



The Building Test Centre

Fire Acoustics Structures

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Report Number BTC 12492F

A FIRE RESISTANCE TEST ON A BRITISH GYPSUM GYPWALL PARTITION CLAD WITH A SINGLE LAYER OF 12.5mm GYPROC SOUNDBLOC BOARD EACH SIDE OF GYPFRAME 70S50 STUDS AND 50mm ISOWOOL 1200 IN THE CAVITY, CONDUCTED IN ACCORDANCE WITH BS EN 1364-1: 1999.

Test Date: 18th March 2003

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

Customer: British Gypsum Limited

BTC 12492F: Page 1 of 32



0296



A FIRE RESISTANCE TEST ON A BRITISH GYPSUM GYPWALL PARTITION CLAD WITH A SINGLE LAYER OF 12.5mm GYPROC SOUNDBLOC BOARD EACH SIDE OF GYPFRAME 70S50 STUDS AND 50mm ISOWOOL 1200 IN THE CAVITY, CONDUCTED IN ACCORDANCE WITH BS EN 1364-1: 1999.

TABLE OF CONTENTS

FOREWORD	4
REPORT AUTHORISATION	4
TEST CONSTRUCTION	5
TEST MATERIALS	7
Gyproc SoundBloc board	7
Metal components	7
Insulation	7
Fasteners	8
Miscellaneous components	8
TEST PROCEDURE	9
TEST RESULTS	9
LIMITATIONS	10
TEST DATA	11
Observations	11
Furnace Temperature Graph	14
Furnace Pressure Graph	15
Unexposed Face Temperature Graph	16
Unexposed Face Thermocouple Layout	17
Unexposed Face Thermocouple Data	18
Additional Unexposed Face Temperature Data	20
Additional Unexposed Face Temperature Data	22
Internal Thermocouple Data at 1500mm height	24
Specimen Lateral Deflection	26
PHOTOGRAPHS	28



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FIELD OF DIRECT APPLICATION _____ **32**

Customer: **British Gypsum Limited**

BTC 12492F: Page 3 of 32



0296



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 on the 14th March 2003. British Gypsum Limited designed the partition system and selected the materials for the test specimen.

The test was carried out on the 18th March 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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BTC 12492F: Page 4 of 32



0296

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 positioned in the partition cavity.

The framework was lined both sides with a single layer of 12.5mm Gyproc SoundBloc board fixed to the framework using 25mm Gyproc drywall screws at 300mm centres around the board perimeter and within the field of the board.

All joints were staggered between layers.

Horizontal joints were located at 2700mm from the base of the specimen on both sides of the partition. Gypframe GFS1 Fixing Strap was used behind the horizontal joints.

All external 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.

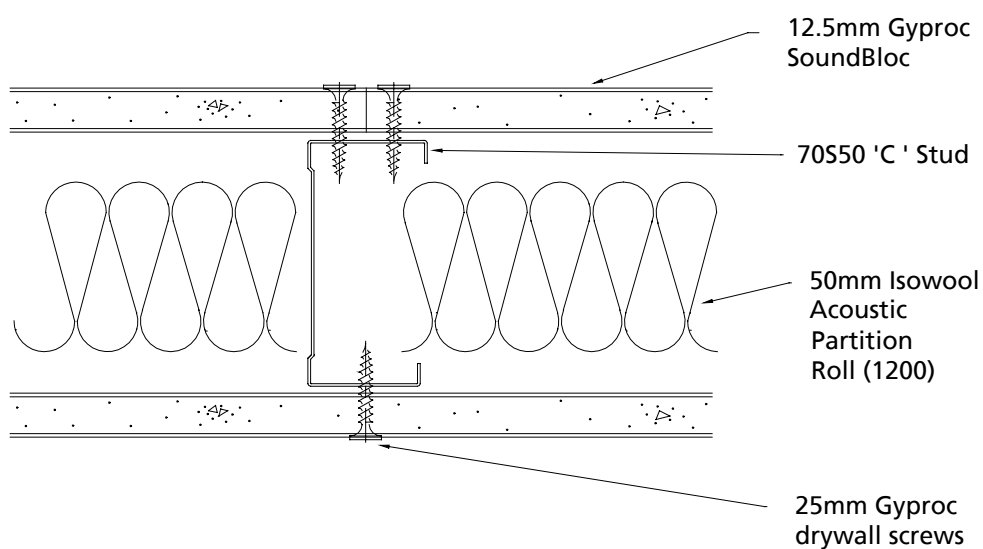


Figure 1. Cross-section of partition specimen.

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 SoundBloc board

Nominally, 2700mm (long) x 1200mm (wide) x 12.5mm (thick), Gyproc SoundBloc board manufactured and supplied by British Gypsum Limited, ex East Leake works.

Actual surface density:	10.44kg/m ² .
Actual thickness:	12.60mm.
Board identification numbers:	16 059 3 02:43
Actual moisture content:	0.70%.

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) manufactured and supplied by British Gypsum – Isover.

Measured density:	13.3kg/m ³
Measured surface density:	0.67kg/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) 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 1.

The ambient temperature at the commencement of the test was 19°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 15.

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	64 minutes (no failure test discontinued at the request of the customer)
	25mm Gap gauge	63 minutes
	6mm Gap gauge	62 minutes
	Cotton pad	60 minutes
Insulation:		51 minutes

The test was terminated at 64 minutes at the request of the customer.

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BTC 12492F: Page 9 of 32

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
Exposed face K Hall

Time		Observations
hrs	mins	
		All observations refer to exposed face unless otherwise stated.
	0	Test started.
	5	The jointing material and backing paper had started to char.
	10	All joints had opened to approximately 2-3mm.
	15	All joints had opened to approximately 3-5mm. The stud was visible through the left-hand joint.
	20	Left-hand vertical joint had opened to approximately 10mm. Right-hand vertical joint had opened to approximately 5-8mm. Horizontal joint had opened to approximately 8-10mm. Cracks had started to develop around the field screws on the lower centre board.
	25	No visible change to the specimen.
	29	<i>Unexposed face</i> A crack had developed in the field of the lower centre board at approximately 900mm height (the board had buckled out of the furnace at this position).
	30	All joints had opened to approximately 10mm. Cracks approximately 150mm long x 1-2mm wide had started to develop within the fields of the lower boards below the horizontal joint.
	35	Cracks approximately 5mm wide had started to develop on the lower right-hand board.

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Time		Observations
hrs	mins	
		All observations refer to exposed face unless otherwise stated.
	39	<i>Unexposed face</i> The fixing at approximately mid-height on the lower centre board had pulled though the board.
	40	All joints had opened to approximately 10-12mm. The boards had started to pull away from the fixings. <i>Unexposed face</i> Screw heads were visible through the jointing material on the left-hand vertical joint at mid-height.
	43	<i>Unexposed face</i> Screw heads were visible through the jointing material on the horizontal joint at mid-width of the specimen.
	44	<i>Unexposed face</i> Discolouration was visible on the horizontal joint approximately 400mm from the fixed end.
	45	The stud was visible through the left-hand joint at mid-height (left-hand vertical joint had opened to approximately 10-12mm). The cracks noted at 30 minutes had opened to approximately 5-6mm.
	48	<i>Unexposed face</i> Discolouration was visible in the field of the lower centre board at approximately 1800mm height.
	50	All joints had opened to approximately 20mm.
	51	<i>Unexposed face</i> INSULATION FAILURE. The roving thermocouple exceeded a temperature rise of 180°C on the lower left-hand board below the horizontal joint.



Time		Observations
hrs	mins	
		All observations refer to exposed face unless otherwise stated.
	55	A horizontal crack approximately 200mm long x 2-5mm wide had started to develop on the lower right-hand board. <i>Unexposed face</i> A gap was visible on the horizontal joint at mid-width of the specimen.
1	00	The crack noted at 55 minutes had opened to approximately 300mm long x 50mm wide. A section of the lower centre board fell into the furnace. <i>Unexposed face</i> INTEGRITY FAILURE. The cotton pad ignited when used on the horizontal joint at mid-width of the specimen.
1	02	<i>Unexposed face</i> FURTHER INTEGRITY FAILURE. The 6mm x 150mm gap gauge entered the furnace through the left-hand vertical joint at approximately 1200-1500mm height.
1	03	The lab was visible through a gap approximately 1200mm from the fixed end. <i>Unexposed face</i> FURTHER INTEGRITY FAILURE. The 25mm gap gauge would have entered the furnace through the left-hand vertical joint at approximately 2100mm height.
1	04	TEST TERMINATED at the request of the customer.



Furnace Temperature Graph

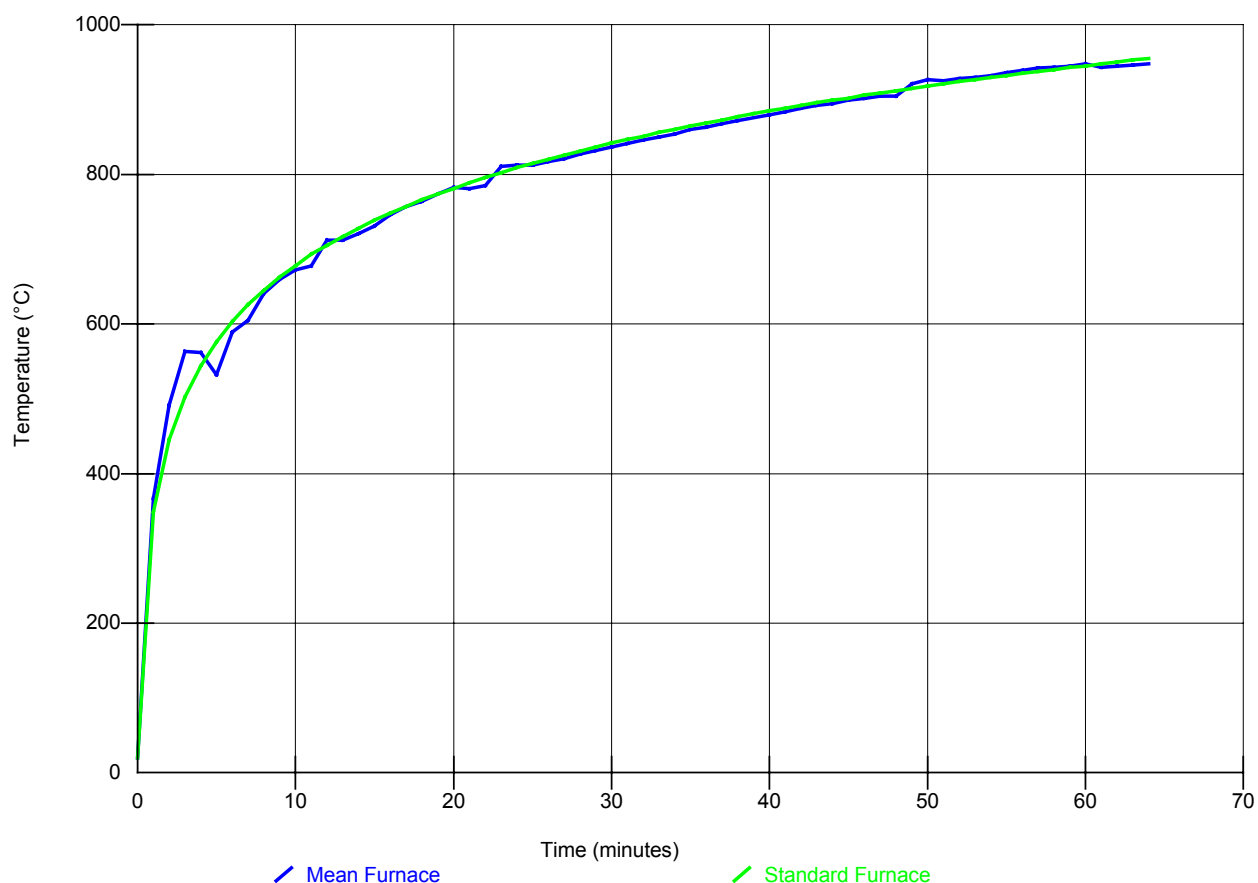


Figure 2. Furnace temperature graph.



Furnace Pressure Graph

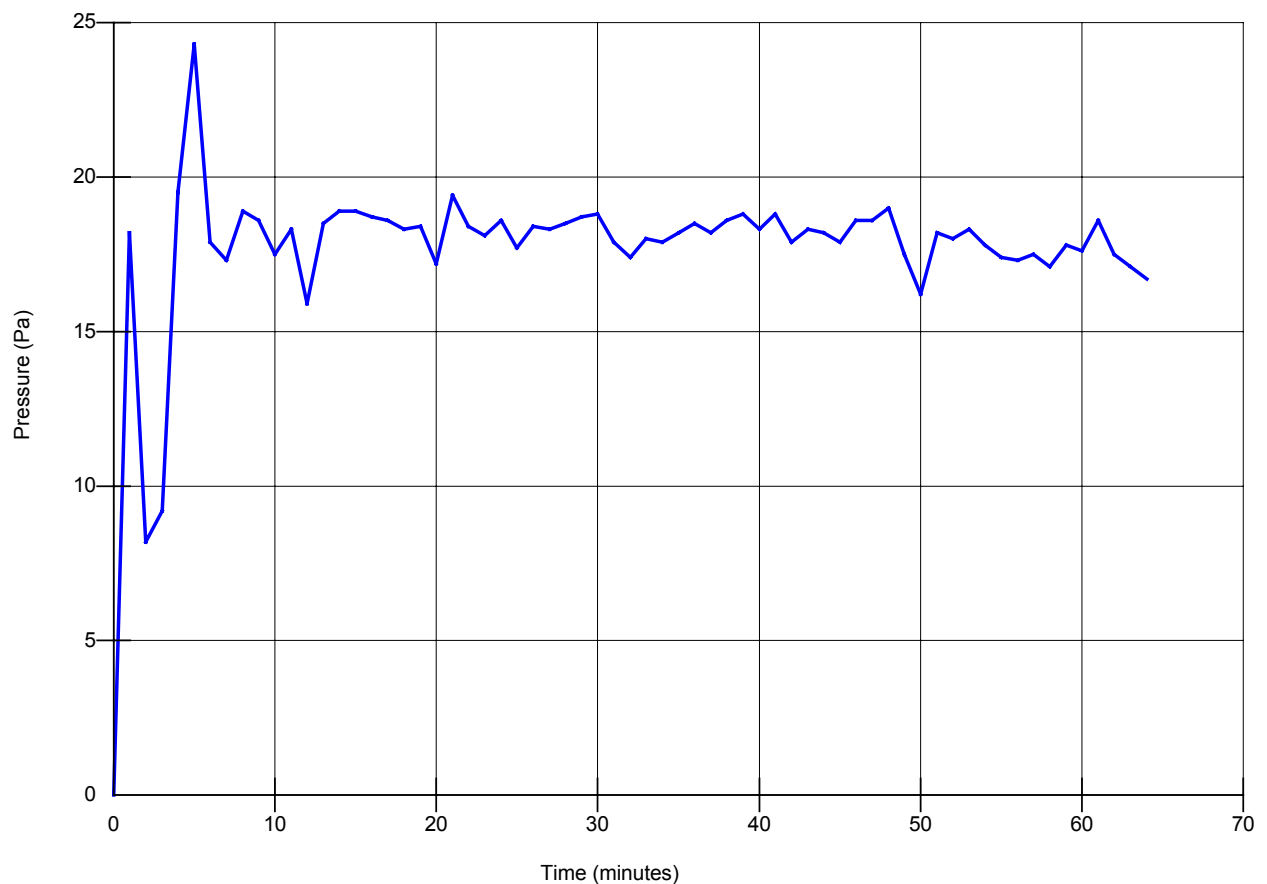


Figure 3. Furnace pressure graph.



Unexposed Face Temperature Graph

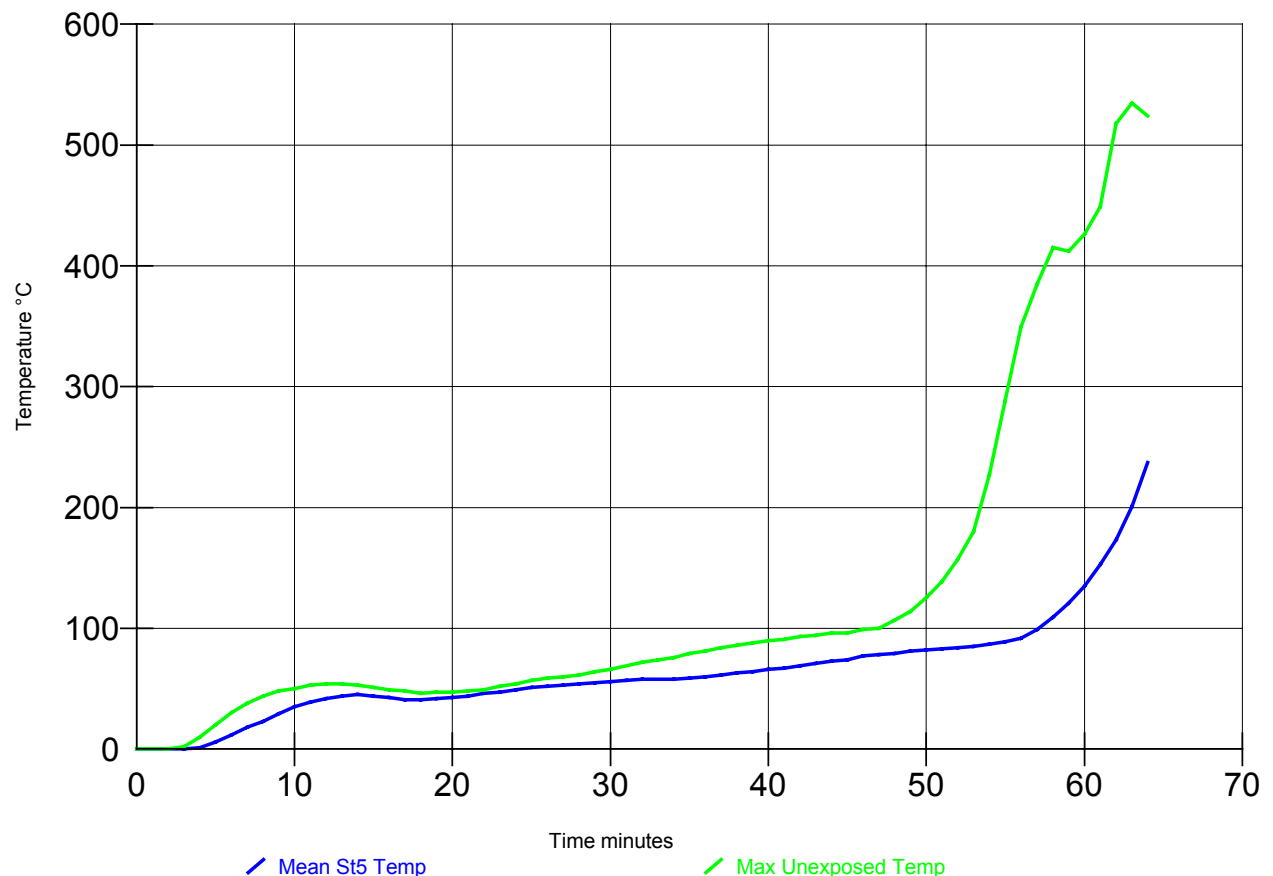


Figure 4. Unexposed face temperature graph.



Unexposed Face Thermocouple Layout

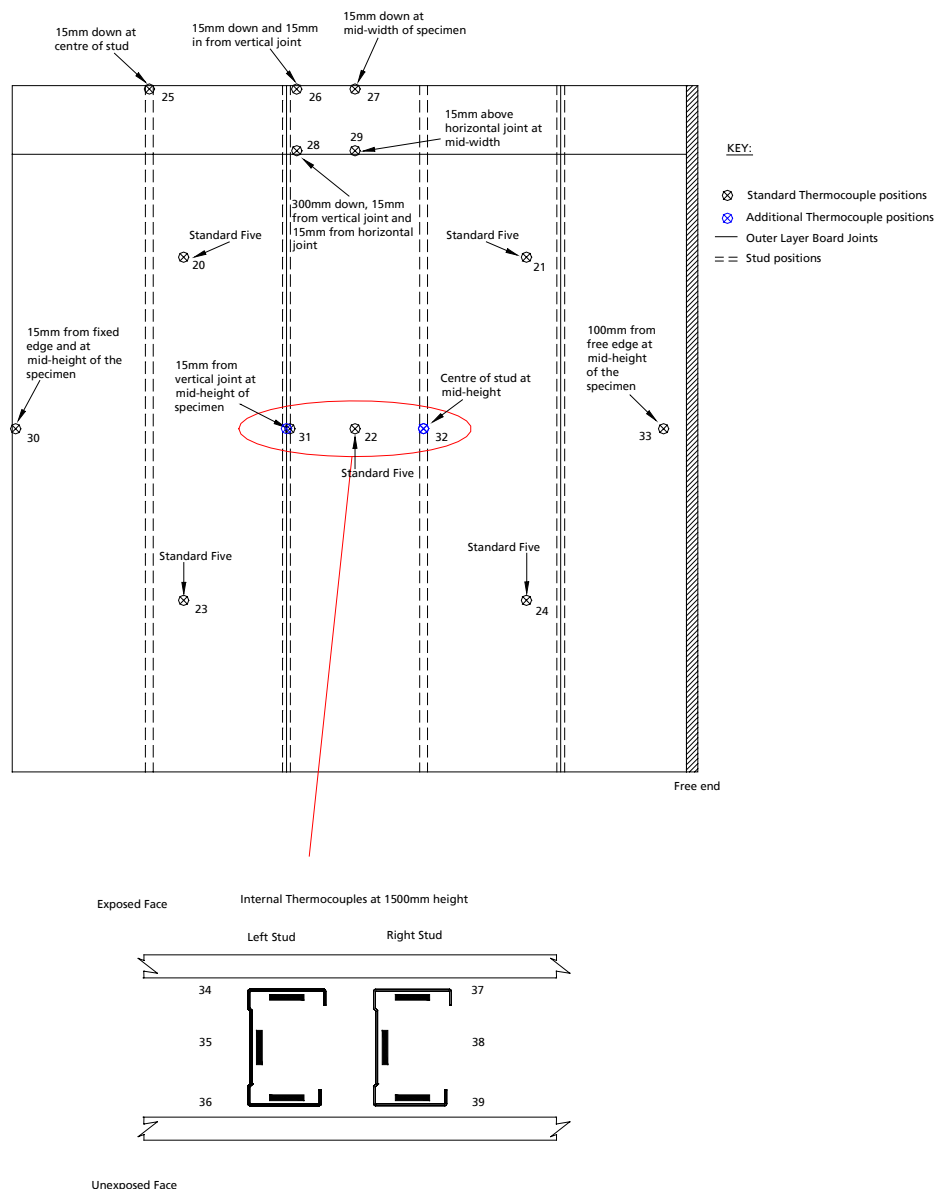


Figure 5. Unexposed face thermocouple layout.



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	1	2	2	2	2
5	5	9	7	6	5
6	10	16	13	12	10
7	15	23	20	18	15
8	20	28	27	24	19
9	26	33	34	31	24
10	31	37	40	40	28
11	37	40	44	46	31
12	41	42	47	47	35
13	44	44	47	50	38
14	45	44	47	50	43
15	45	43	45	48	42
16	43	41	44	46	41
17	42	40	43	45	39
18	42	40	43	45	39
19	42	41	43	45	40
20	43	42	44	46	43
21	44	43	45	47	44
22	46	45	47	48	48
23	47	46	48	49	49
24	49	48	50	51	50
25	50	50	51	52	52
26	51	51	52	53	54
27	52	52	53	55	55
28	53	53	54	56	57
29	54	54	54	57	58
30	55	55	55	58	59
31	56	55	56	59	60
32	56	56	57	60	61
33	56	56	57	60	61



Time (mins)	Temperature Rise (°C)				
	Thermocouple No. 20	Thermocouple No. 21	Thermocouple No. 22	Thermocouple No. 23	Thermocouple No. 24
34	57	56	57	60	62
35	58	57	58	61	63
36	60	58	58	61	64
37	61	59	59	63	65
38	63	60	61	64	67
39	65	61	62	65	68
40	67	63	64	67	70
41	69	64	65	68	72
42	71	66	67	70	74
43	73	68	69	72	76
44	75	70	71	74	78
45	76	71	73	75	79
46	78	73	75	78	81
47	79	74	76	79	82
48	81	76	78	81	83
49	83	77	79	82	84
50	84	78	81	83	84
51	86	79	82	84	85
52	89	80	85	85	85
53	90	81	87	85	86
54	92	82	90	86	86
55	98	83	92	87	87
56	111	83	94	88	88
57	135	84	98	90	88
58	177	86	106	91	89
59	214	87	122	93	90
60	248	90	150	96	92
61	283	96	194	101	93
62	320	107	233	110	95
63	370	124	288	127	98
64	423	154	351	158	102

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	1	0	0	0
4	3	8	3	1	1
5	11	19	9	5	4
6	22	30	19	10	9
7	30	38	27	15	14
8	38	44	36	20	18
9	43	48	42	24	21
10	46	50	46	27	24
11	47	51	47	31	26
12	48	51	47	34	27
13	48	51	47	36	27
14	48	51	46	38	28
15	47	50	46	38	28
16	47	49	46	38	28
17	46	48	45	38	28
18	46	46	44	37	29
19	44	45	45	37	30
20	44	44	45	38	31
21	44	45	45	40	34
22	45	46	46	42	38
23	46	47	46	46	41
24	47	49	47	52	45
25	47	52	48	57	50
26	48	55	48	63	54
27	49	58	49	68	57
28	50	61	50	72	59
29	51	64	51	75	61
30	51	66	52	78	63
31	52	69	53	82	64
32	52	72	54	85	66
33	53	74	55	88	67

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BTC 12492F: Page 20 of 32



Time (mins)	Temperature Rise (°C)				
	Thermocouple No. 25	Thermocouple No. 26	Thermocouple No. 27	Thermocouple No. 28	Thermocouple No. 29
34	53	76	56	91	69
35	53	79	57	93	71
36	54	81	58	96	74
37	55	84	60	99	76
38	56	86	61	102	78
39	57	88	62	105	80
40	58	90	63	108	82
41	59	91	63	113	84
42	61	93	64	117	85
43	62	94	65	123	87
44	63	96	66	130	88
45	64	96	66	138	89
46	66	99	69	148	91
47	67	100	72	159	93
48	69	102	75	172	96
49	71	103	77	190	100
50	72	105	79	211	108
51	74	108	80	235	122
52	76	111	82	260	142
53	78	115	83	293	175
54	80	119	87	324	227
55	83	125	92	362	288
56	85	134	95	393	349
57	87	147	96	420	385
58	89	162	100	430	415
59	92	180	103	432	412
60	96	203	110	436	426
61	99	231	122	447	437
62	101	265	147	493	464
63	111	322	191	542	484
64	119	394	249	602	493

See figure 5 for the locations of the thermocouples.

Thermocouple No. 28 was located over a screw head.

Customer: **British Gypsum Limited**

BTC 12492F: Page 21 of 32



0296

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	2	0	0
4	1	10	1	3
5	2	20	5	10
6	6	29	10	19
7	10	35	16	28
8	15	40	21	37
9	20	43	25	45
10	25	46	30	50
11	29	48	32	53
12	33	49	34	54
13	37	49	37	54
14	40	48	39	53
15	42	46	39	51
16	43	45	38	49
17	43	43	39	47
18	43	43	39	46
19	42	43	41	47
20	42	44	43	47
21	42	46	45	48
22	43	49	48	49
23	44	52	50	50
24	45	54	53	52
25	46	57	56	53
26	47	59	58	55
27	48	60	60	57
28	49	61	61	58
29	50	63	62	59
30	50	64	63	59
31	51	66	64	61
32	52	68	65	61
33	53	69	67	61



Time (mins)	Temperature Rise (°C)			
	Thermocouple No. 30	Thermocouple No. 31	Thermocouple No. 32	Thermocouple No. 33
34	54	72	68	61
35	55	73	69	62
36	56	76	71	62
37	58	79	74	63
38	59	81	77	64
39	60	83	78	66
40	60	85	80	67
41	61	86	83	68
42	62	87	85	70
43	63	89	85	72
44	64	90	86	74
45	64	92	86	76
46	66	96	89	79
47	67	100	91	81
48	69	107	94	82
49	72	114	98	83
50	73	125	104	84
51	75	139	117	85
52	77	157	136	86
53	78	180	163	87
54	79	202	192	87
55	80	223	216	88
56	80	244	238	89
57	81	272	260	89
58	81	312	281	90
59	81	364	302	91
60	82	419	323	92
61	82	449	348	94
62	82	518	370	96
63	83	535	397	100
64	85	524	416	105

See figure 5 for the locations of the thermocouples.



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	25	24	21	25	23	21
1	26	24	22	27	23	21
2	52	46	41	69	36	21
3	89	84	87	94	79	34
4	97	90	91	94	87	59
5	101	93	91	95	89	70
6	100	93	88	94	86	75
7	101	94	89	99	86	75
8	102	96	93	102	87	78
9	105	98	96	106	90	79
10	107	101	97	114	94	82
11	108	103	97	127	98	84
12	109	104	95	148	103	86
13	112	107	94	178	117	86
14	120	110	90	216	134	87
15	141	121	89	257	159	86
16	176	142	87	313	191	88
17	226	165	84	383	243	97
18	274	191	85	450	290	103
19	318	220	87	518	336	110
20	362	248	90	558	375	124
21	394	275	95	583	405	142
22	421	300	98	602	430	191
23	445	322	100	626	455	224
24	466	343	104	368	481	256
25	484	361	114	464	502	288
26	498	378	122	516	519	313
27	513	395	135	708	534	333
28	526	411	152	694	547	352
29	539	426	172	696	558	368
30	548	438	195	697	567	379
31	557	449	224	709	575	385
32	566	462	273	705	583	394
33	575	475	307	729	589	403
34	584	489	326	732	595	410



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
35	594	500	335	743	600	415
36	603	511	341	738	606	420
37	613	519	347	737	611	425
38	621	527	356	761	613	430
39	630	536	368	789	614	436
40	638	543	379	804	-	446
41	644	548	389	794	-	462
42	649	548	399	798	-	477
43	-	549	408	805	-	495
44	-	549	418	800	-	516
45	-	551	426	791	-	538
46	-	553	435	799	-	560
47	-	557	443	804	-	583
48	-	562	452	801	-	-
49	-	575	463	819	-	-
50	-	590	475	814	-	-
51	-	602	489	805	-	-
52	-	650	501	805	-	-
53	-	657	514	850	-	-
54	-	660	529	854	-	-
55	-	665	545	846	-	-
56	-	681	578	911	-	-
57	-	686	635	-	-	-
58	-	652	633	-	-	-
59	-	701	-	-	-	-
60	-	-	-	-	-	-

See figure 5 for the locations of the thermocouples.

Thermocouple No. 34 did not work after 42 minutes.
Thermocouple No. 35 did not work after 59 minutes.
Thermocouple No. 36 did not work after 58 minutes.
Thermocouple No. 37 did not work after 56 minutes.
Thermocouple No. 38 did not work after 39 minutes.
Thermocouple No. 39 did not work after 47 minutes.

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BTC 12492F: Page 25 of 32



0296



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	1.8	-3.8
2	5.8	-2.2
3	8.8	-0.7
4	6.3	-0.7
5	5.8	-0.8
6	5.3	-1.1
7	5	-1.3
8	4.6	-1.6
9	4.4	-1.6
10	4.4	-1.7
11	4.6	-1.7
12	6	-1.6
13	9.5	-1.1
14	15.3	0.8
15	23.4	5.9
16	33.8	12.8
17	43.6	21.9
18	50.3	29.5
19	54.8	38
20	58.8	45.3
21	61.6	50.1
22	62.8	52.3
23	63.6	53.1
24	64.7	54.2
25	65.9	55.2
26	67	55.8
27	68.1	56.5
28	69.1	57.3
29	69.9	58
30	70.4	58.6
31	71	59.3
32	71.8	60.1
33	72.8	61
34	73.9	61.9
35	74.6	62.9



Time (mins)	Deflection at centre of the specimen (mm)	Deflection 50mm from free end of the specimen (mm)
36	75.4	63.7
37	76.3	64.7
38	77	65.7
39	77.7	66.7
40	78.4	67.6
41	79	68.6
42	79.6	69.5
43	80.2	70.3
44	80.8	71.1
45	81.9	71.8
46	83.2	72.3
47	84.2	72.8
48	85.2	73.6
49	86.9	74.6
50	88.6	75.7
51	90.1	77.3
52	93.7	78.6
53	96.1	79.6
54	98	80.6
55	98.8	81.2
56	98.9	81.6
57	98.9	82.1
58	98.8	82.7
59	99	83.1
60	99.5	83.2

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

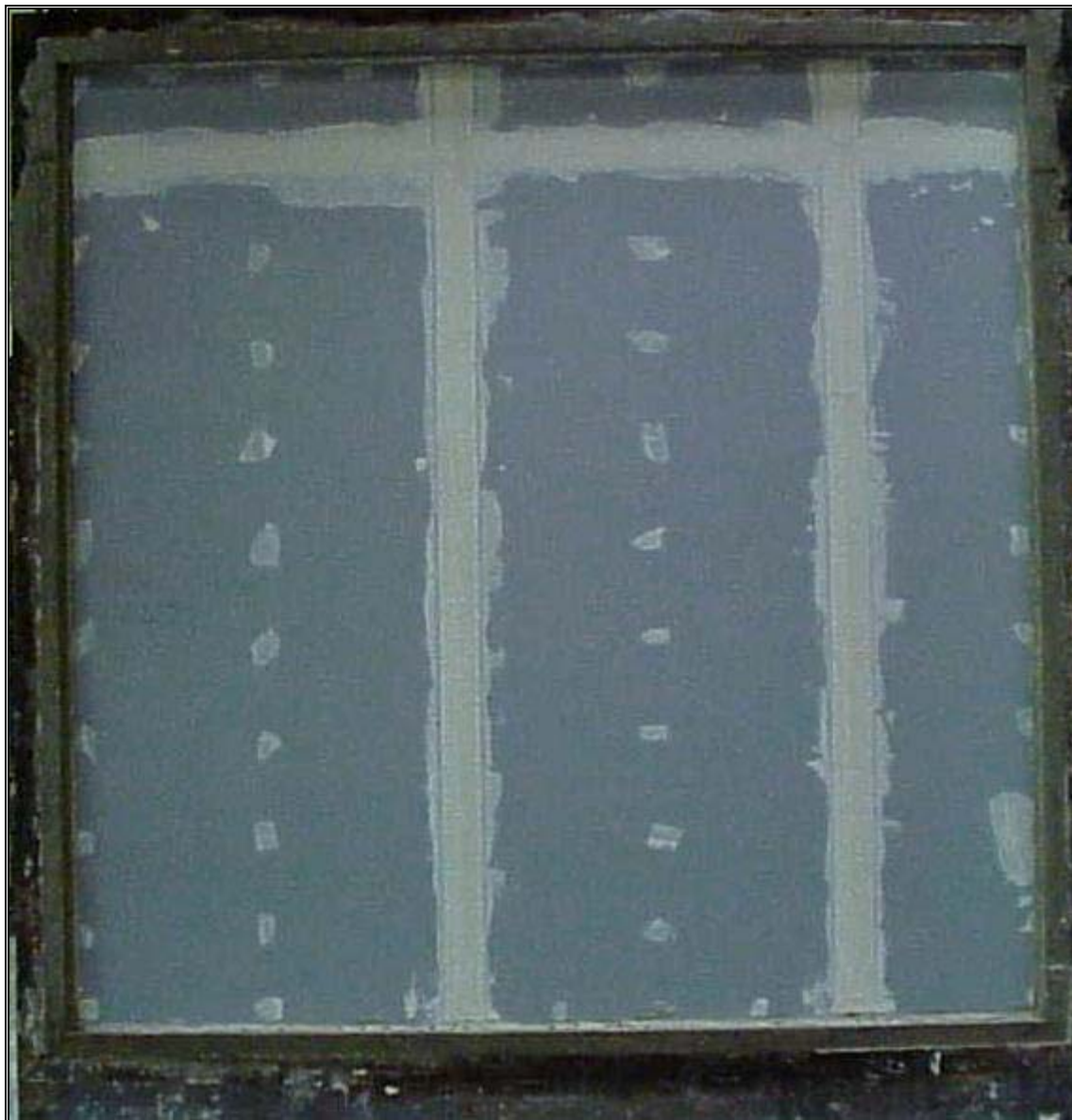


The Building Test Centre

Fire Acoustics Structures

The Building Test Centre
British Gypsum Limited
East Leake
Loughborough
Leics. LE12 6NP
Tel (0115) 945 1564
Fax (0115) 945 1562
email btc.testing@bpb.com

PHOTOGRAPHS



Photograph 1. Exposed face prior to test

Customer: **British Gypsum Limited**

BTC 12492F: Page 28 of 32



0296



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Photograph 2. Unexposed face prior to test.

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BTC 12492F: Page 29 of 32



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Photograph 3. Unexposed face after test termination.

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BTC 12492F: Page 30 of 32



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Photograph 4. Exposed face after test termination

Customer: **British Gypsum Limited**

BTC 12492F: Page 31 of 32



0296

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 95mm).
- (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 SoundBloc).
- (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
<100mm, \therefore 4000mm