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Report Number **BTC 12026F**

A FIRE RESISTANCE TEST ON A GYPROC GYPWALL PARTITION INCORPORATING A SINGLE LAYER OF 12.5mm SOUNDBLOC EACH SIDE OF 48S50 STUDS WITH 25mm ISOWOOL 1200 IN THE CAVITY, CONDUCTED IN ACCORDANCE WITH BS EN 1364-1:1999.

Test Date: 10th July 2002

www.btconline.co.uk

Customer: **British Gypsum Limited**
East Leake
Loughborough
Leicestershire
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0296

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A FIRE RESISTANCE TEST ON A GYPROC GYPWALL PARTITION INCORPORATING A SINGLE LAYER OF 12.5mm SOUNDBLOC EACH SIDE OF 48S50 STUDS WITH 25mm ISOWOOL 1200 IN THE CAVITY, CONDUCTED IN ACCORDANCE WITH BS EN 1364-1:1999.

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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. The construction of the specimen took place on the 12th June 2002. British Gypsum Limited designed and selected the materials comprising the test specimen.

The test date was carried out on the 10th July 2002.

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 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

Report Author	Authorised by
Brian Willson *Test Report Writer*	**Eur Ing. Paul Howard** BSc. (Hons.), CEng., MIOA *Head of Laboratory*

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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 50C50 channels were fixed to the head and base of the test aperture at 600mm centres with 60mm Hilti Hus fixings. Gypframe 48S50 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, but the gap between the stud and the lining was filled with a 50mm Rockwool Firebatt gasket. The left hand stud was fixed to the test frame at 600mm centres with 60mm Hilti Hus fixings.

25mm Isowool 1200 was located within the stud cavities.

The framework was lined both sides with a single layer of 12.5mm Gyproc SoundBloc. The boards were fixed to the metal stud, channel and strap at 300mm centres around the perimeter and to intermediate studs using 25mm Gyproc Drywall screws. All vertical board joints were staggered.

Horizontal joints were positioned 2700mm from the base on both the exposed and unexposed faces of the construction. A Gypframe GFS1 fixing strap was used behind the horizontal board joints.

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

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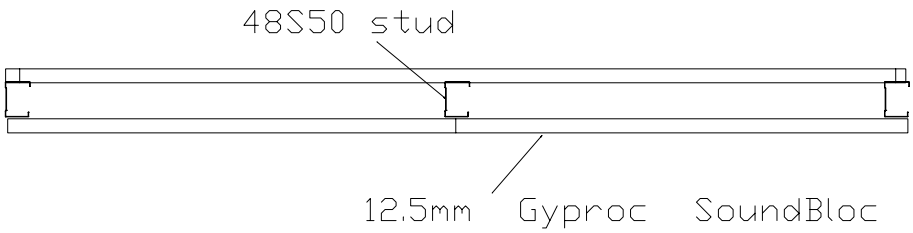

Figure 1. Cross-section through the partition.

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

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TEST MATERIALS

Gyproc SoundBloc

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

Measured surface density:	10.59 kg/m^2.
Measured thickness:	12.25 mm.
Board identification numbers:	16157211:25
Measured moisture content:	0.42%

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 the board was determined using samples dried to a constant weight in an oven at 40°C.

Isowool 1200 insulation

Nominally 25mm thick glass mineral wool, manufactured and supplied by British Gypsum – Isover Limited.

Measured surface density:	0.4 kg/m^2
Measured density:	16.0 kg/m^3

Surface density calculated using the weight of one roll of 25mm Isowool 1200 and its nominal surface area and nominal thickness.

Metal components

(i) Gypframe 48S50 metal studs. Manufactured from galvanised mild steel nominally 0.5mm thick using the "Ultrasteel" process.
(ii) Gypframe 50C50 metal channel. Manufactured from galvanised mild steel nominally 0.5mm thick using the "Ultrasteel" process.
(iii) Gypframe GFS1 fixing strap manufactured from galvanised mild steel nominally 0.5mm thick.

All metal components supplied by British Gypsum Limited.

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Fasteners

(i) 25mm Gyproc Drywall screws supplied by British Gypsum Limited.
(ii) 60mm Hilti Hus fixings supplied by Hilti Limited.

Jointing Material

(i) Gyproc Joint Filler supplied by British Gypsum Limited.
(ii) Gyproc Paper Tape supplied by British Gypsum Limited.

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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 maintained at 18 ± 2 Pa positive with respect to atmosphere, at the top of the specimen, except during the first 4 minutes of the test.

The test conditions did not meet the full requirements of BS EN 1363-1:1999 as the furnace linings and test frame stiffness did not fully comply. The test centre is of the opinion that these deviations 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:	**44 minutes (Sustained flaming)**
	45 minutes (Cotton pad)
	49 minutes (6mm x 150mm gap gauge)
	49 minutes (25mm gap gauge)
Insulation:	**44 minutes (thermocouple N°31 exceeded 180 deg C.)**

The test was terminated at 49 minutes.

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LIMITATIONS

The results only relate to the behaviour of the specimen of the element of construction under the particular conditions of test; they are not intended to be the sole criteria for assessing the potential fire performance of the element in use nor do they reflect the actual behaviour in fires.

The 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.

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Fire Acoustics Structures

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TEST DATA

Observations

Observers: Unexposed face S. Harms
Exposed face K. Hall

Time		*Observations* All observations refer to the exposed face unless otherwise stated.
hrs	Mins	
	0	Test Started
	3	Horizontal and vertical joints, paper tape peeling away.
	6	Lower left hand board, taper cracking 2600mm high from top to base 1500mm in length.
	10	Horizontal and vertical joints, joint material fallen away.
	15	Right hand vertical joint and horizontal joint open to approximately 5-7mm. Left hand vertical joint open to approximately 7-10mm, stud exposed.
	16	Centre of left hand board, vertical crack open to approximately 1-2mm.
	20	Left and right vertical joint open to approximately 10-12mm. Horizontal joint open to approximately 8-10mm. Lower centre board mid-height, horizontal crack 600mm long open to approximately 4-6mm.
	22	Lower left hand board, taper cracking full height. Full height of board moved into cavity.
	23	Vertical joints open to approximately 15mm (25mm max.). *Unexposed face* Left hand vertical joint at approximately 2m height, joint splitting, discolouration, steam and smoke emission.

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Time		*Observations*
hrs	Mins	All observations refer to the exposed face unless otherwise stated.
	26	*Unexposed face* Head dropped approximately 5mm at mid-width, no path to furnace.
	28	*Unexposed face* Left hand vertical joint, steam and smoke emissions increased.
	29	Lower centre and lower right hand boards, horizontal cracking approximately 600mm long open to 6-8mm. *Unexposed face* Left hand vertical joint open to approximately 10mm, visible behind joint paper.
	33	Vertical joints open to approximately 25-30mm.
	35	*Unexposed face* Lower left hand board screw heads pulling through in field of board.
	36	*Unexposed face* Left hand vertical joint approximately 200mm below horizontal joint, jointing material beginning to char.
	38	*Unexposed face* Left hand vertical joint, jointing material continuing to char from horizontal joint down to mid-height of lower board.
	39	*Unexposed face* Field of lower left hand board, discolouration over stud.
	41	Left hand vertical joint open to approximately 25-30mm. Right hand vertical joint open to approximately 30-45mm.
	42	*Unexposed face* Glow visible at left hand vertical joint.
	43	Distortion of studs on joints approximately 15-20mm from vertical.

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Time		*Observations*
hrs	Mins	
		All observations refer to the exposed face unless otherwise stated.
	44	*Unexposed face* **INSULATION FAILURE.** The temperature rise exceeded 180°C on thermocouple No. 31 (15mm from vertical joint at mid-height of specimen). **INTEGRITY FAILURE.** Sustained flaming left hand vertical joint mid-height for 30 seconds.
	45	*Unexposed face* **INTEGRITY FAILURE.** Cotton pad glowing left hand vertical joint.
	48	Lower centre board left hand side, a piece approximately 600mm x 1200mm peeled away from stud into furnace.
	49	*Unexposed face* **INTEGRITY FAILURE.** Inner board fell through left hand vertical joint. 6mm x 150mm gap and 25mm gap visual failure. **TEST TERMINATED.**

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Furnace Temperature Graph

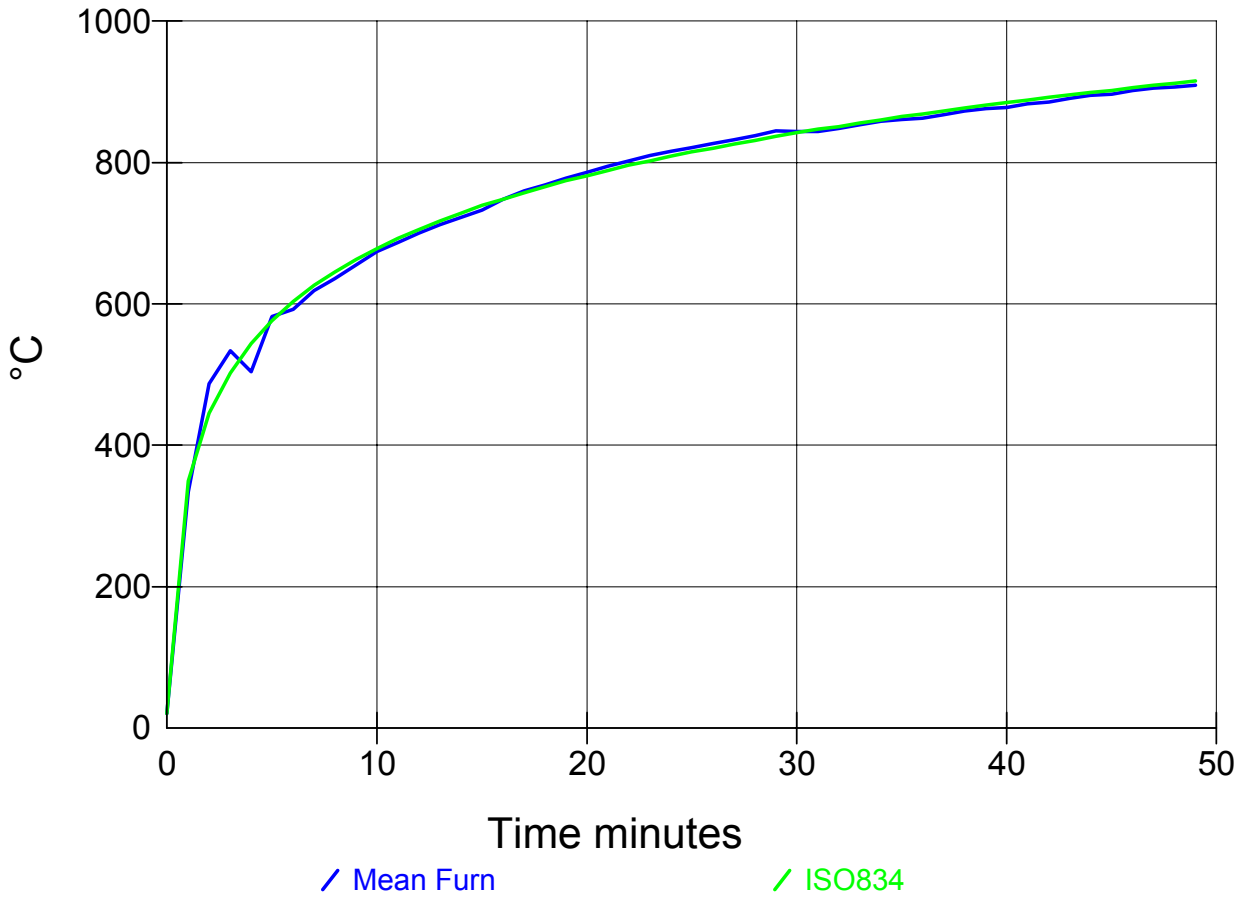

Figure 2. Furnace temperature graph

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Unexposed Face Temperature Graph

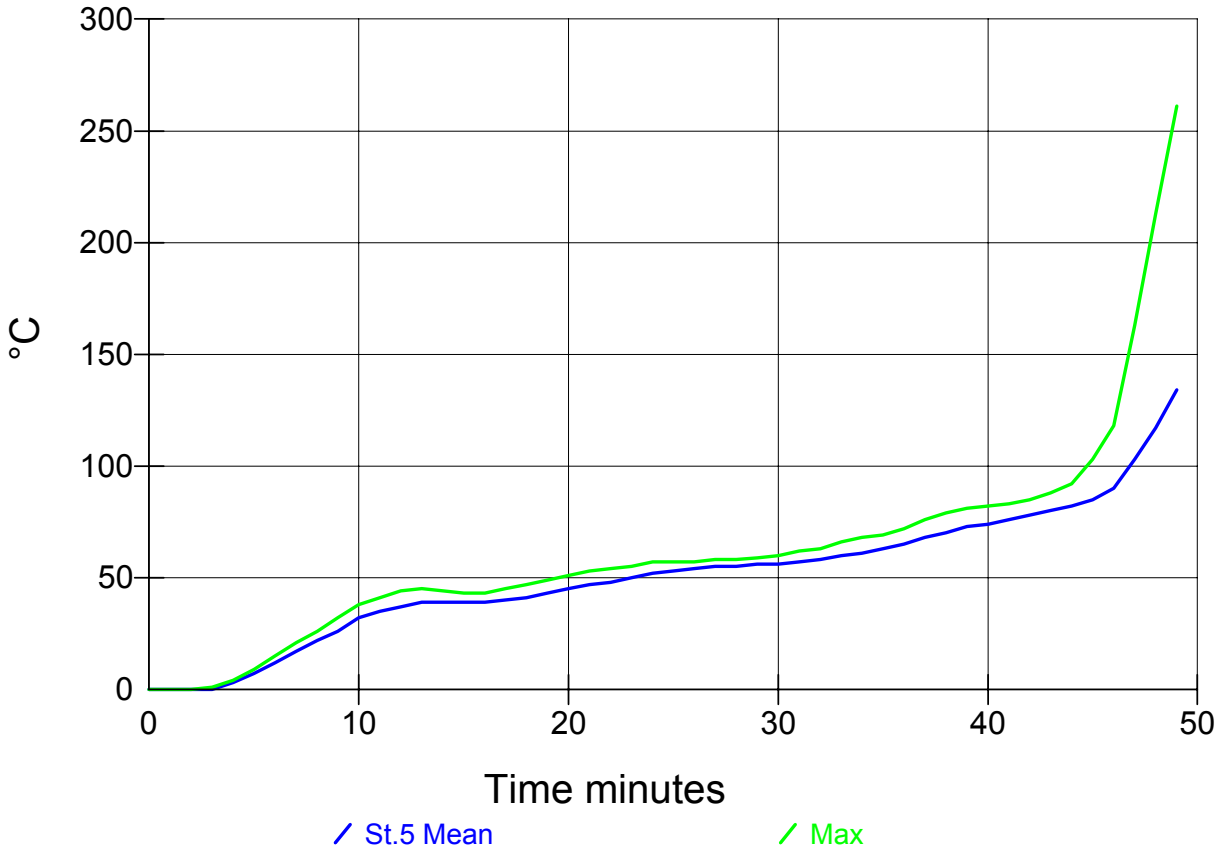

Figure 3. Unexposed face temperature graph.

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Pressure Graph

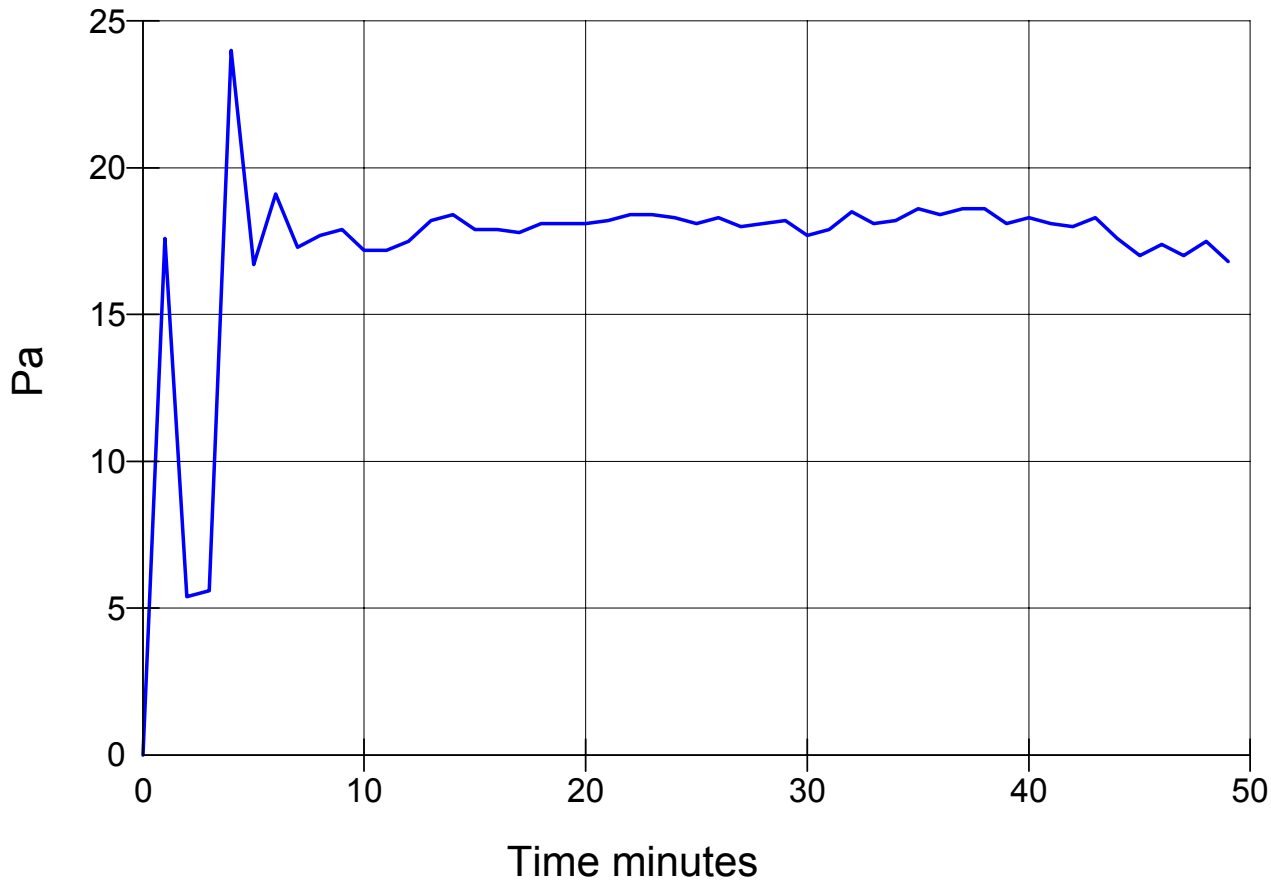

Figure 4. Pressure graph.

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Unexposed Face Thermocouple Layout

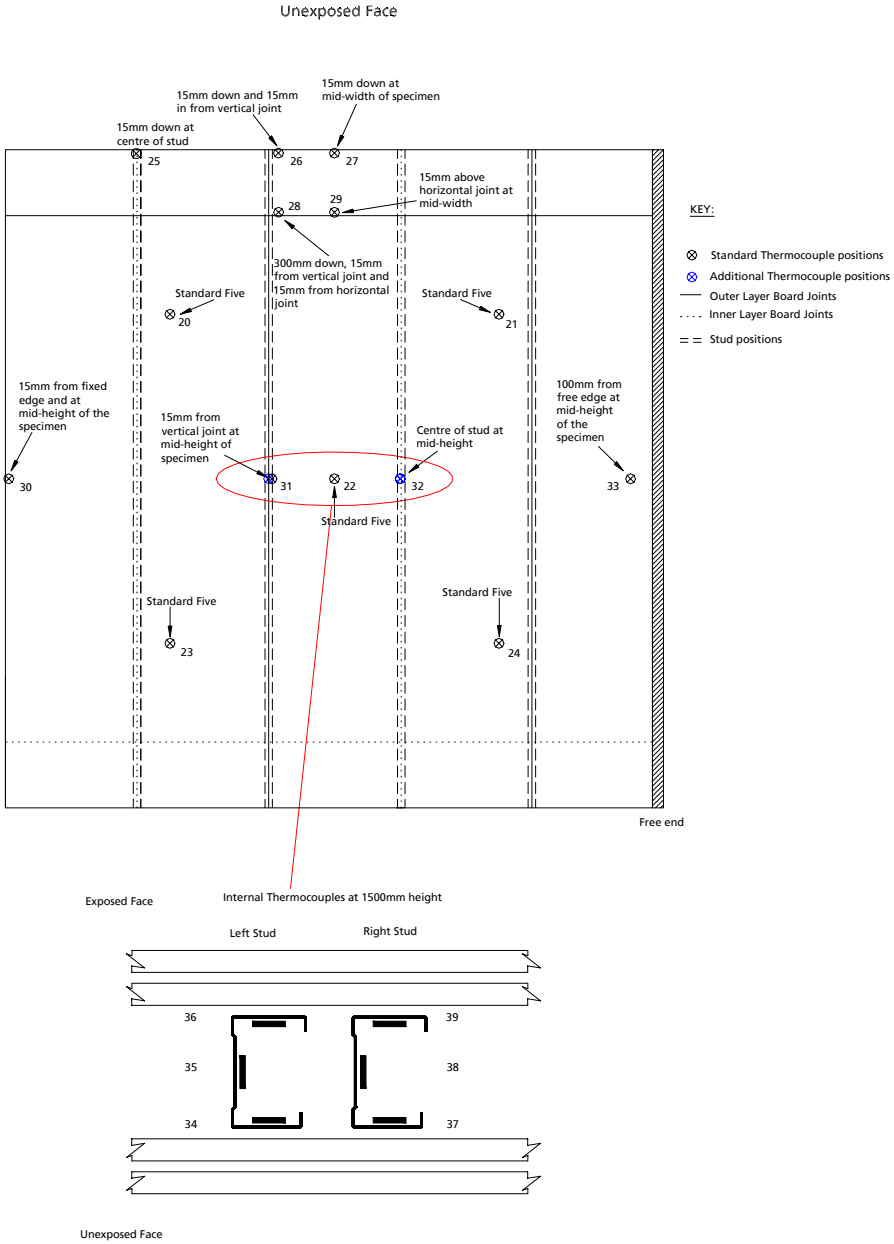

Figure 5. Unexposed face thermocouple layout.

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Unexposed Face Standard Five Temperature 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	1	0	0
4	3	2	4	4	2
5	8	6	9	9	5
6	13	10	15	15	8
7	18	15	21	20	13
8	24	19	26	25	17
9	29	22	32	30	21
10	35	27	38	35	25
11	39	30	41	38	27
12	42	33	44	40	29
13	44	36	45	42	31
14	44	38	43	42	32
15	43	37	42	41	33
16	42	37	43	40	33
17	42	38	45	41	34
18	43	39	47	42	36
19	44	41	49	44	38
20	46	43	51	46	41
21	47	45	53	48	43
22	48	47	54	50	45
23	50	49	55	51	48
24	51	51	57	52	50
25	53	52	57	53	51
26	55	52	57	55	52
27	56	53	58	56	53
28	56	54	58	55	54
29	57	55	59	55	55
30	58	56	60	54	56
31	59	56	62	55	56
32	61	57	63	56	56
33	62	58	66	58	57
34	64	59	68	60	58

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Time (mins)	Temperature Rise (°C)				
	Thermocouple No. 20	Thermocouple No. 21	Thermocouple No. 22	Thermocouple No. 23	Thermocouple No. 24
35	66	61	69	62	59
36	68	63	72	65	60
37	71	65	76	67	62
38	74	67	79	70	63
39	77	69	81	73	65
40	79	72	82	75	66
41	81	73	83	77	67
42	81	75	85	80	69
43	83	76	88	82	72
44	85	77	92	83	73
45	88	78	103	86	74
46	92	78	118	91	75
47	101	80	163	97	77
48	112	80	213	104	78
49	140	81	261	113	79

See figure 5 for thermocouple layout

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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	Thermocouple No. 30
0	0	-3	0	0	0	0
1	0	0	0	-1	0	0
2	0	0	0	-1	0	0
3	0	0	0	-1	0	0
4	1	5	5	-1	2	1
5	6	14	13	0	6	3
6	12	24	22	0	10	7
7	19	33	30	0	15	12
8	25	39	36	0	20	17
9	30	43	39	0	23	22
10	34	45	43	1	26	26
11	37	45	44	1	27	30
12	38	46	44	2	29	33
13	40	46	45	1	30	36
14	41	47	45	1	31	38
15	42	47	44	2	32	39
16	41	45	43	2	32	40
17	41	44	42	2	32	40
18	41	45	43	2	32	40
19	41	47	44	3	33	39
20	43	48	45	3	34	40
21	45	48	47	3	36	41
22	47	48	48	3	38	42
23	48	49	49	2	42	44
24	51	50	50	3	46	46
25	54	51	51	3	49	47
26	56	52	51	4	52	48
27	58	53	52	4	57	49
28	59	54	55	3	60	49
29	60	56	58	5	61	50
30	61	56	61	4	63	50
31	62	58	64	4	65	52
32	64	60	67	5	65	54
33	65	62	69	6	65	56
34	67	63	71	6	67	57

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Time (mins)	Temperature Rise (ºC)					
	Thermocouple No. 25	Thermocouple No. 26	Thermocouple No. 27	Thermocouple No. 28	Thermocouple No. 29	Thermocouple No. 30
35	69	65	73	6	69	58
36	72	67	77	7	71	59
37	75	69	82	7	73	61
38	77	71	90	7	76	62
39	78	75	94	9	78	64
40	79	77	102	7	87	65
41	80	81	108	7	93	67
42	80	85	108	10	94	69
43	80	86	112	10	108	69
44	81	87	118	14	117	70
45	83	90	128	18	122	71
46	84	92	145	23	140	72
47	86	95	176	26	189	73
48	87	102	224	29	239	74
49	90	110	277	30	310	75

See figure 5 for thermocouple layout.

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Additional Unexposed Face Temperature Data (continued)

Time (mins)	Temperature Rise (°C)		
	Thermocouple No. 31	Thermocouple No. 32	Thermocouple No. 33
0	0	-1	0
1	0	-1	0
2	0	-1	0
3	1	1	0
4	7	7	2
5	15	14	7
6	24	22	12
7	31	30	17
8	37	36	21
9	39	40	25
10	42	42	29
11	44	42	31
12	45	43	34
13	46	44	36
14	45	43	37
15	44	42	38
16	44	43	37
17	44	44	37
18	46	45	38
19	48	47	39
20	51	49	41
21	53	50	44
22	55	52	46
23	56	54	48
24	58	57	51
25	58	57	52
26	62	57	53
27	69	57	54
28	76	58	55
29	83	59	56
30	94	60	56
31	109	61	57
32	107	63	57
33	105	65	58
34	102	66	59

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Time (mins)	Temperature Rise (°C)		
	Thermocouple No. 31	Thermocouple No. 32	Thermocouple No. 33
35	97	68	60
36	99	70	62
37	97	73	63
38	99	77	64
39	98	80	66
40	101	81	69
41	102	82	71
42	104	84	72
43	113	86	74
44	143	89	75
45	202	94	76
46	284	100	77
47	350	110	77
48	402	126	78
49	433	156	79

See figure 5 for thermocouple layout. Figures shown in red indicate insulation failure.

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Additional Internal Temperature Data

Time	Actual Temperature (°C)					
	Stud 1			Stud 2		
(mins)	Cold Flange Thermocouple No. 34	Web Thermocouple No. 35	Hot Flange Thermocouple No. 36	Cold Flange Thermocouple No. 37	Web Thermocouple No. 38	Hot Flange Thermocouple No. 39
0	25	26	27	19	27	28
1	25	26	29	24	27	32
2	27	42	65	40	50	79
3	48	78	96	77	89	97
4	71	88	95	85	92	97
5	75	89	96	84	93	98
6	79	90	96	84	94	100
7	81	91	96	83	95	104
8	87	94	98	87	95	110
9	91	95	101	89	97	117
10	91	95	105	88	98	127
11	91	96	108	87	100	139
12	91	98	113	87	102	156
13	89	100	121	85	107	185
14	87	105	139	83	118	222
15	87	118	175	86	143	270
16	91	139	217	94	181	317
17	94	157	252	97	224	338
18	100	176	285	101	274	389
19	102	200	318	102	326	453
20	102	223	351	102	377	513
21	102	241	377	102	421	559
22	104	258	396	103	456	583
23	116	274	410	113	480	598
24	137	290	424	144	497	611
25	166	306	439	183	510	-
26	195	323	455	244	522	-
27	232	339	470	305	533	-
28	275	356	485	342	546	-
29	305	375	499	364	559	-
30	328	394	513	382	573	-

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Time (mins)	Actual Temperature (°C)					
	Stud 1			Stud 2		
	Cold Flange Thermocouple No. 34	Web Thermocouple No. 35	Hot Flange Thermocouple No. 36	Cold Flange Thermocouple No. 37	Web Thermocouple No. 38	Hot Flange Thermocouple No. 39
31	345	412	526	396	583	-
32	361	428	539	413	597	-
33	377	445	551	429	611	-
34	393	460	563	444	627	-
35	408	474	576	459	640	-
36	423	488	588	475	651	-
37	437	501	599	485	663	-
38	451	515	610	498	680	-
39	467	527	620	516	693	-
40	475	540	628	707	704	-
41	485	553	636	726	718	-
42	498	567	645	738	727	-
43	512	582	653	751	740	-
44	554	623	660	761	751	-
45	645	679	674	768	761	-
46	690	724	696	779	782	-
47	728	779	748	796	791	-
48	739	754	732	818	805	-
49	763	771	741	853	833	-

See Figure 5 for the location of the thermocouples.

Thermocouple No. 39 did not work after 24 minutes.

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Specimen Lateral Deflection

Time (mins)	Deflection (mm)	
	On free end	Centrally
0	-0.3	-0.1
1	1	6
2	2.4	10.6
3	3	13.8
4	2.8	12.4
5	2.6	13.3
6	2.3	13.7
7	2.1	14.7
8	2.1	16.1
9	2.1	17.9
10	2	20.3
11	2	22.3
12	2.3	24.8
13	2.6	28.5
14	3.7	34.2
15	8.1	42.4
16	15.9	54.3
17	28.8	67.2
18	34	88.4
19	38.9	101.2
20	42.5	110.7
21	44	118.1
22	44.9	124
23	45.8	129.6
24	46.5	134
25	47.3	137.9
26	48.1	141.8
27	48.8	145.4
28	49.2	148.5
29	49.4	151.9
30	49.3	155
31	49.3	157.4
32	49.3	159.4
33	49.3	161.3
34	49.4	163.1

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Time (mins)	Deflection (mm)	
	On free end	Centrally
35	49.5	164.7
36	49.5	166.7
37	49.6	168.6
38	49.7	170.5
39	49.8	172.2
40	49.8	173.5
41	49.9	174.9
42	49.9	176.4
43	50	177.8
44	50	178.9
45	50.1	180.2
46	50.2	181.5
47	177.5	186.3
48	176.8	186.3
49	176.4	186.3

The deflection was recorded at the approximate centre of the specimen and at mid-height on the free edge.

Positive readings indicate deflection into the furnace.

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PHOTOGRAPHS

Photo 1. Exposed face prior to test.

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Photo 2. Unexposed face prior to test.

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Photo 3. Insulation failure on left hand vertical joint at 44 minutes. The temperature rise on thermocouple No 31 exceeded 180°C.

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Photo 4. View of the unexposed face after test termination showing areas of insulation and integrity failure.