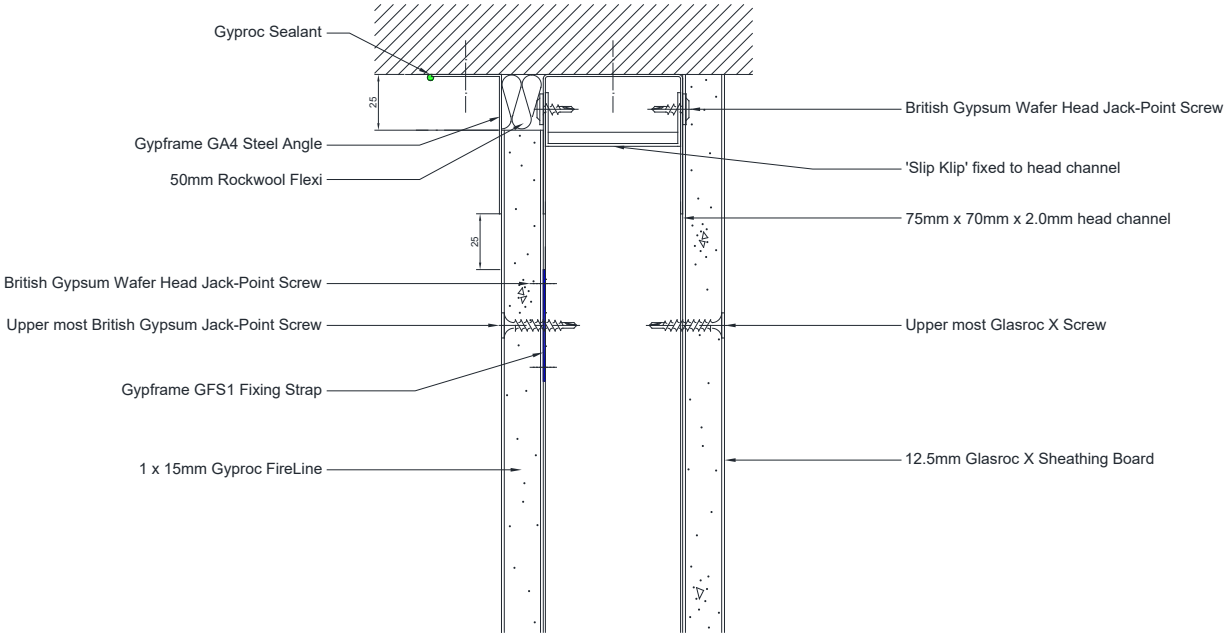

Figure 1 – Cross section through the head prior to the Isover Polterm installation.

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Exposed Face Elevation

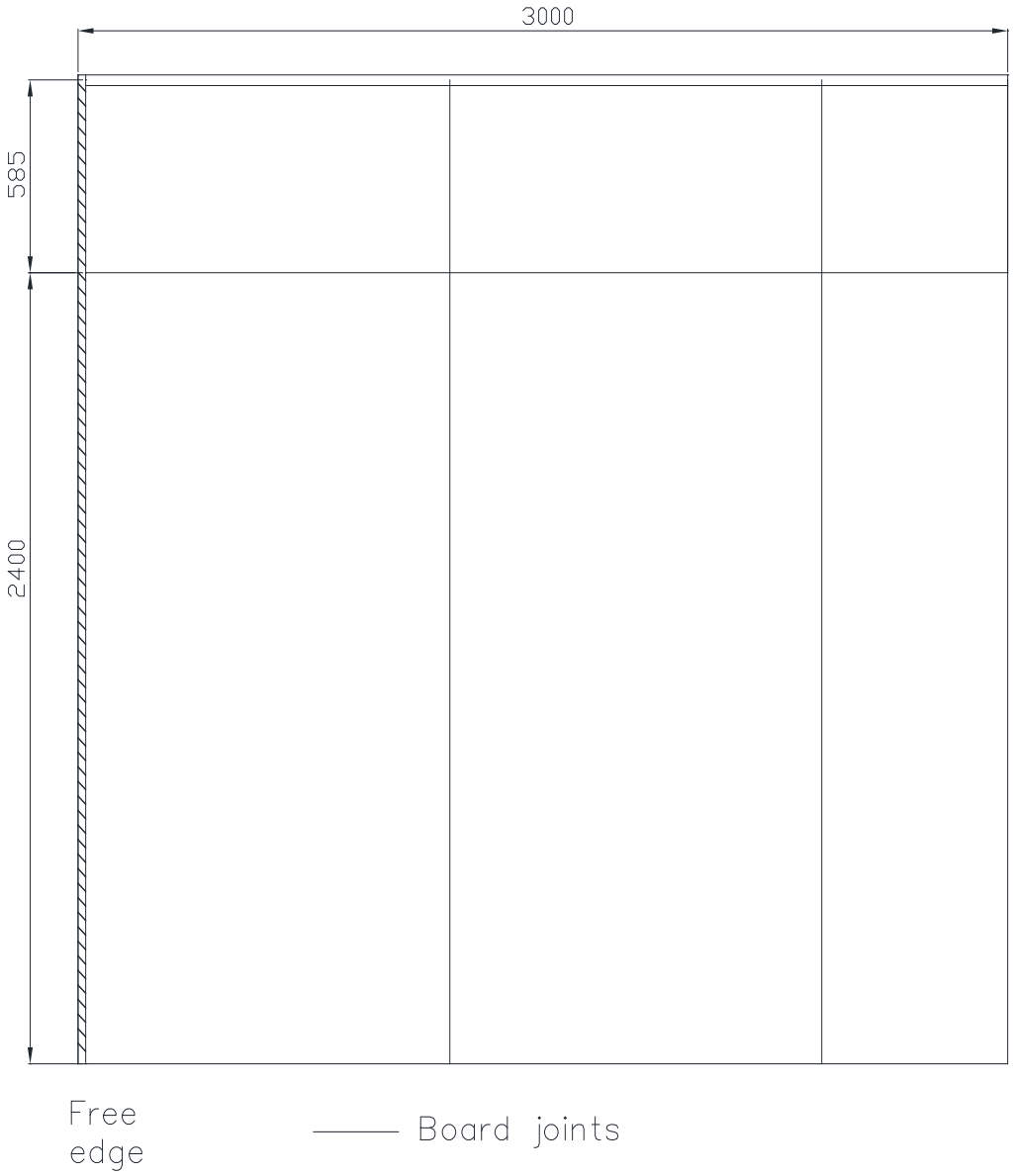

Figure 2 – Exposed face elevation.

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Unexposed Face Elevation

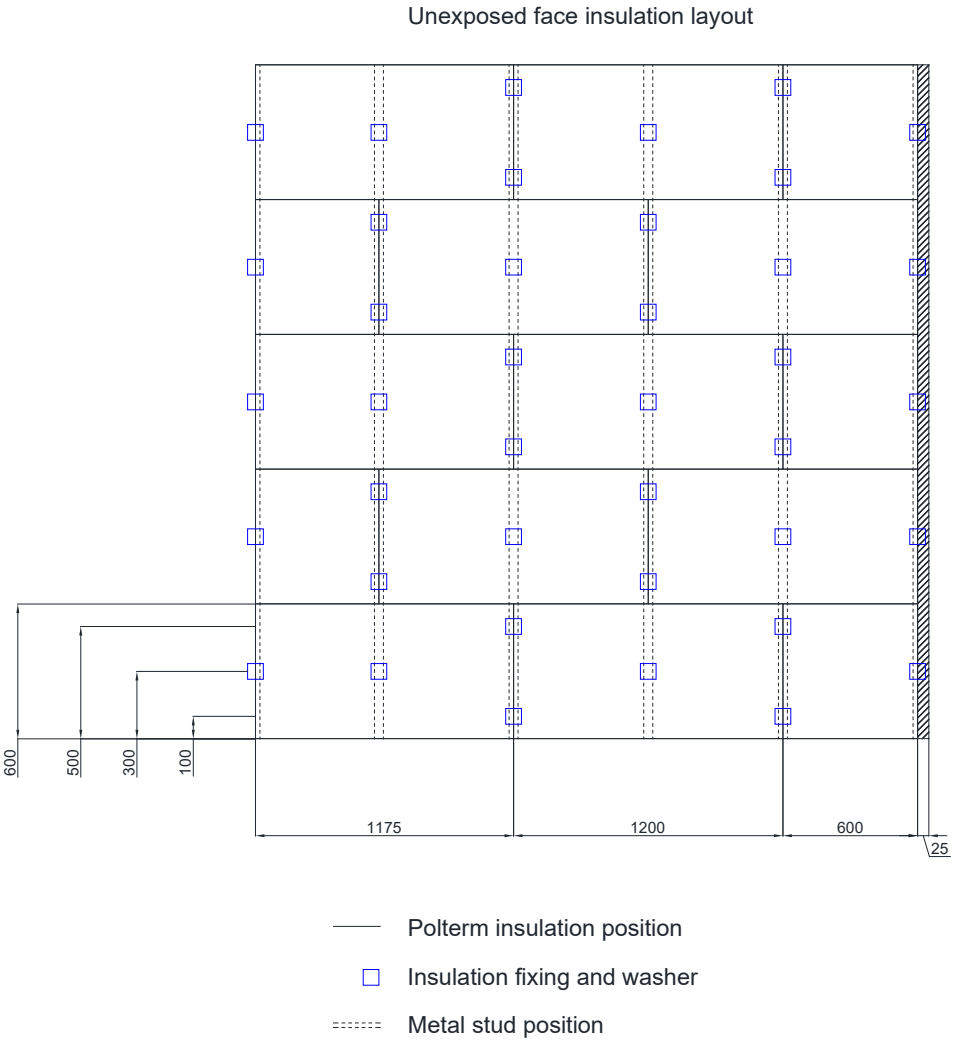

Figure 3 – Unexposed face elevation.

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TEST MATERIALS

Plasterboard

i) Nominally, 2400 mm (long) x 1200 mm (wide) x 15 mm (thick), Gyproc FireLine (TE), manufactured and supplied by British Gypsum, ex Sherburn.

Measured mass per unit area:	13.0 kg/m²
Measured thickness:	15.4 mm
Board identification numbers:	31 170 21 17:01
	31 170 21 17:01
	31 170 21 17:02
Measured moisture content:	0.23 %

ii) Nominally, 2400 mm (long) x 1200 mm (wide) x 12.5 mm (thick), Glasroc X (SE), manufactured and supplied by British Gypsum, ex Melnik.

Measured mass per unit area:	11.0 kg/m²
Measured thickness:	12.5 mm
Board identification numbers:	20 05 21 07:23
	20 05 21 07:24
	20 05 21 07:24
Measured moisture content:	0.32 %

The surface density and board thickness were calculated using the actual weight and size of a selection of boards used in the test specimen. The moisture content of plasterboard was determined using samples dried to constant weight in an oven at 50 °C.

Material dimensions were supplied by British Gypsum.

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Metal Components

iii) Gypframe GFS1 Fixing Strap, supplied by The Building Test Centre.
iv) Gypframe GA4 Steel Angle, supplied by The Building Test Centre.
v) 75 mm x 38 mm x 1.2 mm gauge cold rolled structural steel channel, manufactured by Hadley Steel Framing and supplied by British Gypsum.

Measured web dimension	76 mm
Measured flange dimension	38 mm
Measured thickness	1.19 mm
Measured weight per metre	1.45 kg/m

vi) 75 mm x 70 mm x 2.0 mm gauge cold rolled structural steel channel, manufactured by Hadley Steel Framing and supplied by British Gypsum.

Measured web dimension	76 mm
Measured flange dimension	70 mm
Measured thickness	1.95 mm
Measured weight per metre	3.21 kg/m

vii) 70 mm x 50 mm x 1.2 mm gauge (with 12 mm returns) cold rolled structural steel studs, manufactured by Hadley Steel Framing and supplied by British Gypsum.

Measured web dimension	70 mm
Measured flange dimension	48 mm
Measured thickness	1.22 mm
Measured weight per metre	1.77 kg/m

Fasteners

viii) 13 mm British Gypsum Wafer Head Jack-Point Screws, supplied by The Building Test Centre.
ix) 25 mm British Gypsum Jack-Point Screws, supplied by The Building Test Centre.
x) Centre.
xi) 80 mm fire resistant fixings, supplied by The Building Test Centre.
xii) 25 mm Glasroc X Screws, supplied by British Gypsum.
xiii) SXC5-6.3 x 100-A2. Stainless steel self-drilling insulation fastener screw 100 mm long x 6.3 mm diameter. Manufactured by SFS Intec and supplied by British Gypsum.
xiv) IDR-70x70-6.8. Stress Plate square retaining washers. 70 mm x 70 mm, 6.8 mm diameter central hole, 304 Grade. Manufactured by SFS Intec and supplied by British Gypsum.
xv) 'Slip Klips' manufactured by Hadley Steel Framing and supplied by British Gypsum.

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Miscellaneous Components

xvi) Gyproc Paper Joint Tape, supplied by The Building Test Centre.
xvii) Gyproc Joint Filler, supplied by The Building Test Centre.
xviii) Rock mineral fibre gasket, supplied by The Building Test Centre.
xix) Glasroc X Sealant, supplied by The Building Test Centre.
xx) Gyproc Sealant, supplied by The Building Test Centre.

Insulation

xxi) Nominally 50 mm (thick) APR 1200 (Acoustic Partition Roll), manufactured by Saint-Gobain Isover and supplied by British Gypsum.

Measured surface density: 0.66 kg/m²

xxii) Nominally 50 mm (thick) Rockwool Flexi manufactured by Rockwool and supplied by British Gypsum.

Measured surface density: 1.78 kg/m²

xxiii) Nominally 50 mm Isover Polterm Max insulation. Manufactured and supplied by Isover.

Measured surface density: 3.25 kg/m²

Where measurements could not be taken and were provided by the customer or the manufacturer e.g. from material labelling, or where mass and dimension measurements were provided by the customer or the manufacturer e.g. customer has completed material dimension forms the results only apply to the sample as received.

All data and materials supplied by the customer or manufacturer are clearly identified.

Material information was sampled and recorded according to procedure AP070 vs. 1.1.

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TEST PROCEDURE

The test was conducted fully in accordance with BS EN 1364-1: 2015. The specimen was subjected to fire from one side, as specified in BS EN 1364-1: 2015.

The test specimen was not symmetrical and should therefore be tested in both orientations. No performance can be claimed for the system if installed with Gyproc FireLine on the unexposed to the furnace without a separate test being undertaken to substantiate this orientation.

The test procedure used was EN 1364-1 Issue 3.

The ambient temperature at the commencement of the test was 26 °C.

The furnace pressure was set to control at 18 ± 2 Pa positive with respect to atmosphere, at the top of the specimen. Furnace pressure data is shown in **Figure 5**.

The test conditions did not meet the full requirements of BS EN 1363-1: 2020 as the test frame stiffness did not fully comply.

The specimen and associated construction were not conditioned in accordance with clause 8 of BS EN 1363-1: 2020.

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TEST RESULTS

The requirement of the standard was satisfied for the following periods:

Integrity	**Sustained Flaming**	**88 minutes, no failure.**
	6 mm Gap Gauge	**88 minutes, no failure.**
	25 mm Gap Gauge	**88 minutes, no failure.**
	Cotton Pad	**87 minutes.**
Insulation		**81 minutes.**
Test Terminated		**88 minutes, at the request of the sponsor.**

LIMITATIONS

The scope of the Field of Direct Application of the results and construction details in this test report is explained in BS EN 1364-1: 2015, section 13.

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TEST DATA

Observations

All observations refer to the exposed face unless stated.

Observers: Unexposed face: Ryan Skilton
Exposed face: Eric Chee and Beth Kelliher

Time Hours	Time Minutes	Observations
0	00	Test started.
0	10	Jointing material was flaking away. Face papers had charred.
0	20	Left-hand vertical joint had opened up to approximately 2-3 mm. Right-hand vertical joint had opened up to approximately 2-3 mm. Horizontal joint had opened up to approximately 2-3 mm.
0	30	Left-hand vertical joint had opened up to approximately 8 mm. Right-hand vertical joint had opened up to approximately 6 mm. Horizontal joint had opened up to approximately 8 mm. Boards had cracked around screw heads. *Unexposed face* No visible change.
0	40	Left-hand vertical joint had opened up to approximately 10 mm. Right-hand vertical joint had opened up to approximately 9-10 mm. Horizontal joint had opened up to approximately 14 mm.
0	50	Left-hand vertical joint had opened up to approximately 12 mm. Right-hand vertical joint had opened up to approximately 10 mm. Horizontal joint had opened up to approximately 20 mm.
1	00	Left-hand vertical joint had opened up to approximately 20 mm. Right-hand vertical joint had opened up to approximately 12 mm. Horizontal joint had opened up to approximately 28 mm. *Unexposed face* No visible change.

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Time Hours	Time Minutes	Observations
1	10	Left-hand vertical joint had opened up to approximately 28 mm. Right-hand vertical joint had opened up to approximately 13 mm. Horizontal joint had opened up to approximately 30 mm.
1	16	*Unexposed face* The deflection of the specimen had caused the washers to pull into the Polterm insulation. Smoke was emitting from the specimen approximately 1200 mm from the fixed edge and approximately 1200 mm height.
1	19	*Unexposed face* Smoke was emitting from the specimen approximately 350 mm from the free edge and approximately 1200 mm height.
1	20	Left-hand vertical joint had opened up to approximately 36 mm. Right-hand vertical joint had opened up to approximately 20 mm. Horizontal joint had opened up to approximately 34 mm.
1	21	*Unexposed face* **INSULATION FAILURE.** The temperature rise of thermocouple no.41 positioned at mid-height on the right-hand vertical joint on a washer exceeded 180 °C.
1	22	Crack down the centre of the lower left-hand board had opened up to approximately 40 mm.
1	24	Crack down the centre of the lower centre board had opened up to approximately 8-10 mm.
1	26	*Unexposed face* Cotton pad attempt at approximately 1200 mm from the free edge and approximately 2400 mm height – no failure.
1	27	*Unexposed face* **INTEGRITY FAILURE.** The cotton pad ignited (glowed) when placed approximately 1300 mm from the free edge at approximately 2400 mm height.
1	28	**TEST TERMINATED** at the request of the sponsor.

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Furnace Temperature Graph

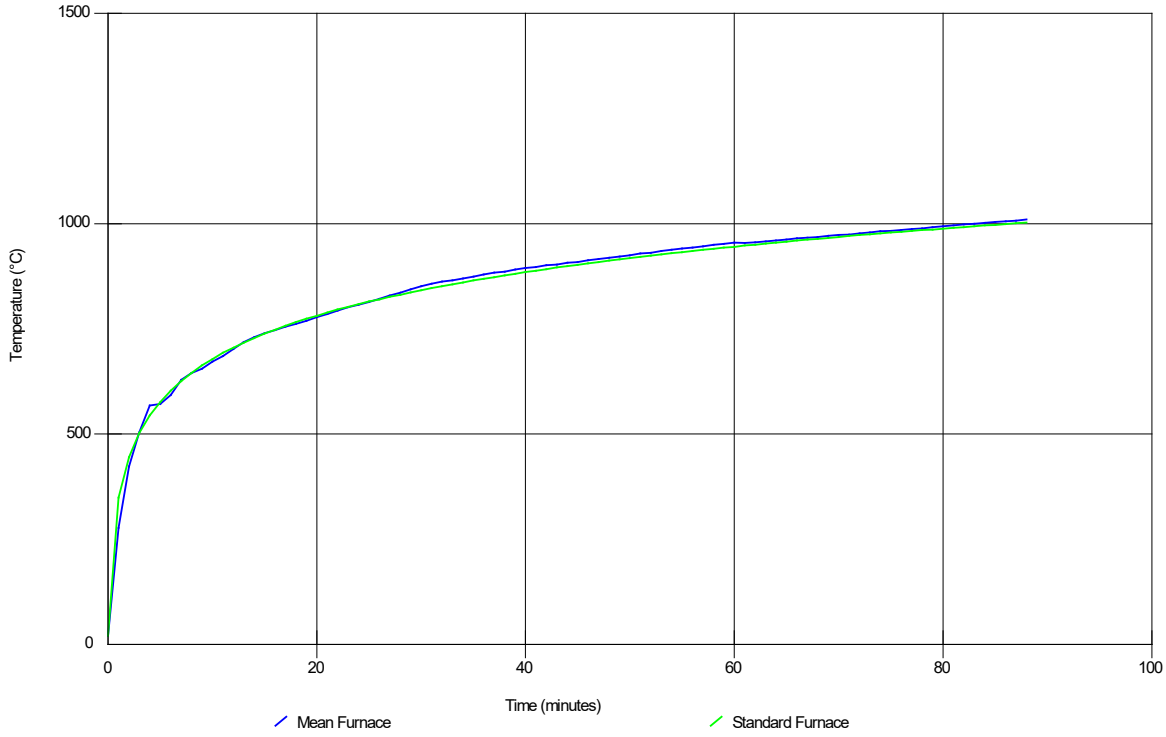

Figure 4 – Furnace temperature graph.

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Furnace Pressure Graph

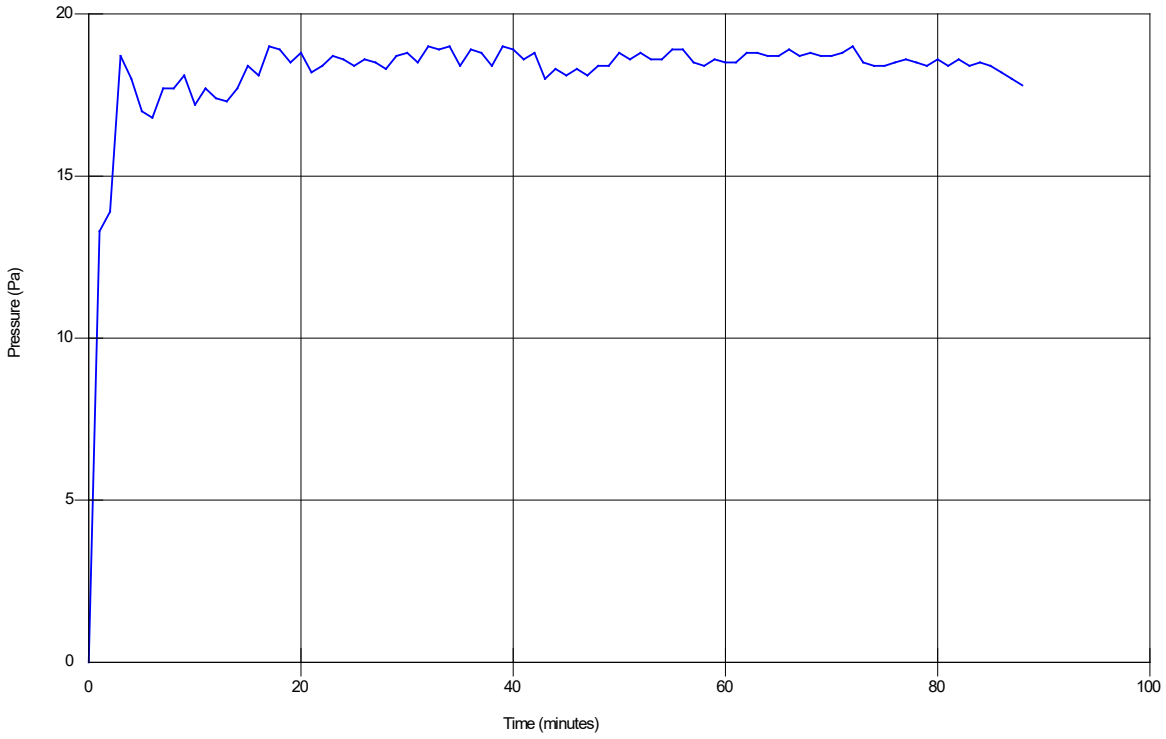

Figure 5 – Furnace pressure graph.

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Unexposed Face Temperature Graph

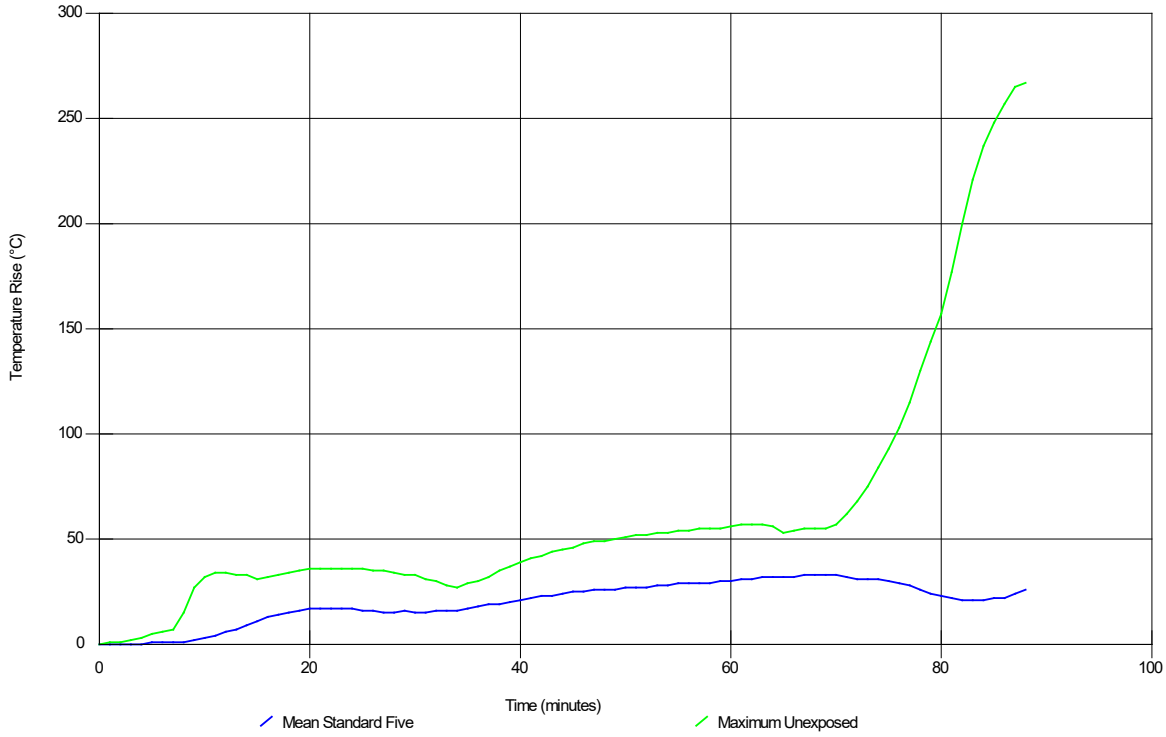

Figure 6 – Unexposed face temperature graph.

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Unexposed Face Thermocouple Layout

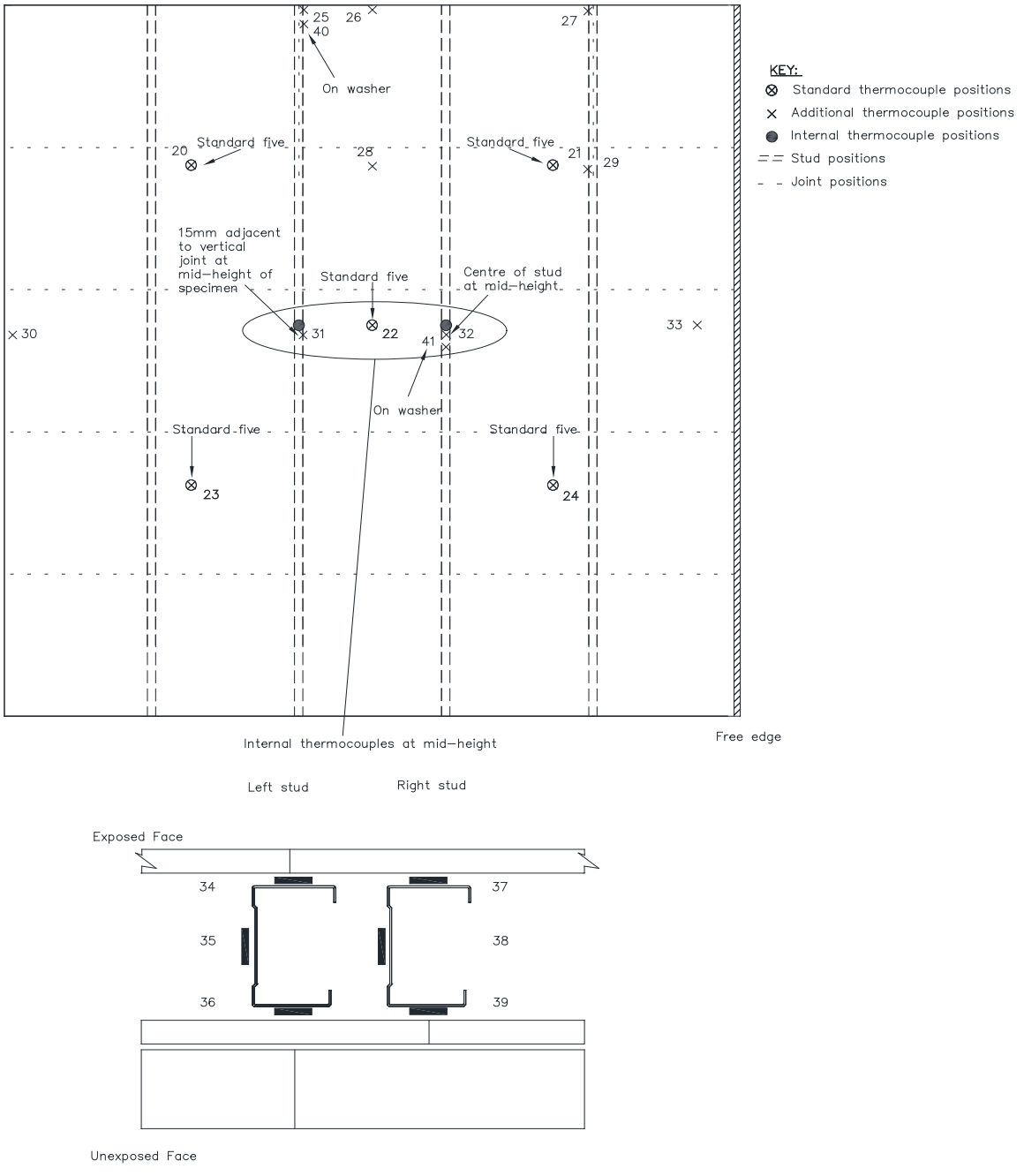

Figure 7 – Unexposed face thermocouple layout.

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Unexposed Face Standard Five Temperature Data

Time (minutes)	Temperature Rise (°C)					
	Thermocouple No. 20	Thermocouple No. 21	Thermocouple No. 22	Thermocouple No. 23	Thermocouple No. 24	Mean Standard Five
0	0	0	0	0	0	0
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	1	1	1	1	0	1
6	1	1	1	1	0	1
7	1	1	1	1	1	1
8	1	2	2	1	1	1
9	1	2	3	1	1	2
10	2	4	5	2	1	3
11	2	6	8	2	1	4
12	3	8	12	3	2	6
13	4	11	15	4	2	7
14	6	13	18	6	3	9
15	7	15	20	8	5	11
16	9	16	22	10	6	13
17	11	17	23	12	8	14
18	12	18	23	13	10	15
19	13	18	24	13	12	16
20	14	19	24	14	13	17
21	15	19	24	14	14	17
22	15	19	23	14	15	17
23	15	19	22	14	15	17
24	15	18	21	14	15	17
25	15	18	20	13	15	16
26	15	17	19	13	15	16
27	15	16	19	13	14	15
28	14	16	19	13	14	15
29	14	17	20	13	15	16
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31	14	17	19	12	15	15
32	15	16	19	12	16	16
33	15	16	18	13	16	16
34	16	16	19	14	16	16
35	16	16	21	15	16	17
36	15	17	23	17	17	18
37	15	18	24	18	18	19
38	16	19	25	18	19	19

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Time (minutes)	Temperature Rise (°C)					
	Thermocouple No. 20	Thermocouple No. 21	Thermocouple No. 22	Thermocouple No. 23	Thermocouple No. 24	Mean Standard Five
39	16	21	26	19	19	20
40	18	22	26	20	20	21
41	19	22	27	21	21	22
42	19	23	28	22	22	23
43	20	23	28	23	22	23
44	21	24	29	23	23	24
45	22	25	29	24	23	25
46	22	26	29	25	24	25
47	23	26	30	25	24	26
48	24	26	30	25	25	26
49	24	26	30	26	25	26
50	24	27	30	26	26	27
51	25	27	30	27	26	27
52	25	27	31	27	27	27
53	26	28	31	28	27	28
54	26	28	31	28	27	28
55	26	29	32	28	28	29
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63	31	35	34	29	30	32
64	32	35	34	29	30	32
65	33	36	34	29	30	32
66	33	36	33	29	29	32
67	34	37	33	30	31	33
68	35	37	32	30	32	33
69	35	37	32	30	32	33
70	35	38	32	29	31	33
71	35	36	31	29	31	32
72	34	34	29	27	31	31
73	34	34	29	25	31	31
74	34	34	30	24	31	31
75	33	33	30	21	31	30
76	32	32	30	19	30	29
77	32	31	29	18	29	28
78	30	29	27	17	26	26
79	29	28	25	17	23	24

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Time (minutes)	Temperature Rise (°C)					
	Thermocouple No. 20	Thermocouple No. 21	Thermocouple No. 22	Thermocouple No. 23	Thermocouple No. 24	Mean Standard Five
80	28	26	24	17	21	23
81	27	24	23	17	19	22
82	26	23	23	17	18	21
83	24	22	25	18	17	21
84	21	21	27	19	17	21
85	19	21	29	21	18	22
86	17	21	31	23	19	22
87	17	22	34	26	20	24
88	18	23	37	29	23	26

See **Figure 7** for the location of the thermocouples.

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Additional Unexposed Face Temperature Data

Time (minutes)	Temperature Rise (°C)				
	Thermocouple No. 25	Thermocouple No. 26	Thermocouple No. 27	Thermocouple No. 28	Thermocouple No. 29
0	0	0	0	0	0
1	0	0	1	0	0
2	0	0	1	0	0
3	1	1	2	0	0
4	1	1	3	0	0
5	1	1	5	1	1
6	2	1	6	1	1
7	4	2	7	1	1
8	15	2	10	1	1
9	27	3	15	2	2
10	32	5	21	2	3
11	34	8	25	3	4
12	34	11	28	4	6
13	33	15	29	6	8
14	33	18	30	8	11
15	31	21	31	10	13
16	31	23	32	13	15
17	31	24	33	15	17
18	31	25	34	16	18
19	32	25	35	17	19
20	32	25	36	18	20
21	32	26	36	18	20
22	32	26	36	19	20
23	32	26	36	19	20
24	33	26	36	19	19
25	34	26	36	18	19
26	35	25	35	18	18
27	35	24	34	17	17
28	34	24	32	17	17
29	33	22	32	16	17
30	33	22	30	16	17
31	31	21	29	16	17
32	30	21	28	17	17
33	28	20	27	18	17
34	27	20	27	18	17
35	26	19	26	18	18
36	26	19	26	18	19
37	25	19	26	19	21
38	25	19	26	20	23

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Time (minutes)	Temperature Rise (°C)				
	Thermocouple No. 25	Thermocouple No. 26	Thermocouple No. 27	Thermocouple No. 28	Thermocouple No. 29
39	25	20	26	21	25
40	25	20	26	22	26
41	26	21	27	23	28
42	26	21	28	23	28
43	26	22	28	24	29
44	26	22	29	24	30
45	26	22	29	25	31
46	26	22	30	25	31
47	27	23	30	26	32
48	27	23	30	26	32
49	27	23	30	27	33
50	27	23	30	28	33
51	28	23	31	28	34
52	28	23	32	29	34
53	28	24	32	29	35
54	28	24	32	30	35
55	29	24	33	30	36
56	29	24	33	31	37
57	30	25	34	32	37
58	30	25	34	33	37
59	30	25	34	35	37
60	31	26	35	37	38
61	32	27	35	39	39
62	32	27	36	42	41
63	33	28	37	43	42
64	34	29	37	45	43
65	34	30	38	47	44
66	35	30	38	47	45
67	35	32	39	48	46
68	35	32	39	49	46
69	36	33	40	49	45
70	37	35	41	49	45
71	38	35	41	48	43
72	37	34	40	45	41
73	38	35	40	43	40
74	39	36	42	42	40
75	40	35	43	39	38
76	41	35	44	35	37
77	41	34	46	33	36
78	41	35	47	31	34
79	41	35	47	30	32

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Time (minutes)	Temperature Rise (°C)				
	Thermocouple No. 25	Thermocouple No. 26	Thermocouple No. 27	Thermocouple No. 28	Thermocouple No. 29
80	42	34	46	29	30
81	44	35	46	31	29
82	45	36	45	33	28
83	46	39	44	36	28
84	46	41	44	40	28
85	45	41	44	47	30
86	44	40	44	63	32
87	43	40	44	78	35
88	43	38	44	95	38

See **Figure 7** for the location of the thermocouples.

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Additional Unexposed Face Temperature Data

Time (minutes)	Temperature Rise (°C)					
	Thermocouple No. 30	Thermocouple No. 31	Thermocouple No. 32	Thermocouple No. 33	Thermocouple No. 40	Thermocouple No. 41
0	0	0	0	0	0	0
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	1	0	0	0	0
6	0	1	1	1	1	0
7	1	1	1	1	1	1
8	1	1	1	1	1	1
9	1	2	1	1	1	1
10	1	2	2	1	2	2
11	1	3	2	2	4	3
12	2	5	3	2	6	4
13	3	7	5	4	9	5
14	4	10	7	5	11	7
15	5	12	9	7	-	10
16	6	15	11	9	-	14
17	8	17	13	10	-	17
18	9	18	14	12	-	19
19	11	19	15	14	-	21
20	12	20	16	15	-	23
21	12	20	17	16	-	24
22	13	20	17	16	-	25
23	13	19	17	17	-	26
24	14	18	17	17	-	26
25	15	18	16	16	-	26
26	15	17	16	16	-	25
27	15	17	15	15	-	25
28	15	16	15	14	-	25
29	15	16	15	14	-	25
30	15	16	16	13	-	25
31	14	17	16	14	-	26
32	14	17	17	13	-	26
33	14	17	17	13	-	27
34	14	19	18	13	-	27
35	14	20	19	13	-	29
36	14	22	20	13	-	30
37	14	25	22	13	-	32
38	15	28	24	13	-	35

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Time (minutes)	Temperature Rise (°C)					
	Thermocouple No. 30	Thermocouple No. 31	Thermocouple No. 32	Thermocouple No. 33	Thermocouple No. 40	Thermocouple No. 41
39	16	30	25	15	-	37
40	16	30	26	17	-	39
41	18	31	28	19	-	41
42	19	32	29	20	-	42
43	20	32	30	21	-	44
44	21	33	32	22	-	45
45	22	33	33	22	-	46
46	22	34	33	22	-	48
47	23	34	34	22	-	49
48	24	34	35	23	-	49
49	24	35	36	22	-	50
50	25	36	37	23	-	51
51	25	37	38	24	-	52
52	26	37	38	24	-	52
53	27	38	39	24	-	53
54	27	38	40	25	-	53
55	27	38	40	25	-	54
56	27	39	41	25	-	54
57	28	40	41	26	-	55
58	27	41	42	25	-	55
59	27	42	41	25	-	55
60	28	44	42	25	-	56
61	28	46	42	25	-	57
62	28	47	40	26	-	57
63	29	49	37	26	-	57
64	29	51	36	26	-	56
65	29	53	33	26	-	53
66	29	54	30	25	-	51
67	30	55	28	26	-	51
68	30	55	27	26	-	51
69	31	55	27	26	-	53
70	31	56	27	27	-	57
71	31	56	27	27	-	62
72	30	56	29	25	-	68
73	31	57	31	26	-	75
74	31	62	34	26	-	84
75	31	76	36	25	-	93
76	31	98	38	25	-	103
77	32	114	38	25	-	115
78	32	130	40	25	-	128
79	33	144	46	26	-	141

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Time (minutes)	Temperature Rise (°C)					
	Thermocouple No. 30	Thermocouple No. 31	Thermocouple No. 32	Thermocouple No. 33	Thermocouple No. 40	Thermocouple No. 41
80	32	155	57	25	-	157
81	32	163	63	26	-	**177**
82	32	170	70	26	-	200
83	32	177	79	25	-	221
84	31	181	92	24	-	237
85	32	190	112	23	-	248
86	30	205	140	21	-	257
87	31	221	155	20	-	265
88	30	236	162	18	-	267

Figures highlighted in red indicate the minute in which the temperature rise exceeded 180 °C.

- Thermocouple broken due to equipment failure.

See **Figure 7** for the location of the thermocouples.

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Internal Temperature Data at 1500 mm Height

Time (minutes)	Actual Temperature (°C)					
	Left stud			Right stud		
	Hot Flange Thermocouple No. 34	Web Thermocouple No. 35	Cold Flange Thermocouple No. 36	Hot Flange Thermocouple No. 37	Web Thermocouple No. 38	Cold Flange Thermocouple No. 39
0	29	28	28	29	28	28
1	30	28	28	32	29	28
2	35	29	28	44	30	28
3	53	34	29	60	34	29
4	81	51	33	82	48	35
5	94	69	45	95	69	51
6	96	79	58	98	82	66
7	98	84	69	100	88	76
8	101	87	76	101	90	85
9	102	90	79	103	92	89
10	102	91	83	103	93	91
11	103	93	87	105	94	93
12	103	94	91	108	95	94
13	104	96	95	111	95	96
14	106	96	98	114	96	94
15	108	97	99	117	97	94
16	111	97	100	121	97	94
17	113	98	99	126	98	95
18	115	98	99	130	99	96
19	116	98	99	136	100	97
20	118	98	98	142	101	98
21	122	98	98	151	103	97
22	131	98	96	170	106	97
23	145	99	94	193	111	96
24	167	104	94	235	121	96
25	200	107	96	274	138	99
26	236	111	99	312	161	107
27	260	119	105	350	189	116
28	287	134	114	389	218	125
29	313	154	121	425	245	139
30	338	179	128	460	270	159
31	361	208	136	489	293	181
32	385	241	147	513	314	197
33	412	263	154	538	335	211
34	431	282	164	559	354	219
35	449	298	173	582	373	228
36	464	312	182	602	391	237

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Time (minutes)	Actual Temperature (°C)					
	Left stud			Right stud		
	Hot Flange Thermocouple No. 34	Web Thermocouple No. 35	Cold Flange Thermocouple No. 36	Hot Flange Thermocouple No. 37	Web Thermocouple No. 38	Cold Flange Thermocouple No. 39
37	480	325	190	620	407	247
38	494	337	199	635	423	256
39	508	348	208	649	439	264
40	524	359	216	661	455	274
41	536	369	225	672	470	284
42	545	379	233	680	484	294
43	554	388	241	686	497	304
44	562	397	249	691	509	314
45	570	406	257	694	520	324
46	577	414	264	694	531	333
47	584	422	272	699	541	341
48	589	430	279	705	550	350
49	595	438	286	712	558	359
50	600	445	293	717	567	369
51	606	452	301	724	577	379
52	612	459	308	729	587	392
53	616	466	316	733	597	408
54	621	472	323	739	604	426
55	623	478	329	735	610	447
56	627	484	336	730	616	466
57	632	489	341	726	622	486
58	636	495	347	723	624	511
59	640	500	353	722	627	535
60	644	505	359	724	632	555
61	648	511	365	727	638	573
62	651	516	371	729	644	586
63	654	522	378	733	649	597
64	658	527	384	737	655	607
65	661	532	391	742	661	619
66	664	538	399	749	675	637
67	667	543	407	759	689	658
68	669	548	416	767	931	675
69	672	552	425	775	777	689
70	675	557	435	781	770	702
71	677	561	445	784	745	713
72	679	564	455	785	776	723
73	681	568	469	815	730	737
74	683	573	483	829	-	755
75	685	579	495	835	-	767

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Time (minutes)	Actual Temperature (°C)					
	Left stud			Right stud		
	Hot Flange Thermocouple No. 34	Web Thermocouple No. 35	Cold Flange Thermocouple No. 36	Hot Flange Thermocouple No. 37	Web Thermocouple No. 38	Cold Flange Thermocouple No. 39
76	688	585	508	845	-	778
77	691	590	520	856	-	791
78	694	597	532	867	-	805
79	698	604	545	876	-	820
80	702	613	557	886	-	833
81	706	620	569	895	-	845
82	709	629	582	900	-	854
83	714	638	593	908	-	863
84	720	646	604	917	-	872
85	712	663	639	916	-	877
86	716	678	664	926	-	888
87	725	691	684	938	-	900
88	735	705	699	-	-	914

- Thermocouple broken due to equipment failure.

See **Figure 7** for the location of the thermocouples.

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Specimen Lateral Deflection

Time (minutes)	Deflection (mm)
	Centre
0	0
1	3
2	3
3	5
4	9
5	10
6	8
7	6
8	5
9	4
10	3
11	3
12	2
13	2
14	3
15	3
16	3
17	3
18	3
19	4
20	5
21	6
22	9
23	13
24	19
25	25
26	30
27	36
28	42
29	47
30	52
31	56
32	60
33	63
34	66
35	68
36	70
37	72
38	74

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Time (minutes)	Deflection (mm)
	Centre
39	75
40	77
41	78
42	79
43	80
44	80
45	81
46	82
47	83
48	84
49	85
50	85
51	86
52	87
53	89
54	89
55	90
56	92
57	93
58	95
59	97
60	99
61	101
62	103
63	104
64	105
65	107
66	108
67	109
68	110
69	111
70	112
71	113
72	114
73	116
74	117
75	119
76	121
77	123
78	125
79	127

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Time (minutes)	Deflection (mm)
	Centre
80	130
81	132
82	134
83	136
84	138
85	139
86	141
87	142
88	142

The deflection was recorded at the approximate centre of the specimen. Positive readings indicate deflection into the furnace.

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PHOTOGRAPHS

Exposed Face Prior to Test

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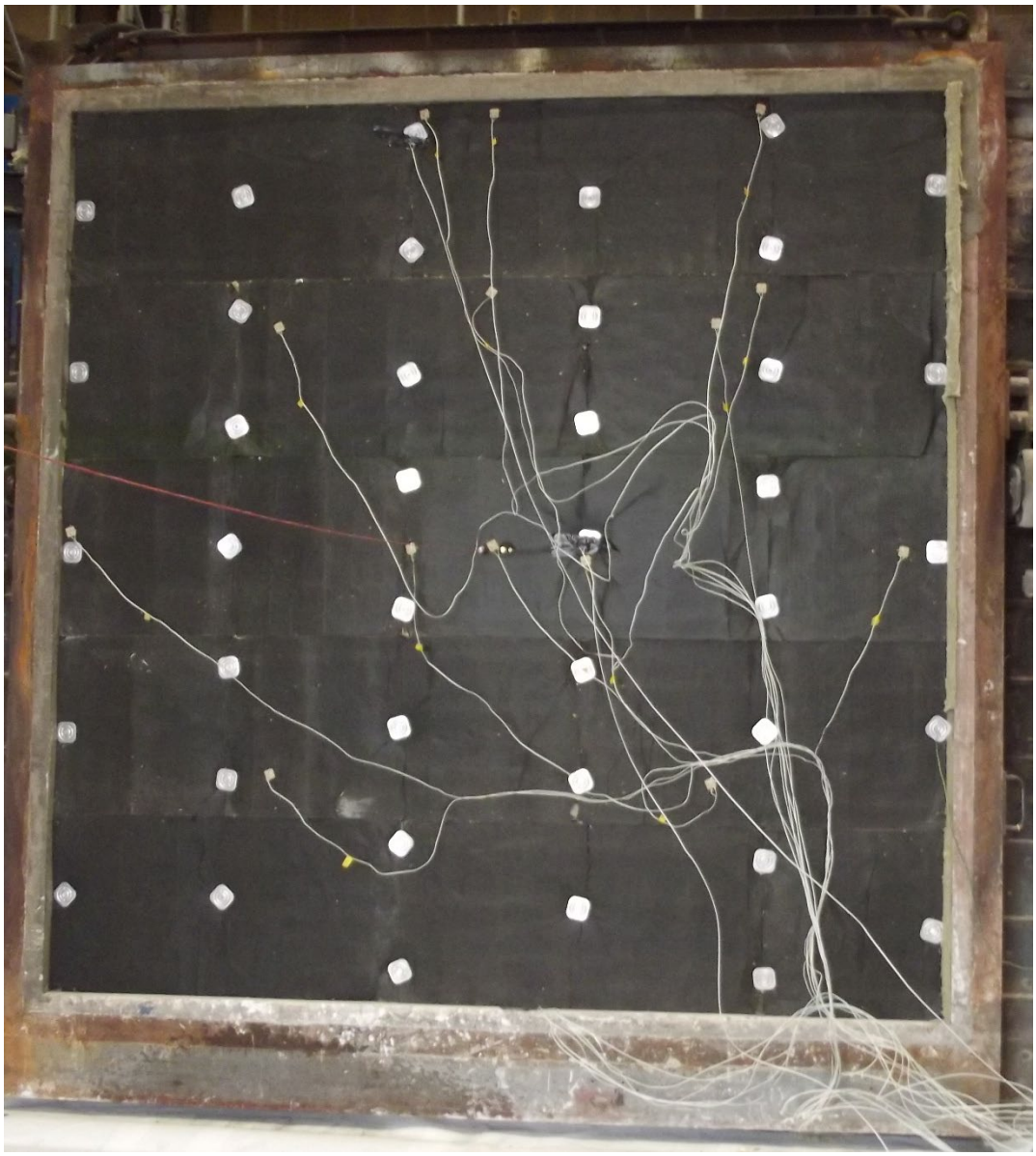
Unexposed Face Prior to Test



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Unexposed Face at 30 Minutes

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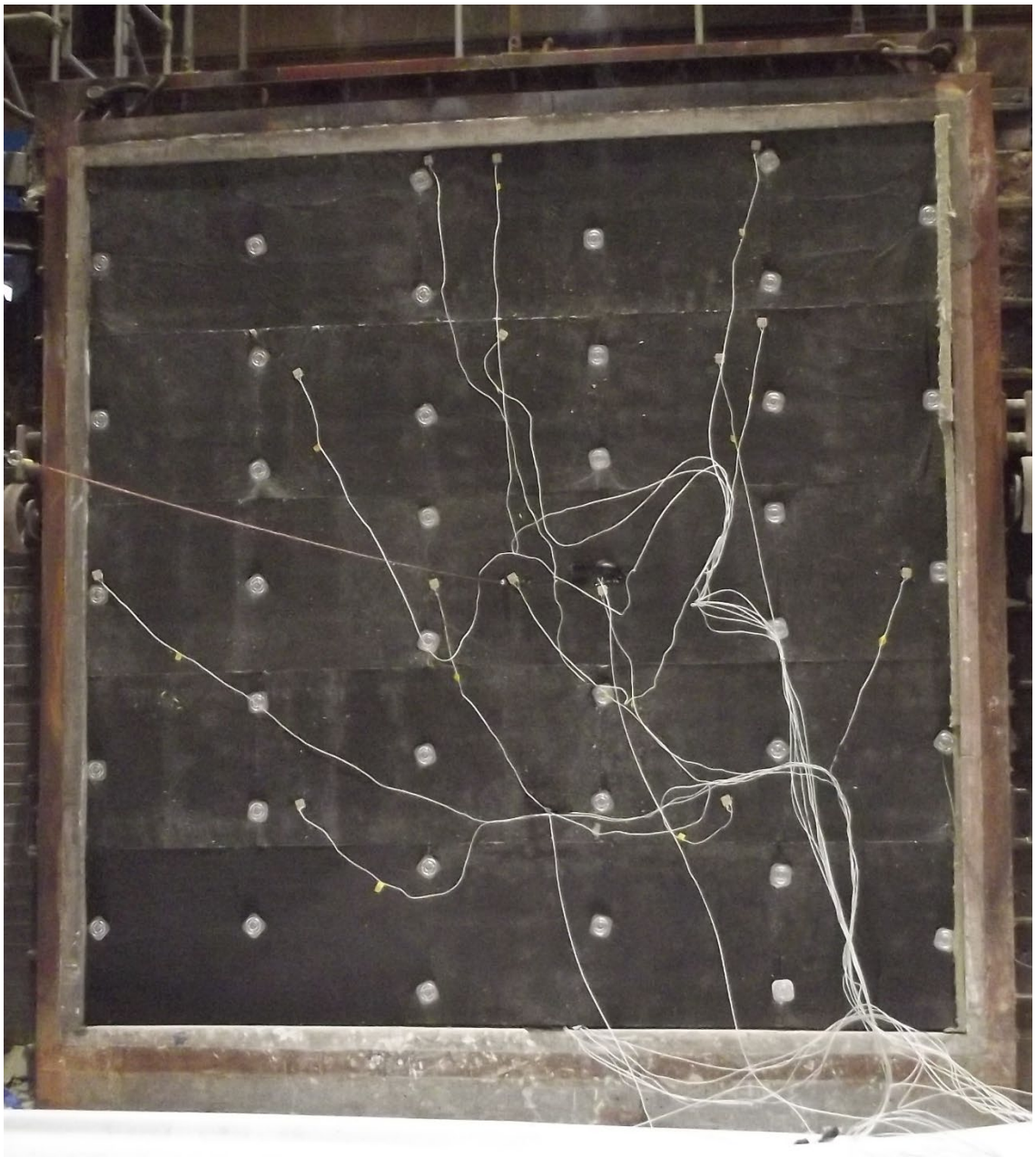
Unexposed Face at 1 Hour



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Unexposed Face at 1 Hour, 28 Minutes, at Test Termination

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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.

i) Decrease in height.

ii) Increase in the thickness of the wall.

iii) Increase thickness of component materials.

iv) Decrease in the linear dimensions of the boards but not thickness.

v) Decrease stud spacing.

vi) Decrease in fixing centres.

vii) 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.

Extension of Width

For test specimens tested without a supporting construction, the width of an identical construction may be increased as the specimen was tested at nominally 3000 mm wide with one vertical edge without restraint.

Extension of Height

The height of the construction may be increased by 1000 mm under the following conditions:

30 minutes	60 minutes
≤ 100 mm	≤ 100 mm