



The Building Test Centre

Fire Acoustics Structures

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Report Number BTC 12804F

A FIRE RESISTANCE TEST ON A BRITISH GYPSUM GYPWALL PARTITION CLAD WITH A DOUBLE LAYER OF 15mm GYPROC FIRELINE BOARD EACH SIDE OF GYPFRAME 70S50 STUDS WITH 50mm ISOWOOL IN THE CAVITY, CONDUCTED IN ACCORDANCE WITH BS EN 1364-1: 1999.

Test Date: 10th June 2003

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

Customer: British Gypsum Limited

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A FIRE RESISTANCE TEST ON A BRITISH GYPSUM GYPWALL PARTITION CLAD WITH A DOUBLE LAYER OF 15mm GYPROC FIRELINE BOARD EACH SIDE OF GYPFRAME 70S50 STUDS WITH 50mm ISOWOOL IN THE CAVITY, CONDUCTED IN ACCORDANCE WITH BS EN 1364-1: 1999.

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FIELD OF DIRECT APPLICATION

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Customer: **British Gypsum Limited**

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FOREWORD

This test report details a fire resistance test conducted on a sheet and stud partition system. The test sponsor was British Gypsum Limited.

The test specimen was installed by British Gypsum Limited. The construction of the specimen took place between the 2nd and 3rd June 2003. British Gypsum Limited designed the partition system and selected the materials for the test specimen.

The test was carried out on the 10th June 2003.

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, construction details, loads, stresses, edge or 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.

REPORT AUTHORISATION

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TEST CONSTRUCTION

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

Gypframe 72C50 Standard Floor & Ceiling Channels were fixed to the head and base of the test aperture at 600mm centres with 60mm fire resistant fixings. Gypframe 70S50 'C' Studs were positioned at 600mm centres between the channels. The right hand stud viewed from unexposed face was not fixed to the perimeter test frame, and the gap between the stud and the frame lining was filled with a 25mm rock mineral fibre gasket. At the left-hand end a Gypframe 70S50 'C' Stud was used to fix the partition to the test frame with 60mm fire resistant fixings at 600mm centres.

50mm Isowool Acoustic Partition Roll (1200) was located in the cavity.

The framework was lined both sides with a double layer of 15mm Gyproc FireLine board. The inner layer was fixed around the perimeter with 25mm Gyproc drywall screws at 300mm centres. The outer layer was fixed around the perimeter and within the field of the board with 42mm Gyproc drywall screws at 300mm centres. All joints were staggered between layers.

Horizontal joints were positioned 2700mm from the base for the outer layers on both the exposed and unexposed faces of the construction. Horizontal joints were positioned 300mm from the base for the inner layers on both the exposed and unexposed faces of the construction. A Gypframe GFS1 Fixing Strap was used behind the horizontal board joints in the outer layers.

All joints were taped and filled using Gyproc Paper Joint Tape and Gyproc Joint Filler. All screw heads were spotted using Gyproc Joint Filler.

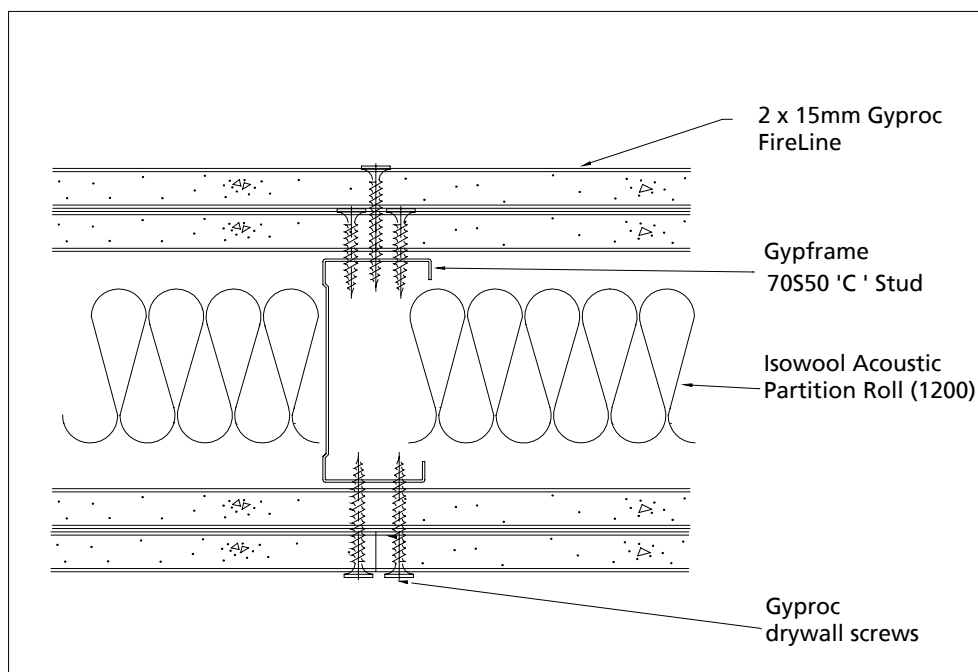


Figure 1. Cross-section of partition specimen.

The descriptions of individual components making up the test specimen were provided by the customer and were checked for accuracy wherever possible.



TEST MATERIALS

Gyproc FireLine

Nominally, 3000mm (long) x 1200mm (wide) x 15mm (thick), Gyproc FireLine plasterboard manufactured and supplied by British Gypsum Limited, ex East Leake works.

Actual surface density:	11.56kg/m ² .
Actual thickness:	15.06mm.
Board identification numbers:	16 119 3 10:14
Actual moisture content:	0.37%.

The surface density and thickness was calculated using the actual weight and size of a selection of the boards used in the test specimen. The moisture content of the plasterboard used in construction was established from measurements made using samples dried to a constant weight in an oven at 40°C.

Metal components

- i) Gypframe 70S50'C' Studs manufactured from galvanised mild steel using the 'Ultrasteel' process.
- ii) Gypframe 72C50 Standard Floor & Ceiling Channel manufactured from galvanised mild steel using the 'Ultrasteel' process.
- iii) Gypframe GFS1 Fixing Strap.

All metal components supplied by British Gypsum Limited.

Insulation

Nominally 50mm (thick) Isowool Acoustic Partition Roll (1200) glass mineral wool manufactured and supplied by British Gypsum – Isover.

Measured density:	13.72kg/m ³
Measured surface density:	0.69kg/m ²

The density was calculated using the insulation roll used in the test specimen.

Fasteners

- i) 25mm Gyproc drywall screws supplied by British Gypsum Limited.
- ii) 42mm Gyproc drywall screws supplied by British Gypsum Limited.
- iii) 60mm fire resistant fixings.

Miscellaneous components

- i) Gyproc Paper Joint Tape.
- ii) Gyproc Joint Filler.

All miscellaneous components were supplied by British Gypsum Limited.

TEST PROCEDURE

The test was conducted fully in accordance with BS EN 1364-1:1999. The specimen was subjected to fire from one side, as specified in BS EN 1364-1:1999. As the test specimen is considered to be symmetrical one test is adequate to cover the fire resistance performance in both directions.

The test procedure used was EN 1364-1 Issue 2.

The ambient temperature at the commencement of the test was 21°C.

The furnace pressure was set to control at 18 ± 2 Pa positive with respect to atmosphere, at the top of the specimen, except during the first 5 minutes of the test.

The allowable tolerances are ± 5 Pa from 5 minutes to 10 minutes and ± 3 Pa from 10 minutes onwards. It is of the opinion of the laboratory that the variations in the furnace pressure exceeding the tolerances stated in BS EN 1363-1:1999 have not unduly influenced the results of this test. Furnace pressure data is shown on page 17.

The test conditions did not meet the full requirements of BS EN 1363-1:1999 as the test frame stiffness did not fully comply. The test centre is of the opinion that this deviation from the documented method will not unduly effect the result of the test.

TEST RESULTS

The requirements of the standard were satisfied for the following periods:

Integrity:	Sustained flaming	172 minutes (no failure test discontinued at the request of the customer)
	25mm Gap gauge	172 minutes
	6mm Gap gauge	169 minutes
	Cotton pad	167 minutes
Insulation:		154 minutes

The test was terminated at 172 minutes at the request of the customer.

LIMITATIONS

The specification and interpretation of fire test methods are the subject of ongoing development and refinement. Changes in associated legislation may also occur. For these reasons it is recommended that the relevance of test reports over 5 years old should be considered by the user. The laboratory that issued the report will be able to offer, on behalf of the legal owner, a review of the procedures adopted for a particular test to ensure that they are consistent with current practices, and if required may endorse the test report.



TEST DATA

Observations

Observers: Unexposed face M Fountain & A Richardson
Exposed face P Cao

Time		Observations
hrs	mins	
		All observations refer to exposed face unless otherwise stated.
	0	Test started.
	10	The jointing material and face paper had started to char.
	20	All joints had opened to approximately 2mm. Approximately 80% of the jointing material had fallen into the furnace.
	30	All joints had opened to approximately 7-8mm.
	40	All joints had opened to approximately 10-12mm. The lower left-hand and centre boards had started to pull away from the perimeter fixings adjacent to the horizontal joint.
	50	All joints had opened to approximately 12-14mm.
1	00	All joints had opened to approximately 12-15mm.
1	10	Horizontal joint had opened to approximately 15-20mm Left-hand joint had opened to approximately 20mm. Right-hand joint had opened to approximately 15mm. Hairline cracks had developed on the inner layer where exposed through the joints.
1	20	Horizontal joint had opened to approximately 25mm Left-hand joint had opened to approximately 25-30mm. Right-hand joint had opened to approximately 20mm. The lower left-hand and centre boards had detached from the perimeter fixings adjacent to the horizontal joint.

Customer: British Gypsum Limited



Time		Observations
hrs	mins	
		All observations refer to exposed face unless otherwise stated.
1	30	No visible change to the board joints. Hairline cracks had started to develop adjacent to the horizontal joint.
1	40	Horizontal joint had opened to approximately 30-35mm Left-hand joint had opened to approximately 30mm. Right-hand joint had opened to approximately 20-25mm.
1	50	Horizontal joint had opened to approximately 35-40mm Left-hand joint had opened to approximately 35mm. Right-hand joint had opened to approximately 25mm. Approximately 2-3mm wide cracks had started to develop adjacent to the horizontal joint.
2	00	The lower left-hand board had detached from its fixings and was peeling into the furnace along the horizontal joint.
2	05	Outer layer board fall – The top right-hand corner of the lower left-hand board approximately 1200mm x 600mm fell into the furnace. The lower centre board had detached from its fixings and was peeling into the furnace along the left-hand vertical joint.
2	10	Further outer layer board fall - A section of the lower left-hand board approximately 1000mm x 200mm (adjacent to the left-hand joint) fell into the furnace. Hairline cracks had developed on the inner layer where exposed. <i>Unexposed face</i> The jointing material had discoloured at the screw head positions on both vertical joints at 2400mm height.
2	13	<i>Unexposed face</i> The jointing material had discoloured at the screw head positions on the right-hand vertical joint at 1800 - 2100mm height.



Time		Observations
hrs	mins	
		All observations refer to exposed face unless otherwise stated.
2	15	Further outer layer board fall – Approximately 65% of the lower left-hand board had fallen into the furnace. The lower centre board had detached from its fixings and was peeling into the furnace along the horizontal joint.
2	20	Further outer layer board fall - A section of the lower centre board approximately 1600mm x 600mm (below the horizontal joint) fell into the furnace. The inner layer left-hand board had detached from its fixings and was peeling into the furnace along the left-hand vertical joint.
2	22	<i>Unexposed face</i> The jointing material had discoloured at the screw head positions on the right-hand vertical joint at 1500mm height.
2	25	Further outer layer board fall – The remainder of the lower centre board fell into the furnace. Inner layer board fall - A section of the upper centre board approximately 2700mm x 600mm (adjacent to the left-hand joint) fell into the furnace.
2	28	<i>Unexposed face</i> The jointing material had discoloured at all screw head positions on both vertical joints.
2	30	Inner layer board fall - A section of the upper left-hand board approximately 2000mm x 600mm fell into the furnace. The inner layer unexposed face was cracked throughout where exposed.
2	34	<i>Unexposed face</i> INSULATION FAILURE. The temperature rise of thermocouple No. 32 exceeded 180°C.
2	35	<i>Unexposed face</i> Discolouration was visible within the field of the lower centre board.



Time		Observations
hrs	mins	
		All observations refer to exposed face unless otherwise stated.
2	36	<i>Unexposed face</i> Discolouration was visible on the right-hand vertical joint at approximately 1500 - 2400mm height.
2	37	<i>Unexposed face</i> Jointing material was peeling away on the right-hand vertical joint close to thermocouple No. 21.
2	41	<i>Unexposed face</i> Discolouration was visible at thermocouple No. 32 (approximately 1200mm long).
2	43	<i>Unexposed face</i> Furnace glow was visible through cracks around thermocouple No. 21 & 32.
2	44	<i>Unexposed face</i> Furnace glow was visible on the left-hand vertical joint at approximately 1500mm height.
2	45	<i>Unexposed face</i> The cotton pad was used on the left-hand vertical joint at approximately 1500mm height but did not glow or ignite.
2	46	<i>Unexposed face</i> The cotton pad was used on the left-hand vertical joint at approximately 1500mm height but did not glow or ignite.
2	47	<i>Unexposed face</i> INTEGRITY FAILURE. The cotton pad ignited when used on the left-hand vertical joint at approximately 1500mm height.
2	49	<i>Unexposed face</i> FURTHER INTEGRITY FAILURE. The 6mm x 150mm gap gauge entered the furnace through the left-hand vertical joint at approximately 900mm height.



Time		Observations
hrs	mins	
		All observations refer to exposed face unless otherwise stated.
2	52	<i>Unexposed face</i> FURTHER INTEGRITY FAILURE. The 25mm gap gauge entered the furnace through the left-hand vertical joint at approximately 900mm height. TEST TERMINATED at the request of the customer.



Furnace Temperature Graph

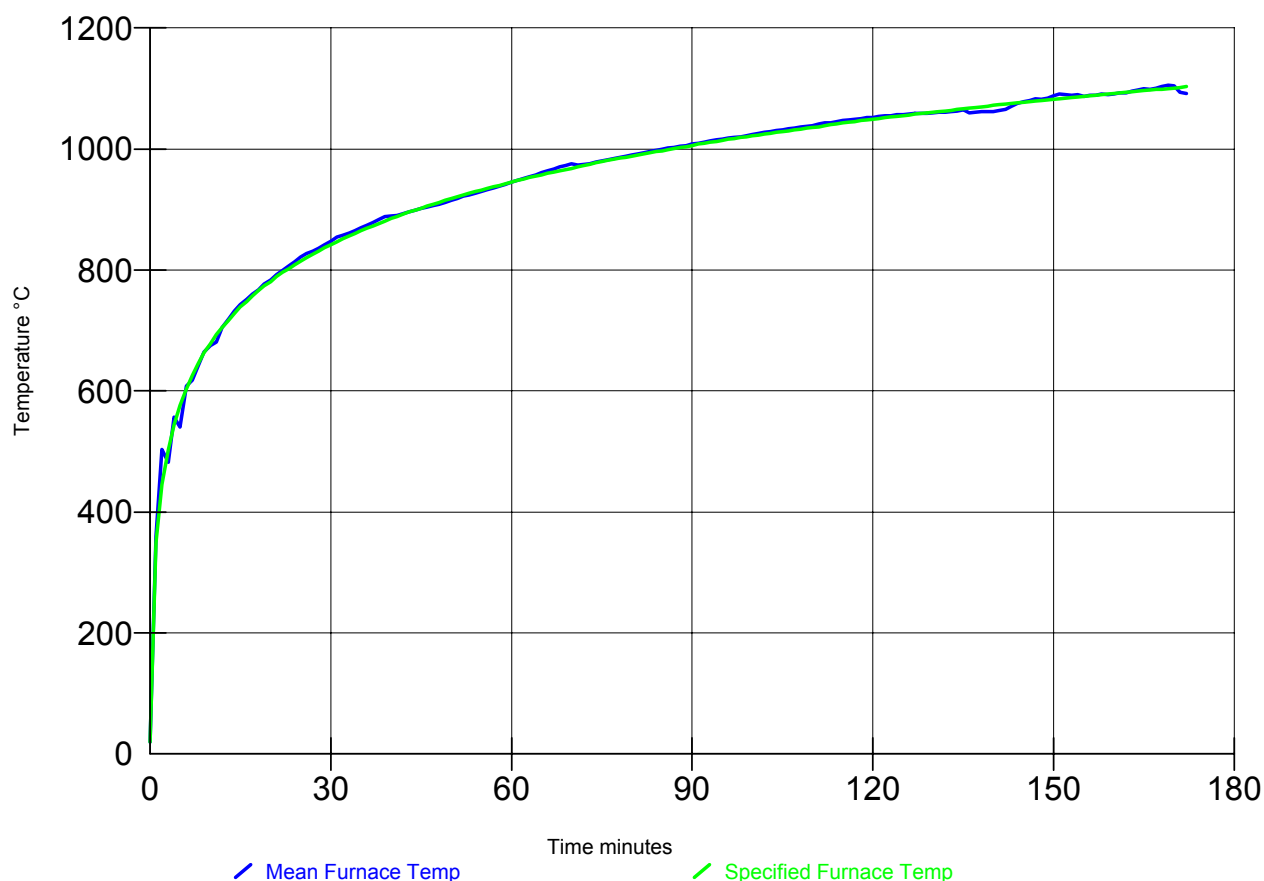


Figure 2. Furnace temperature graph.



Furnace Pressure Graph

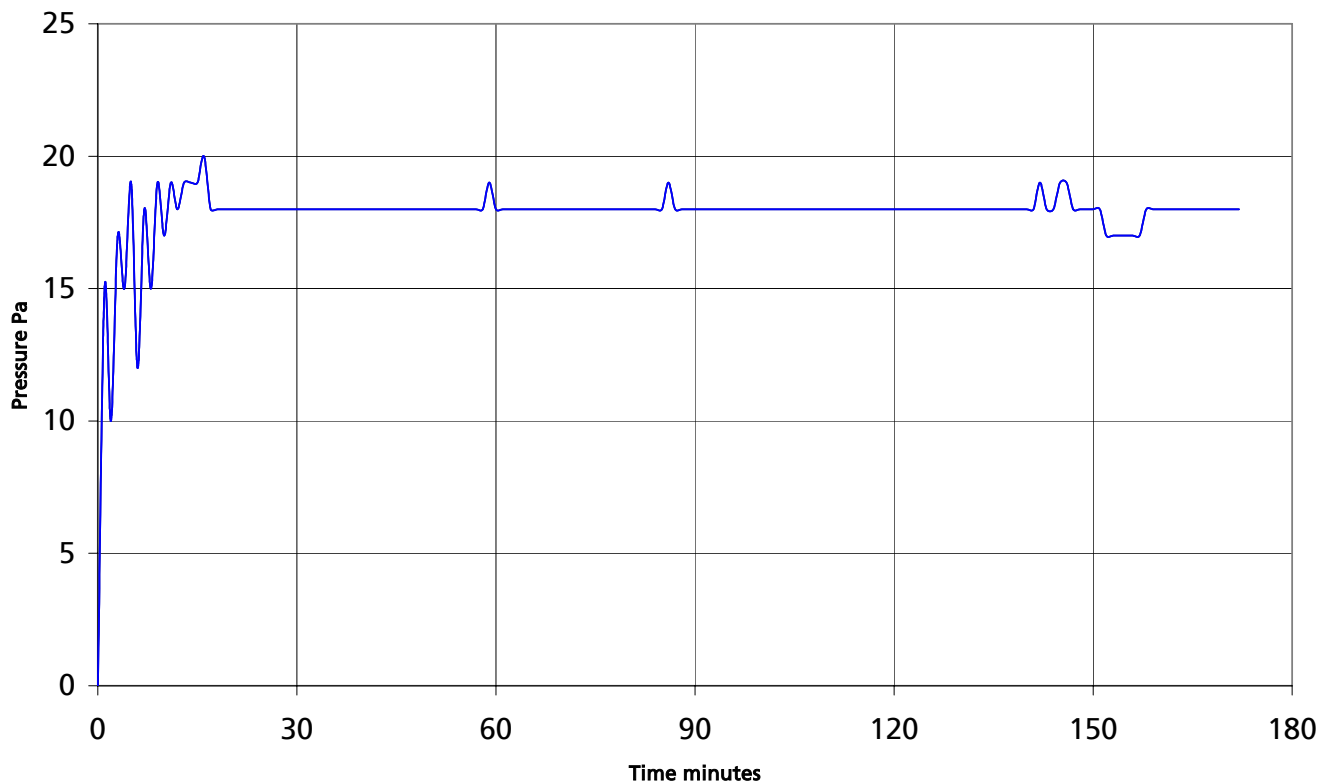


Figure 3. Furnace pressure graph.

The pressure was below the allowable tolerance at 6 minutes.



Unexposed Face Temperature Graph

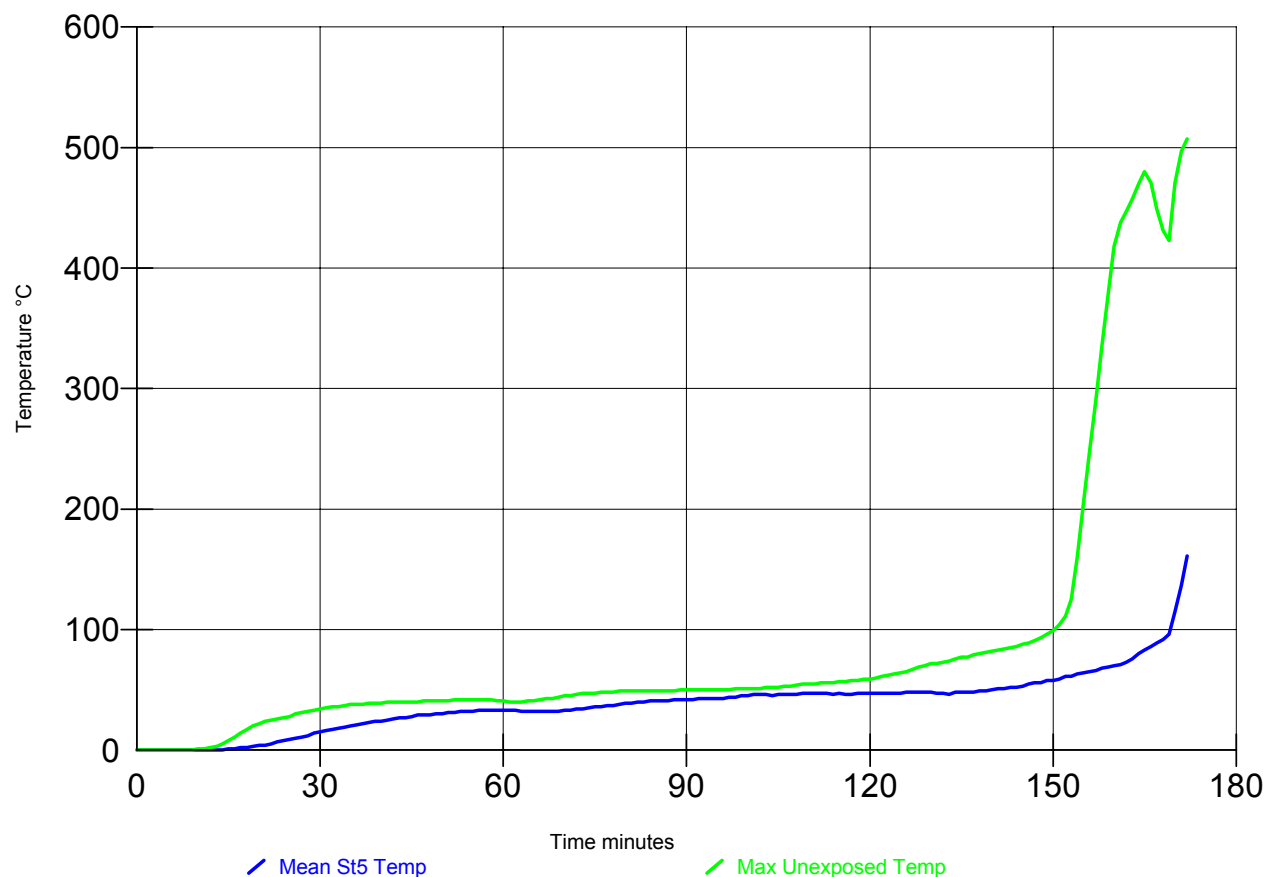


Figure 4. Unexposed face temperature graph.



Unexposed Face Thermocouple Layout

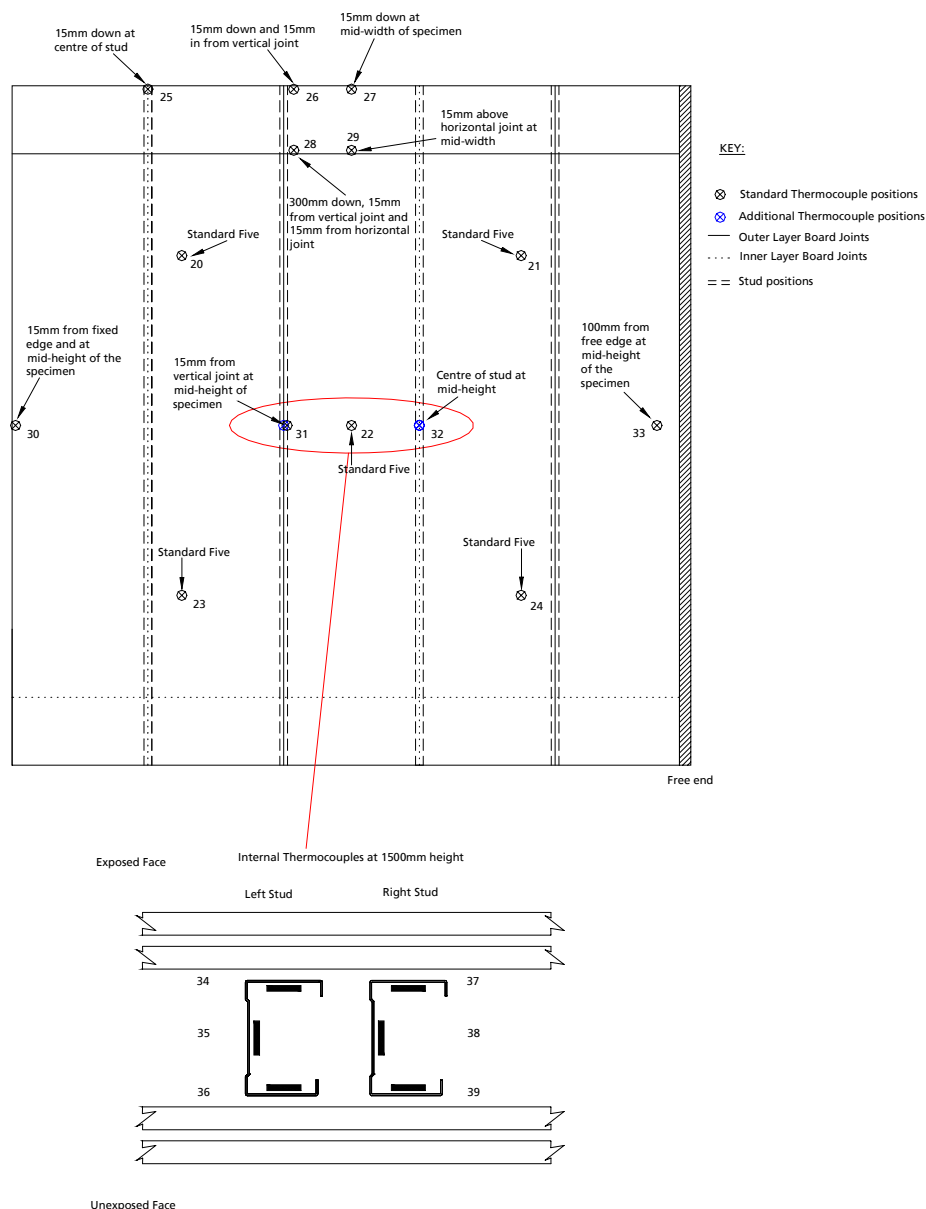


Figure 5. Unexposed face thermocouple layout.



Unexposed Face Thermocouple Data

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

Customer: **British Gypsum Limited**

Time (mins)	Temperature Rise (°C)				
	Thermocouple No. 20	Thermocouple No. 21	Thermocouple No. 22	Thermocouple No. 23	Thermocouple No. 24
34	17	26	30	14	11
35	18	27	31	15	12
36	18	28	32	16	13
37	19	28	34	17	14
38	20	29	34	18	14
39	21	29	36	19	15
40	21	30	37	20	16
41	22	31	38	20	17
42	23	31	38	21	18
43	24	31	39	22	19
44	25	32	39	23	20
45	25	32	40	24	21
46	26	33	40	25	22
47	27	33	41	25	22
48	27	33	41	25	22
49	27	34	41	27	24
50	28	34	41	27	24
51	28	34	41	28	25
52	29	34	42	28	26
53	29	34	42	29	26
54	30	34	42	29	27
55	30	34	42	30	27
56	30	35	42	30	28
57	31	35	42	31	28
58	31	35	42	31	28
59	31	34	41	31	28
60	31	34	41	31	29
61	31	34	40	31	29
62	31	34	40	32	29
63	31	34	39	31	29
64	31	33	38	31	29
65	31	33	38	32	29
66	30	33	37	32	29
67	30	33	37	32	29
68	30	34	37	33	28
69	30	34	37	33	30
70	30	35	37	34	29



Time (mins)	Temperature Rise (°C)				
	Thermocouple No. 20	Thermocouple No. 21	Thermocouple No. 22	Thermocouple No. 23	Thermocouple No. 24
71	30	35	37	35	31
72	31	36	37	36	32
73	31	37	37	37	32
74	31	38	38	38	33
75	32	38	38	39	34
76	32	39	38	39	34
77	33	39	39	40	35
78	34	40	39	41	32
79	34	41	40	42	37
80	35	41	40	43	37
81	36	42	41	43	36
82	37	43	41	44	38
83	37	43	41	44	38
84	38	43	41	45	39
85	38	43	41	45	40
86	39	44	41	45	38
87	39	44	42	46	37
88	40	44	42	46	40
89	40	45	42	47	36
90	40	45	43	47	39
91	40	45	43	47	36
92	41	46	43	48	37
93	41	46	44	48	36
94	41	46	44	48	39
95	42	46	44	48	39
96	42	47	44	49	36
97	42	47	45	49	41
98	43	47	45	49	40
99	43	48	45	49	42
100	43	48	45	49	41
101	44	48	46	49	44
102	44	48	46	49	43
103	44	48	46	49	43
104	44	48	46	49	42
105	45	48	47	49	44
106	45	48	47	49	45
107	45	48	47	49	45

Time (mins)	Temperature Rise (°C)				
	Thermocouple No. 20	Thermocouple No. 21	Thermocouple No. 22	Thermocouple No. 23	Thermocouple No. 24
108	45	48	47	49	44
109	46	48	47	49	45
110	46	48	47	49	45
111	46	48	47	50	45
112	46	48	48	50	44
113	46	48	48	50	45
114	46	48	48	50	42
115	46	48	48	50	45
116	46	48	48	50	41
117	47	48	48	50	37
118	47	48	48	50	44
119	47	48	48	50	44
120	47	48	48	50	44
121	47	48	48	50	45
122	47	48	48	50	45
123	47	48	48	50	43
124	47	48	48	51	44
125	47	48	48	51	44
126	48	48	48	51	45
127	48	49	48	51	45
128	47	49	48	51	45
129	47	49	48	51	45
130	48	50	48	52	44
131	47	50	48	51	42
132	48	50	48	51	40
133	48	50	49	52	34
134	48	51	49	52	40
135	48	51	49	52	40
136	48	51	49	52	41
137	49	52	50	53	39
138	50	53	51	54	40
139	50	53	51	53	39
140	51	55	52	54	41
141	53	56	52	54	42
142	55	57	52	54	41
143	56	57	53	54	44
144	56	57	53	55	42

Time (mins)	Temperature Rise (°C)				
	Thermocouple No. 20	Thermocouple No. 21	Thermocouple No. 22	Thermocouple No. 23	Thermocouple No. 24
145	57	58	56	56	39
146	58	59	58	58	42
147	59	59	60	60	42
148	59	59	62	61	43
149	60	60	63	62	49
150	60	60	65	63	46
151	61	61	66	64	47
152	62	61	67	65	50
153	62	62	67	66	52
154	63	63	67	68	54
155	64	64	67	69	60
156	62	64	68	70	65
157	63	65	68	72	66
158	63	67	69	74	67
159	63	69	69	76	68
160	64	71	70	78	69
161	65	73	72	79	70
162	67	76	74	80	72
163	69	78	79	82	76
164	73	81	84	84	79
165	77	83	89	86	81
166	80	85	93	89	83
167	83	87	99	92	86
168	85	88	107	94	88
169	87	90	119	97	91
170	89	93	198	100	95
171	92	96	296	105	99
172	94	101	390	114	109

See figure 5 for the locations of the thermocouples.



Additional Unexposed Face Temperature Data

Time (mins)	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	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0
5	0	0	0	0	0
6	0	0	0	0	0
7	0	0	0	0	0
8	0	0	0	0	0
9	0	0	0	0	0
10	1	0	0	0	0
11	1	1	1	0	0
12	2	1	1	1	1
13	3	2	2	1	1
14	5	3	3	1	2
15	8	4	5	2	3
16	11	5	7	3	5
17	14	7	10	4	6
18	17	9	13	5	8
19	20	11	15	6	10
20	22	13	18	7	12
21	24	15	21	9	14
22	25	17	23	10	15
23	26	19	25	12	17
24	27	20	27	13	19
25	28	22	28	15	20
26	29	23	30	16	22
27	30	25	31	17	23
28	31	26	32	19	24
29	32	27	33	21	25
30	33	28	34	22	26
31	34	30	35	23	27
32	35	31	36	25	28
33	36	32	36	26	29

Customer: **British Gypsum Limited**



Time (mins)	Temperature Rise (°C)				
	Thermocouple No. 25	Thermocouple No. 26	Thermocouple No. 27	Thermocouple No. 28	Thermocouple No. 29
34	37	33	37	27	29
35	38	33	38	29	30
36	38	34	38	29	31
37	38	35	38	30	32
38	38	36	39	31	32
39	38	36	39	32	33
40	38	37	39	32	33
41	38	37	40	33	34
42	38	38	40	33	35
43	38	38	40	34	35
44	38	38	40	34	35
45	38	39	40	34	36
46	38	39	40	35	36
47	38	40	41	35	36
48	38	40	41	36	36
49	39	39	41	35	37
50	38	40	40	35	37
51	38	40	40	36	37
52	38	40	40	36	37
53	38	40	40	36	38
54	38	40	40	36	37
55	37	40	40	36	37
56	37	40	40	36	37
57	37	40	40	36	38
58	37	40	40	36	37
59	37	39	39	36	37
60	37	40	39	36	37
61	36	39	39	36	36
62	36	39	39	36	36
63	36	38	38	35	36
64	36	38	38	35	36
65	36	37	37	35	35
66	36	36	37	35	35
67	35	36	37	34	35
68	35	36	36	34	35
69	35	36	36	34	35
70	35	35	36	34	35

Time (mins)	Temperature Rise (°C)				
	Thermocouple No. 25	Thermocouple No. 26	Thermocouple No. 27	Thermocouple No. 28	Thermocouple No. 29
71	35	35	36	34	35
72	36	36	36	35	35
73	36	36	36	35	35
74	36	36	37	35	35
75	37	36	37	36	35
76	37	37	37	36	36
77	38	37	37	37	36
78	38	38	38	37	36
79	39	38	38	37	37
80	40	39	39	38	37
81	40	40	39	38	37
82	41	40	39	39	38
83	41	41	40	39	38
84	42	41	41	40	38
85	43	42	41	40	39
86	43	42	42	40	39
87	44	43	42	40	39
88	44	44	43	40	40
89	45	44	43	41	40
90	46	45	44	41	40
91	46	45	44	41	40
92	46	45	45	41	40
93	47	46	46	41	40
94	47	46	46	41	40
95	47	47	47	41	40
96	47	47	47	42	41
97	47	47	48	42	41
98	47	48	49	42	41
99	47	48	49	42	41
100	47	48	49	42	41
101	47	48	49	42	42
102	47	49	50	42	42
103	48	49	50	43	42
104	48	49	50	43	42
105	48	49	51	43	43
106	48	49	50	43	43
107	48	50	51	44	43

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Time (mins)	Temperature Rise (°C)				
	Thermocouple No. 25	Thermocouple No. 26	Thermocouple No. 27	Thermocouple No. 28	Thermocouple No. 29
108	48	50	51	44	43
109	49	50	51	44	43
110	49	50	51	45	43
111	49	51	52	45	44
112	49	51	52	46	44
113	49	51	52	46	44
114	49	51	52	47	44
115	49	52	53	47	44
116	49	52	53	47	44
117	50	52	53	48	44
118	50	52	53	48	44
119	50	53	53	49	44
120	50	52	54	49	45
121	50	53	54	49	45
122	50	53	54	50	46
123	50	53	55	50	46
124	51	53	55	51	46
125	51	53	56	52	47
126	51	53	57	53	47
127	51	54	57	53	48
128	51	54	57	54	48
129	52	54	57	55	49
130	52	55	58	56	49
131	52	55	58	56	49
132	52	55	58	57	50
133	53	55	58	58	50
134	53	56	58	58	51
135	53	56	59	59	51
136	53	56	59	60	52
137	54	57	59	61	54
138	55	57	60	62	55
139	55	57	60	62	56
140	55	58	60	64	58
141	56	58	61	64	59
142	56	59	62	65	59
143	57	59	62	65	60
144	57	61	63	66	61

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Time (mins)	Temperature Rise (°C)				
	Thermocouple No. 25	Thermocouple No. 26	Thermocouple No. 27	Thermocouple No. 28	Thermocouple No. 29
145	59	62	63	67	62
146	60	63	64	68	63
147	61	64	65	69	64
148	62	64	66	70	65
149	62	65	66	71	65
150	63	65	66	73	65
151	64	66	67	74	66
152	65	66	67	75	67
153	66	67	67	76	67
154	67	67	67	77	68
155	68	68	68	78	69
156	69	68	68	80	70
157	71	68	68	81	71
158	73	69	69	82	72
159	74	70	69	83	73
160	76	71	70	84	75
161	78	72	71	86	76
162	79	74	71	88	77
163	81	78	73	90	78
164	83	82	75	92	79
165	84	85	80	94	80
166	86	88	84	98	82
167	87	92	87	101	83
168	89	96	89	106	85
169	90	99	91	110	87
170	92	102	93	116	89
171	94	105	97	127	92
172	96	110	102	144	96

See figure 5 for the locations of the thermocouples.



Additional Unexposed Face Temperature Data

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



Time (mins)	Temperature Rise (°C)			
	Thermocouple No. 30	Thermocouple No. 31	Thermocouple No. 32	Thermocouple No. 33
34	19	23	31	17
35	20	25	32	18
36	21	26	32	19
37	22	27	33	21
38	23	28	34	22
39	24	29	34	23
40	25	30	34	24
41	25	31	35	25
42	26	32	35	26
43	27	32	35	27
44	28	33	35	27
45	28	33	36	28
46	29	34	36	29
47	30	35	36	30
48	29	35	36	30
49	30	36	36	31
50	31	35	36	31
51	31	35	37	32
52	32	36	37	32
53	32	36	37	33
54	32	36	38	33
55	32	36	38	34
56	33	36	38	34
57	33	36	39	34
58	33	36	39	35
59	32	35	39	34
60	33	35	40	35
61	33	35	40	35
62	33	35	40	35
63	33	35	40	35
64	33	35	41	35
65	33	35	41	34
66	32	35	42	34
67	32	36	43	34
68	32	36	43	34
69	32	37	44	34
70	31	38	45	34



Time (mins)	Temperature Rise (°C)			
	Thermocouple No. 30	Thermocouple No. 31	Thermocouple No. 32	Thermocouple No. 33
71	31	39	45	34
72	31	40	46	35
73	31	41	47	35
74	31	42	47	35
75	31	43	47	36
76	31	43	48	36
77	31	44	48	37
78	31	44	48	38
79	31	45	49	38
80	32	45	49	39
81	32	46	49	39
82	32	46	49	40
83	33	46	49	40
84	33	47	49	41
85	34	47	49	41
86	34	48	49	42
87	35	48	49	42
88	35	48	49	42
89	35	49	50	43
90	36	49	50	43
91	36	49	50	43
92	37	49	50	43
93	37	49	50	44
94	38	49	50	44
95	38	49	50	44
96	39	49	50	44
97	39	50	50	45
98	40	50	51	45
99	40	50	51	45
100	41	50	51	46
101	41	50	51	46
102	42	49	51	46
103	42	49	52	46
104	42	49	52	46
105	42	50	52	47
106	42	50	53	46
107	43	50	53	47



Time (mins)	Temperature Rise (°C)			
	Thermocouple No. 30	Thermocouple No. 31	Thermocouple No. 32	Thermocouple No. 33
108	43	50	54	47
109	43	50	55	47
110	43	50	55	47
111	44	50	55	47
112	44	50	56	48
113	44	50	56	48
114	44	50	56	48
115	44	51	57	48
116	44	51	57	47
117	45	51	58	48
118	45	51	58	48
119	45	52	59	48
120	45	52	59	47
121	45	53	60	48
122	45	54	61	48
123	45	54	62	48
124	45	55	63	48
125	45	55	64	48
126	45	56	65	48
127	46	56	67	48
128	45	56	69	48
129	45	57	70	48
130	45	57	72	48
131	45	57	72	48
132	45	57	73	48
133	45	57	74	48
134	45	57	76	48
135	45	58	77	48
136	45	58	77	48
137	45	59	79	49
138	45	60	80	48
139	45	60	81	48
140	45	61	82	49
141	45	62	83	49
142	45	62	84	49
143	45	62	85	50
144	46	64	86	50

Time (mins)	Temperature Rise (°C)			
	Thermocouple No. 30	Thermocouple No. 31	Thermocouple No. 32	Thermocouple No. 33
145	46	66	88	51
146	46	68	89	52
147	46	69	91	53
148	46	71	93	55
149	45	73	96	57
150	46	76	99	58
151	46	78	104	61
152	46	81	111	62
153	46	83	125	64
154	46	85	160	65
155	46	88	206	65
156	46	91	248	66
157	46	93	291	66
158	47	97	335	67
159	47	100	379	68
160	47	105	418	69
161	48	111	438	70
162	48	122	447	72
163	48	143	457	74
164	49	168	470	80
165	49	203	480	86
166	49	240	471	90
167	49	285	449	93
168	49	354	431	95
169	49	421	423	97
170	50	471	422	100
171	50	497	420	102
172	51	507	418	105

See figure 5 for the locations of the thermocouples.

Figures shown in red indicate the time and position of insulation failure.



Internal Thermocouple Data at 1500mm height

Time (mins)	Actual Temperature (°C)					
	Left-hand stud			Right-hand 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	24	23	22	24	24	23
1	24	23	22	24	24	23
2	24	24	23	25	24	23
3	27	24	22	25	24	23
4	41	28	23	28	25	23
5	62	38	25	33	28	24
6	75	48	31	41	34	26
7	82	58	37	51	43	30
8	86	64	41	61	54	37
9	88	68	44	70	62	48
10	90	72	49	77	70	60
11	91	75	54	82	75	69
12	93	79	60	86	80	74
13	94	82	65	88	83	78
14	95	86	69	90	85	81
15	95	87	72	91	86	83
16	95	89	74	92	87	84
17	94	88	75	92	88	84
18	94	87	76	93	88	85
19	94	87	76	93	89	85
20	93	89	76	94	90	86
21	92	89	76	94	90	86
22	91	89	75	95	91	86
23	91	89	74	96	93	88
24	93	90	75	96	94	89
25	93	91	76	96	95	90
26	93	90	77	96	96	91
27	94	91	76	97	97	91
28	95	92	75	98	98	92
29	96	92	75	99	99	92
30	96	93	76	100	99	92
31	96	93	78	103	100	92



Time (mins)	Actual Temperature (°C)					
	Left-hand stud			Right-hand 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
32	96	94	79	104	101	92
33	97	94	81	105	102	93
34	96	95	83	108	104	93
35	97	96	84	110	106	94
36	97	96	85	112	105	94
37	99	97	86	115	108	93
38	100	97	86	117	109	93
39	101	97	87	119	110	93
40	103	97	87	121	112	93
41	104	98	88	124	113	94
42	105	98	88	127	115	95
43	104	98	88	132	117	95
44	105	98	89	141	120	96
45	106	99	89	154	125	97
46	106	99	89	172	131	100
47	106	99	90	193	139	102
48	106	100	91	212	148	104
49	107	101	92	229	157	108
50	107	101	92	245	168	112
51	107	103	92	258	178	116
52	109	104	92	272	189	122
53	111	106	92	284	200	129
54	119	109	91	297	211	138
55	137	113	92	311	223	146
56	162	122	94	327	236	153
57	189	133	97	344	251	160
58	214	146	101	362	267	167
59	237	162	105	379	282	173
60	259	177	110	395	296	181
61	281	194	113	411	311	188
62	303	210	118	425	325	198
63	324	227	126	439	339	207
64	341	243	132	454	354	216
65	358	260	151	467	365	226
66	373	276	153	475	381	240



Time (mins)	Actual Temperature (°C)					
	Left-hand stud			Right-hand 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
67	388	291	161	485	392	252
68	404	306	177	494	404	265
69	416	320	187	502	414	277
70	427	334	199	510	424	287
71	440	347	212	518	433	298
72	445	360	224	526	442	307
73	451	369	236	534	450	315
74	458	378	239	541	458	322
75	466	386	241	548	465	328
76	475	394	240	555	471	334
77	483	401	251	562	478	340
78	491	407	267	569	483	346
79	498	414	275	575	488	351
80	504	420	281	581	493	355
81	511	426	281	586	496	359
82	517	433	282	591	500	363
83	522	438	294	595	504	367
84	527	444	297	599	507	371
85	532	449	304	603	511	375
86	537	454	310	607	514	379
87	541	459	317	611	518	384
88	546	463	322	614	521	388
89	550	468	320	617	525	393
90	553	471	329	621	528	398
91	557	476	335	624	532	403
92	561	480	341	626	535	409
93	564	484	346	629	538	414
94	568	489	348	632	542	420
95	572	493	356	634	544	427
96	575	497	358	637	547	435
97	580	500	363	639	550	443
98	584	504	369	642	554	449
99	588	509	370	645	556	455
100	591	513	376	647	559	461
101	595	516	381	649	562	465



Time (mins)	Actual Temperature (°C)					
	Left-hand stud			Right-hand 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
102	550	520	387	651	564	470
103	555	524	392	653	567	474
104	564	528	398	656	570	478
105	581	531	403	659	573	482
106	585	535	411	662	576	486
107	598	538	409	664	579	491
108	605	541	427	667	582	496
109	609	543	435	670	585	501
110	613	544	428	672	588	506
111	610	546	433	674	591	511
112	618	549	442	677	595	517
113	606	553	445	679	599	523
114	623	556	459	681	604	531
115	621	560	469	683	609	540
116	609	563	477	684	614	549
117	616	566	487	686	619	560
118	636	568	492	686	624	571
119	638	571	495	688	630	581
120	642	571	497	690	636	590
121	653	570	499	693	642	598
122	647	567	499	696	648	606
123	653	563	499	699	-	611
124	662	561	498	697	-	612
125	-	561	503	696	-	616
126	-	563	508	699	-	621
127	-	568	517	702	-	626
128	-	577	527	705	-	631
129	-	587	539	708	-	636
130	-	690	553	709	-	642
131	-	714	566	711	-	647
132	-	-	580	713	-	652
133	-	-	595	715	-	657
134	-	-	606	716	-	659
135	-	-	618	715	-	660
136	-	-	624	716	-	663



Time (mins)	Actual Temperature (°C)					
	Left-hand stud			Right-hand 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
137	-	-	639	720	-	668
138	-	-	656	723	-	675
139	-	-	680	728	-	684
140	-	-	699	734	-	696
141	-	-	714	737	-	713
142	-	-	728	742	-	741
143	-	-	734	755	-	762
144	-	-	747	759	-	785
145	-	-	774	786	-	821
146	-	-	917	913	-	1005
147	-	-	970	-	-	-
148	-	-	999	-	-	-
149	-	-	-	-	-	-
150	-	-	-	-	-	-

See figure 5 for the locations of the thermocouples.

Thermocouple No. 34 did not work after 124 minutes.
 Thermocouple No. 35 did not work after 131 minutes.
 Thermocouple No. 36 did not work after 148 minutes.
 Thermocouple No. 37 did not work after 146 minutes.
 Thermocouple No. 38 did not work after 122 minutes.
 Thermocouple No. 39 did not work after 146 minutes.



Specimen Lateral Deflection

Time (mins)	Deflection at centre of the specimen (mm)	Deflection 50mm from free end of the specimen (mm)
0	0	0
1	1.9	0.2
2	1.8	0.2
3	2.2	0.3
4	3	0.6
5	3.9	0.8
6	5	1.2
7	5.8	1.4
8	6.4	1.4
9	6.8	1.4
10	7	1.3
11	7	1.3
12	6.8	1.2
13	6.7	1.1
14	6.6	1
15	6.4	0.9
16	6.3	0.8
17	6.1	0.7
18	6	0.6
19	6	0.5
20	5.8	0.5
21	6	0.4
22	6.2	0.4
23	6.4	0.4
24	6.2	0.4
25	6.3	0.3
26	6.5	0.3
27	6.7	0.3
28	6.9	0.4
29	7.1	0.3
30	7.2	0.4
31	7.5	0.3
32	7.7	0.4
33	7.8	0.4
34	8	0.4
35	8	0.4



Time (mins)	Deflection at centre of the specimen (mm)	Deflection 50mm from free end of the specimen (mm)
36	8.2	0.4
37	8.2	0.4
38	8.3	0.4
39	8.3	0.4
40	8.4	0.3
41	8.6	0.3
42	8.6	0.3
43	8.8	0.3
44	9.1	0.3
45	9.5	0.3
46	10.2	0.3
47	11.1	0.4
48	12.1	0.4
49	13.3	0.5
50	14.5	0.5
51	15.7	0.7
52	17	0.9
53	18.5	1.2
54	20.1	1.7
55	21.9	2.5
56	23.6	3.6
57	25.2	5.2
58	27	7
59	28.6	9.2
60	29.6	11.4
61	30.4	13.2
62	30.6	14.7
63	30.7	16.2
64	30.8	18
65	30.9	19.4
66	30.9	20
67	30.9	20.1
68	31.1	20
69	31.2	19.8
70	31.4	19.6
71	31.6	19.4
72	31.9	19.3
73	32.7	19.1



Time (mins)	Deflection at centre of the specimen (mm)	Deflection 50mm from free end of the specimen (mm)
74	33.3	19
75	34.1	18.9
76	35	18.9
77	35.6	18.9
78	36.4	18.9
79	37.1	18.9
80	37.6	18.9
81	38.2	19
82	38.7	19
83	39.3	19
84	39.8	19
85	40.2	19.2
86	40.7	19.2
87	41.2	19.3
88	41.6	19.4
89	42	19.6
90	42.5	19.7
91	42.8	19.8
92	43.2	19.9
93	43.6	20.1
94	44	20.2
95	44.3	20.4
96	44.7	20.5
97	45.1	20.7
98	45.5	20.8
99	45.8	20.9
100	46.2	21.1
101	46.4	21.3
102	46.9	21.4
103	47.2	21.6
104	47.6	21.8
105	47.9	22.1
106	48.3	22.4
107	48.6	22.7
108	49.1	23.1
109	49.4	23.4
110	49.7	23.8
111	50	24.2



Time (mins)	Deflection at centre of the specimen (mm)	Deflection 50mm from free end of the specimen (mm)
112	50.2	24.6
113	50.5	25.1
114	50.9	25.5
115	51.1	25.9
116	51.3	26.4
117	51.7	27
118	52	27.7
119	52.3	28.3
120	52.6	29
121	52.9	29.7
122	53.1	30.3
123	53.4	31
124	53.7	31.8
125	54	32.8
126	54.4	33.7
127	54.7	34.6
128	55.1	35.5
129	55.5	36.3
130	55.8	37.2
131	56.1	38.1
132	56.5	38.9
133	56.9	39.7
134	57.2	40.2
135	57.4	40.6
136	57.7	41.3
137	58.1	42
138	58.6	42.8
139	59.1	43.5
140	59.6	44.2
141	60.3	45.1
142	60.2	45.7
143	60.7	46.5
144	61	47
145	61.1	47.4
146	60.8	47.4
147	61	47.5
148	61.1	47.1
149	62	49.4



Time (mins)	Deflection at centre of the specimen (mm)	Deflection 50mm from free end of the specimen (mm)
150	62.8	51.4
151	63.4	52.8
152	63.7	54
153	63.7	55.4
154	63.5	56.6
155	63.3	57.8

Both deflection measurements were taken at the mid-height of the specimen.
Negative values indicate that the specimen deflected out of the furnace.

The deflection transducers were removed after 155 minutes.

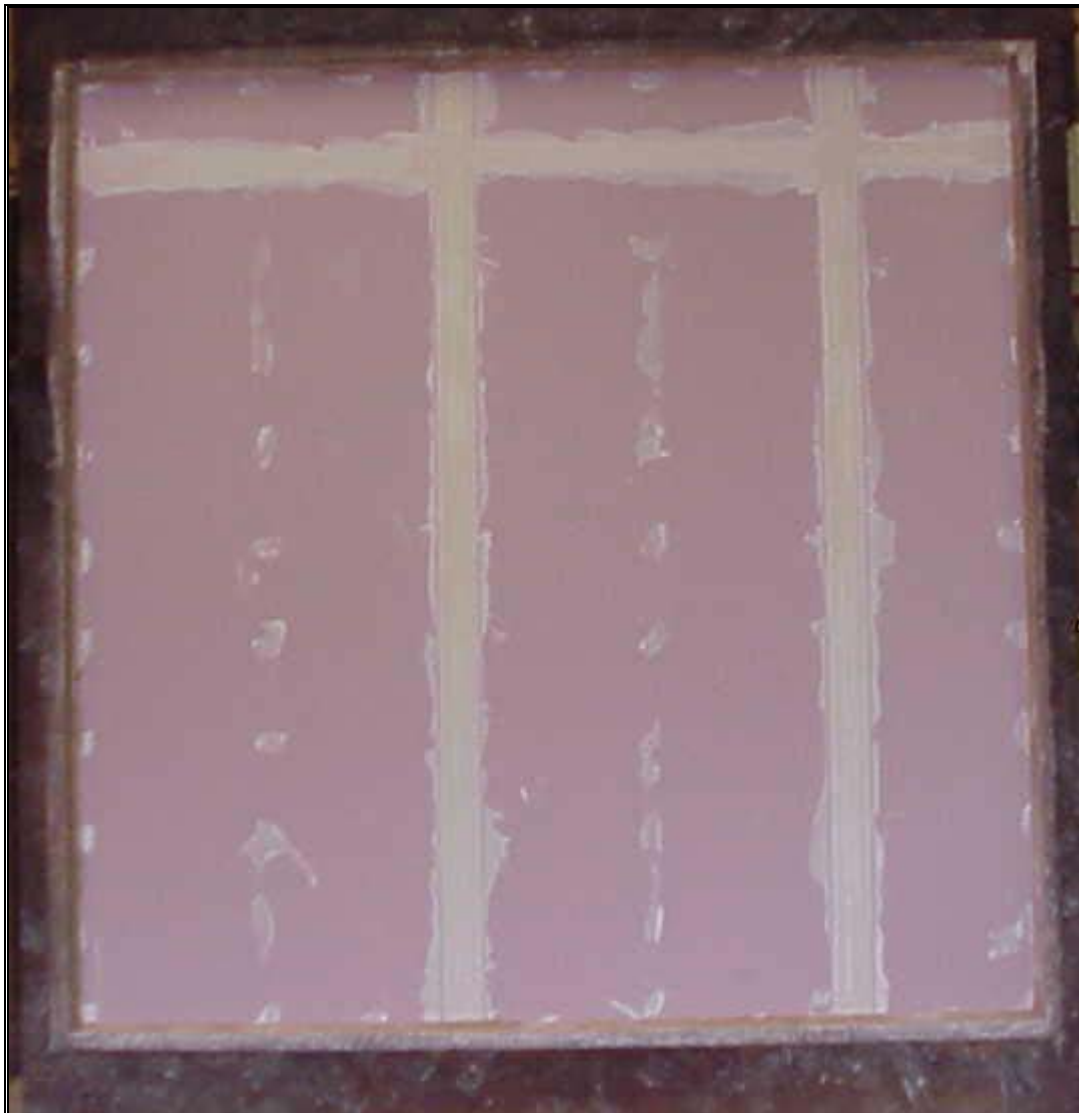


The Building Test Centre

Fire Acoustics Structures

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PHOTOGRAPHS



Photograph 1. Exposed face prior to test.

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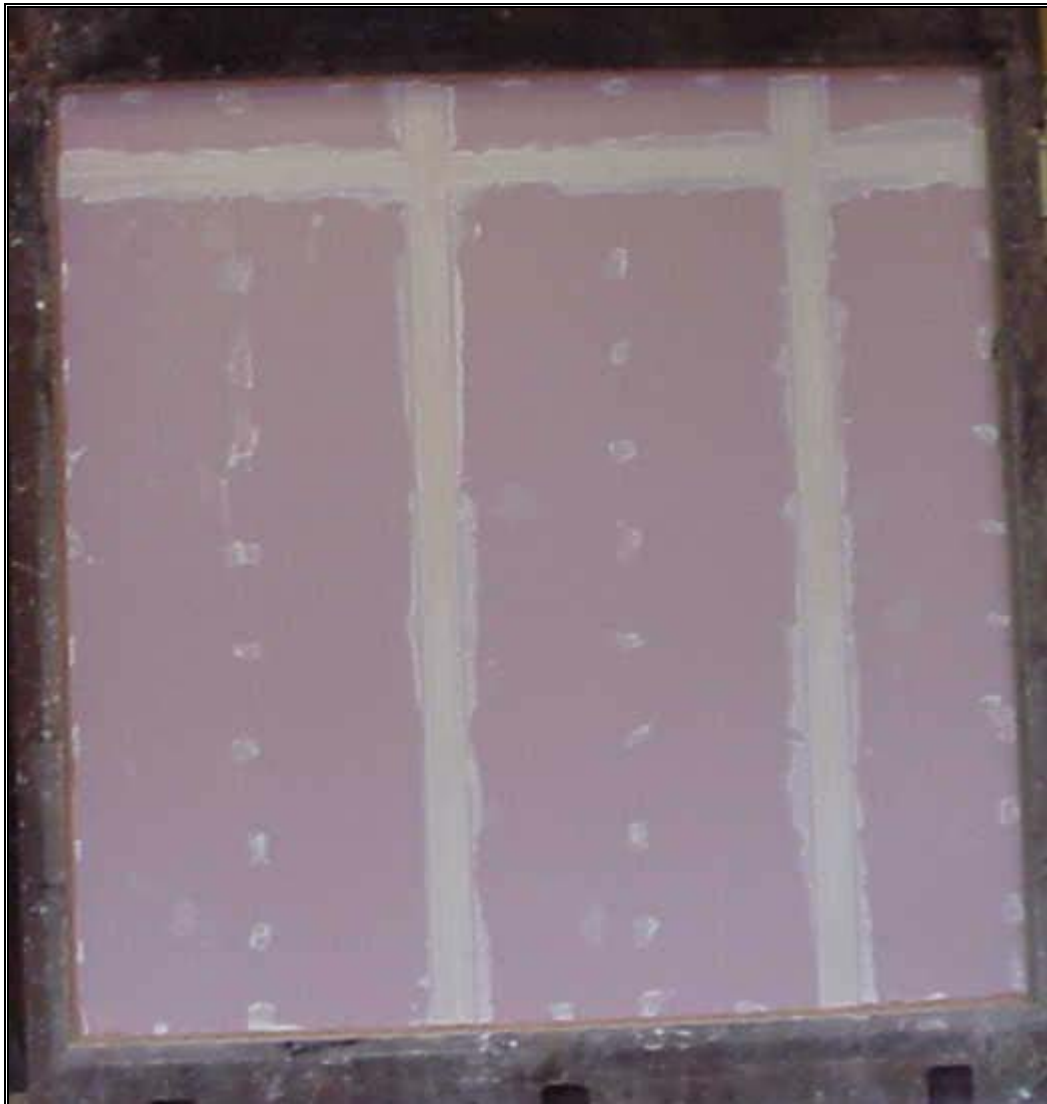
0296



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Photograph 2. Unexposed face prior to test.

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Photograph 3. Unexposed face at test termination.

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Photograph 4. Exposed face after 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 from 3000mm.
- (ii) Increase in the thickness of the wall (minimum thickness 130mm).
- (iii) Increase thickness of component materials (minimum Gypframe stud depth 70mm, minimum Gypframe 'C' stud gauge 0.5mm).
- (iv) Decrease in the linear dimensions of the boards but not thickness ($\leq 2700\text{mm}$ long $\times \leq 1200\text{mm}$ wide Gyproc FireLine).
- (v) Decrease stud spacing from 600mm.
- (vi) Decrease in fixing centres from 300mm.
- (vii) Increase in the number of horizontal joints.
- (viii) Horizontal and vertical joints, of the type tested.

Extension of Width

The width of an identical construction may be increased as the specimen was tested at nominally 3000mm wide with one vertical edge without restraint.

Extension of Height

The height of constructions tested at a minimum of 3000mm, maybe increased to 4000mm at the following fire resistance periods as the lateral deflection was below 100mm.

30 minutes	60 minutes	90 minutes	120 minutes	150 minutes
<100mm, $\therefore$ 4000mm	<100mm, $\therefore$ 4000mm	<100mm, $\therefore$ 4000mm	<100mm, $\therefore$ 4000mm	<100mm, $\therefore$ 4000mm