The Building Test Centre
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Report Number **BTC 13269F**

A FIRE RESISTANCE TEST ON A GANG-NAIL SYSTEMS LOADBEARING FLOOR, INCORPORATING ECOJOISTS PROTECTED BY A DOUBLE LAYER OF 12.5mm GYPROC FIRELINE BOARD, CONDUCTED IN ACCORDANCE WITH BS 476: PART 21: 1987: CLAUSE 7.

Test Date: 3rd March 2004

www.btconline.co.uk

Customer: **Gang-Nail Systems Limited**
Christy Estate
Ivy Road
Aldershot
Hampshire
GU12 4XG

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The Building Test Centre
Fire Acoustics Structures

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TABLE OF CONTENTS

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FOREWORD

This test report details a full scale fire resistance test on a loaded floor. The test sponsor was Gang-Nail Systems Limited.

The test specimen was installed by Gang-Nail Systems Limited. The construction of the specimen took place between the 23rd and 27th February 2004. The Building Test Centre played no role in the design or selection of the materials comprising the test specimen.

The test was carried out on the 3rd March 2004.

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
Lynda Cooper *Technologist*	**Phil Barnes** *Fire Test Manager*

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TEST CONSTRUCTION

The specimen was constructed in a refractory concrete lined steel restraint frame having an opening of 4000mm long x 3000mm wide.

Ecojoists, 4160mm (long) x 72mm (wide) x 219mm (deep) were placed, nominally, at 600mm centres, spanning the 4000mm length of the test frame.

The Ecojoist comprised 72mm (wide) x 47mm (deep) TR26 top and bottom timber chords with size 8, V-shaped metal webs on each outer side of the timbers.

Full-depth noggings, 220mm (deep) x 47mm (wide) were fixed at each end of the joists (within the test aperture) with 100mm round head nails, 4 per nogging.

Noggings, 73mm (deep) x 47mm (wide), were fixed at 1200mm centres between the joists by skew nailing at 45^{o} with 75mm and 100mm tosh nails, 2 per nogging.

The tops of the joists were covered with a walking surface of 22mm (finished thickness) tongued and grooved chipboard (nominally 2400mm long x 600mm wide). This was screw fixed to the joists at 300mm centres using 41mm Gyproc Drywall Timber screws.

The underside of the floor was lined with two layers of 12.5mm Gyproc FireLine board.

The inner layer of boards was fixed at 230mm centres to the joists and noggings using 32mm Gyproc Drywall Timber screws.
The outer layer of boards was fixed at 230mm centres around the perimeter and to the joists only using 51mm Gyproc Drywall Timber screws.

All board joints were staggered between layers.

All joints were finished using Gyproc Joint Tape and Joint Filler. All nail heads were spotted using Gyproc Joint Filler.

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Horizontal Section through Ecojoist

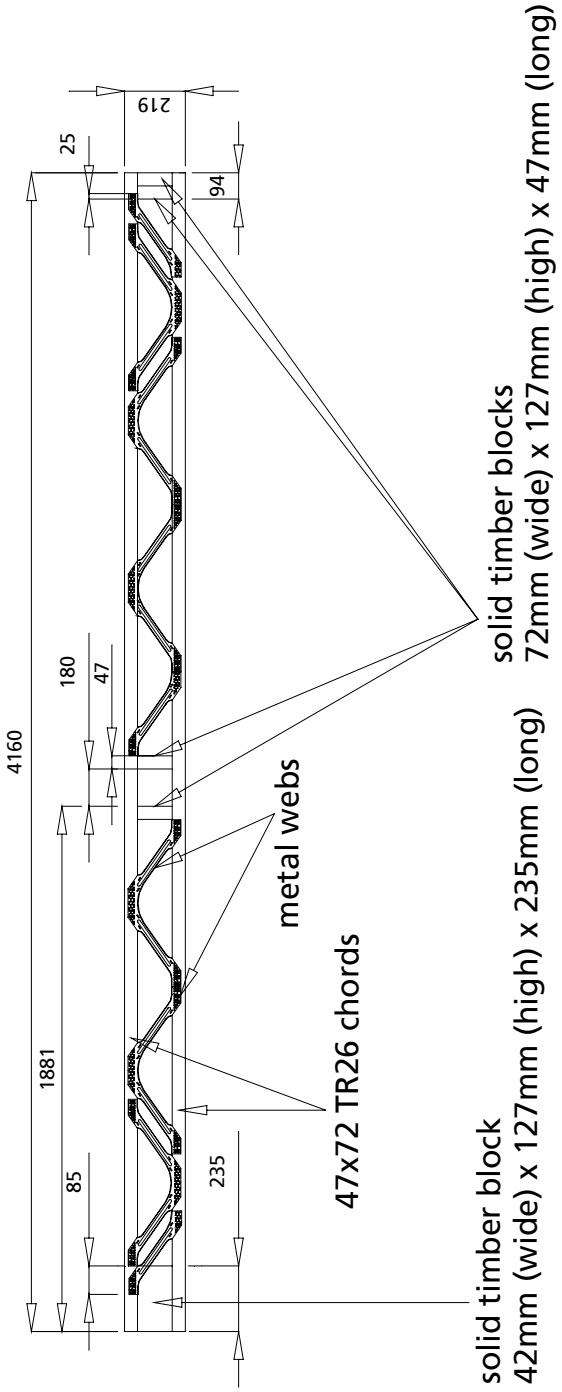

Figure 1. Horizontal cross-section through Ecojoist.
All dimensions are in mm.

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Chipboard Walking Surface and Joist Layout

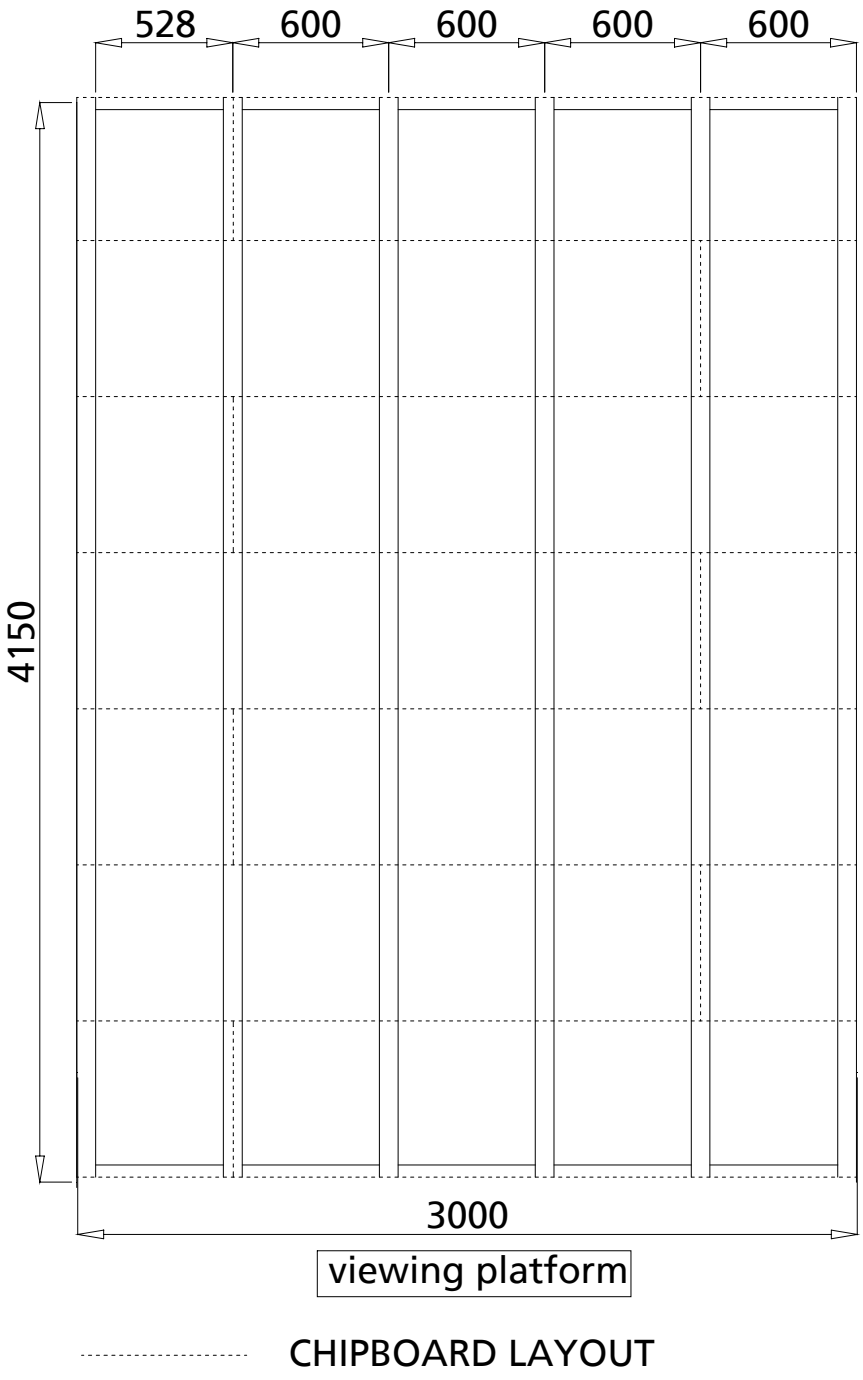

Figure 2. Chipboard layout.
All dimensions are in mm.

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Outer FireLine Board Layout

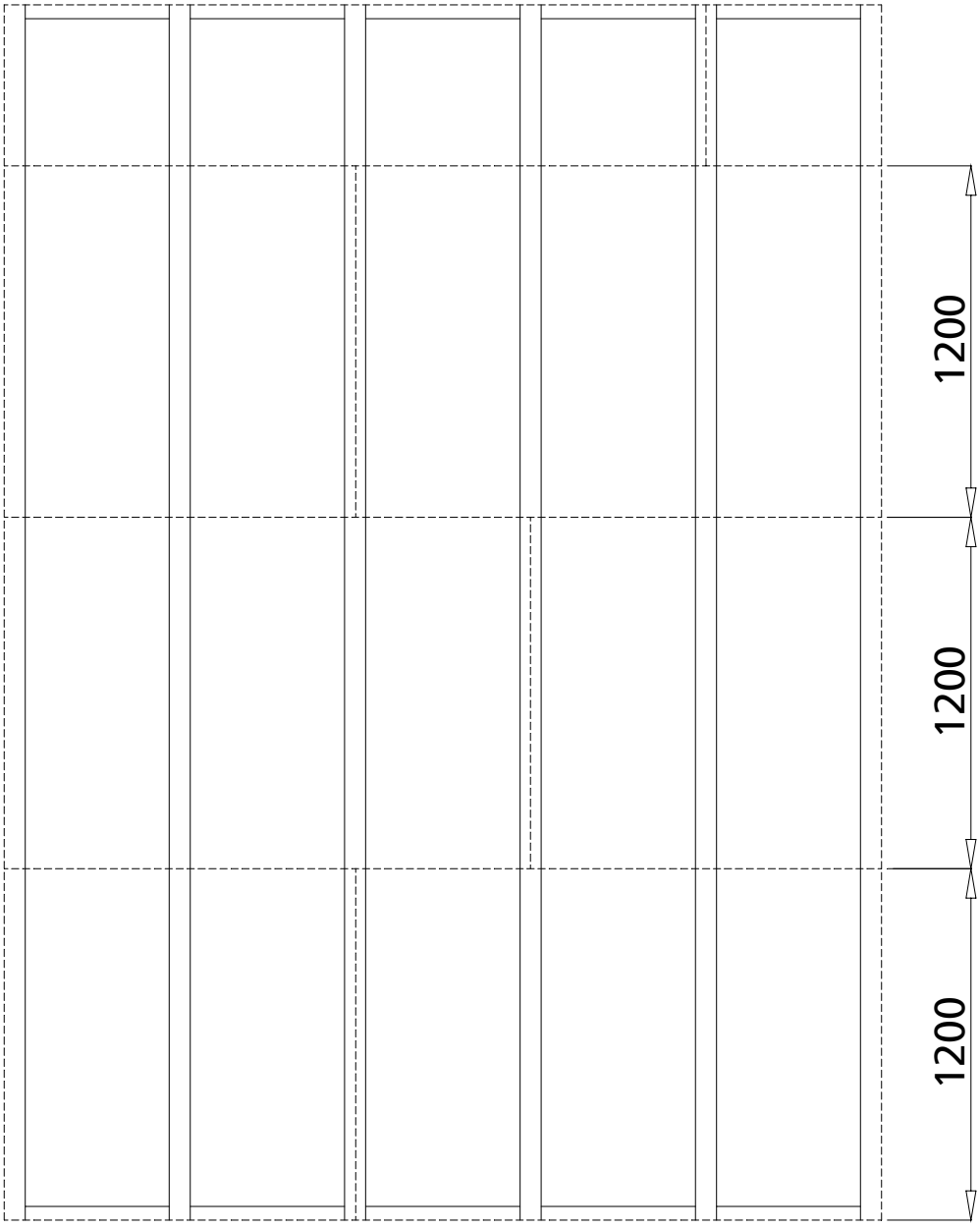

Figure 3. Outer FireLine board layout
All dimensions are in mm.

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Inner FireLine Board Layout

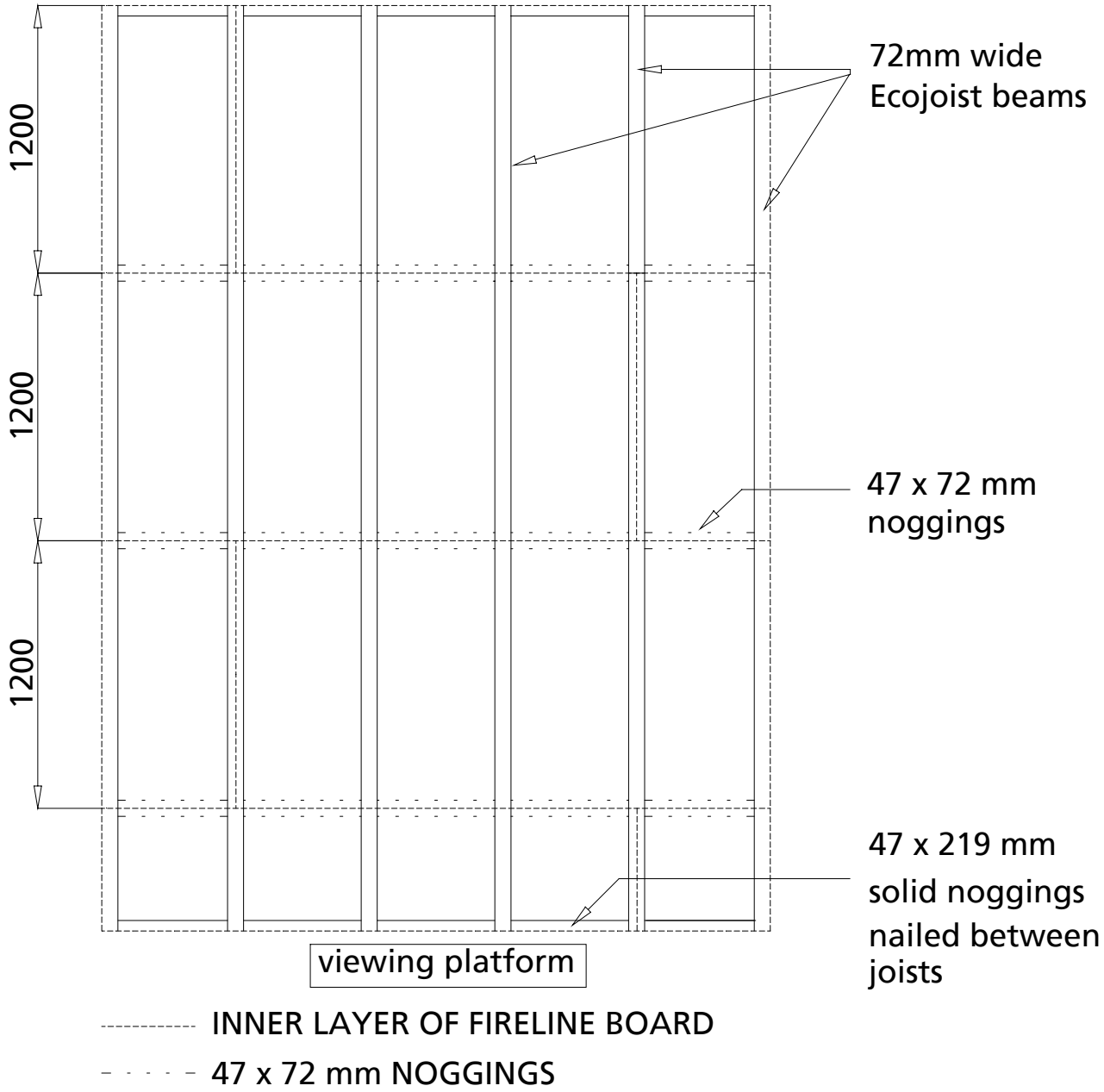

Figure 4. Inner FireLine board layout.
All dimensions are in mm.

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TEST MATERIALS

Gyproc FireLine

(1) Gyproc FireLine board T/E

Nominally 2400mm (long) x 1200mm (wide) x 12.5mm (thick) manufactured and supplied by British Gypsum Limited ex East Leake.

Board identification numbers:	16 055 4 19:46 16 055 4 19:47
Actual surface density:	9.90 kg/m^2.
Actual thickness:	12.88 mm.
Nominal moisture content:	< 1%.

The surface density 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 constant weight in an oven at 40°C.

Timber Components

(2) Ecojoists

Nominally 4160mm (long) x 72mm (wide) x 219mm (deep).

Top chord	72mm x 47mm TR36 R/ white wood.
Bottom chord	72mm x 47mm TR36 R / white wood.
Metal webs	V size 8. Calliper: 0.998mm

(3) Full Depth Timber Noggings

47mm (wide) x 220mm (deep).

(4) Timber Noggings

42mm (wide) x 72mm (deep).

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(5) *Chipboard flooring*

Tongued and grooved, nominally 2400mm (long) x 600mm (wide) x 22mm (thick).
All timber components were supplied by Gang-Nail Systems Limited.

Actual surface density: 17.83 kg/m^2.

Fasteners

(6) 75mm and 100mm tosh nails.
(7) 100mm round head nails.
(8) 32mm Gyproc Drywall Timber screws.
(9) 41mm Gyproc Drywall Timber screws.
(10) 51mm Gyproc Drywall Timber screws.

Miscellaneous Components

(11) Gyproc Joint Filler supplied by British Gypsum Limited.
(12) Gyproc Paper Tape supplied by British Gypsum Limited.

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 PROCEDURE

The test was conducted in accordance with BS 476: Part 21: 1987: Clause 7. The asymmetrical specimen was subjected to fire from the underside (plasterboard side), this being the required direction of fire resistance as specified in BS 476: Part 21: 1987: Clause 7.

Where areas of the test specification are ambiguous, or open to interpretation, the Fire Test Study Group Resolutions 43, 47, 50, 53, 67, 70, 71, 72, 77, 79 and 83 have been followed (where appropriate). These Resolutions provide the basis of common agreements between the fire test laboratories that are members of this group.

The test procedure used was 476/21/7 issue 1.

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

The furnace pressure was set to control at 16.3 ±2 Pascals positive with respect to atmosphere, at a point 100mm below the top of the specimen, except during the first 5 minutes of the test. The test centre is of the opinion that the fluctuations in the furnace pressure exceeding the tolerances stated in BS 476: Part 20: 1987 will not unduly influence the results of the test.
Furnace pressure data is shown in figure 6.

A total load of 18.14kN was applied to twenty-four equally distributed loading points at the request of the customer. Load calculations, supplied by the customer, can be found on pages 33 to 34.

TEST RESULTS

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

Loadbearing Capacity Failure	73 minutes	
Integrity	73 minutes	By virtue of load bearing capacity failure
Insulation	73 minutes	By virtue of load bearing capacity failure

The test was terminated at 73 minutes.

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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.

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TEST DATA

Observations

Observers: Unexposed face M Fountain
Exposed face A Richardson

Time		Observations
hours	mins	*All observations refer to the exposed face unless otherwise stated.*
	0	Test started.
	5	Paper liner discoloured.
	6	Surface of boards was flaming. Paper liner started to char. Jointing material started to char.
	10	Further charring occurred.
	15	Paper liner and jointing material had burnt away.
	17	Boards sagged slightly between fixings.
	19	Joints started to open up to approximately 2-3mm.
	20	No visible change.
	24	All gaps open to approximately 2-3mm Joint between the long edge of the left-hand 2nd and 3rd row boards open to approximately 8-10mm due to increased sagging of boards.
	25	No visible change.
	30	All gaps open to approximately 5-6mm. Boards noted at 24 minutes sagged by approximately 10-15mm along their long edges.

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Time		Observations
hours	mins	*All observations refer to the exposed face unless otherwise stated.*
	40	Joints open to approximately 10mm. Boards noted at 24 minutes sagged by approximately 20mm along their long edges.
	45	Increased sagging on all boards.
	48	Long edges of right-hand 2nd row board sagged by approximately 30mm.
	50	No visible change.
	52	Long edges of right-hand 2nd row board pulled away from fixings.
	55	No visible change.
	58	*Unexposed face* Cracking and popping noises heard from the specimen.
	59	The left-hand 2nd and 3rd row boards, noted initially at 24 minutes, pulled away from their fixings.
1	00	Part of the 3rd row board fell from the centre of the specimen, approximately 1800mm x 1200mm. Exposed 2nd layer boards flamed.
1	04	More of outer board fell from right-hand side of 3rd row.
1	05	Joint along long edge of right-hand inner layer boards open to approximately 5-10mm
1	08	Flaming around second layer joints. *Unexposed face* Cracking and popping noises heard from specimen.

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Time		Observations
hours	mins	*All observations refer to the exposed face unless otherwise stated.*
1	11	Poor visibility due to flaming. *Unexposed face* Whole floor visibly dropped.
1	12	*Unexposed face* Smoke issued from joints in chipboard walking surface.
1	13	*Unexposed face* **LOAD BEARING CAPACITY FAILURE.** The specimen failed to support the applied load. **TEST TERMINATED.**

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Furnace Temperature Graph

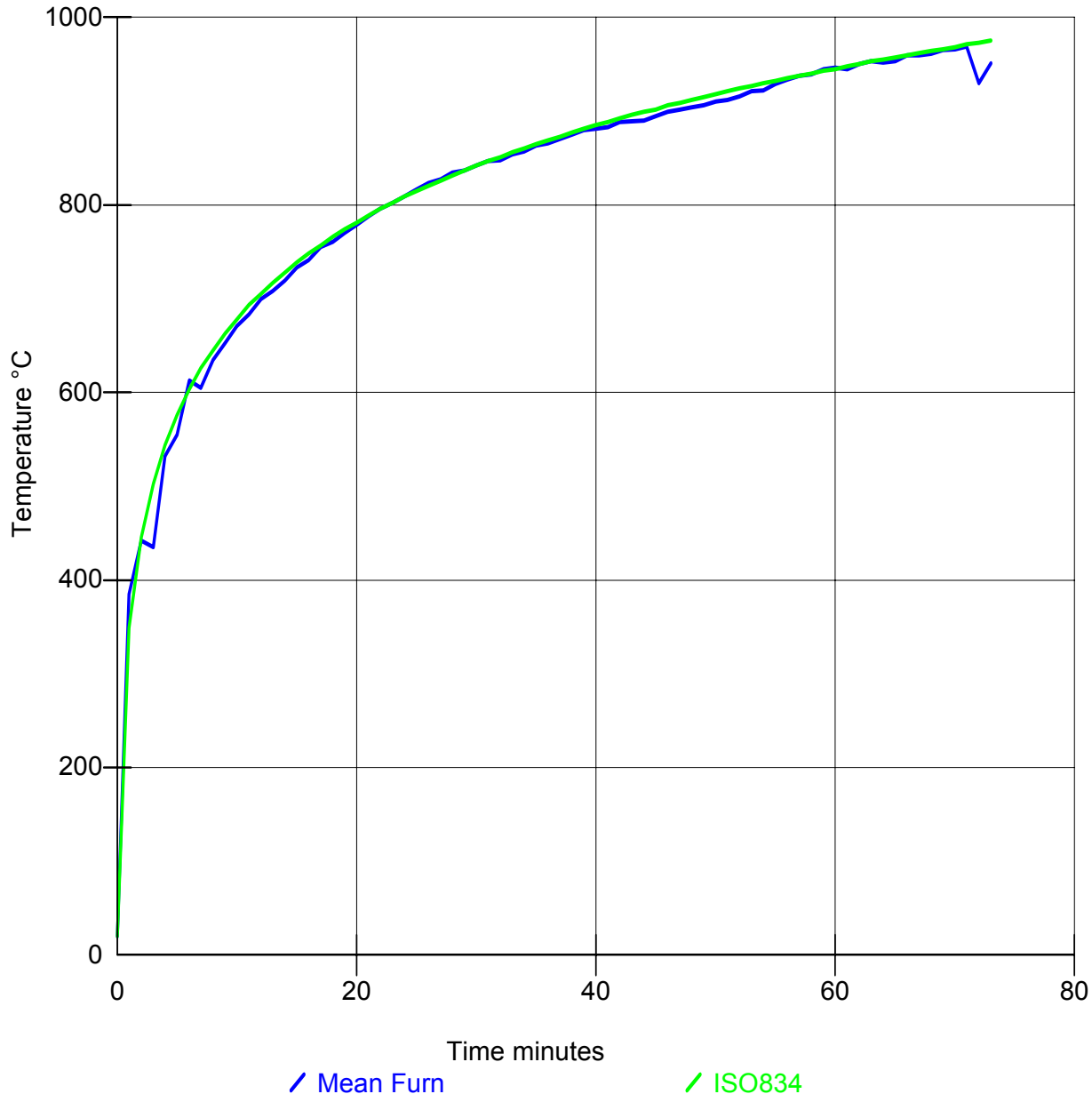

Figure 5. Furnace temperature graph.

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Furnace Pressure Graph

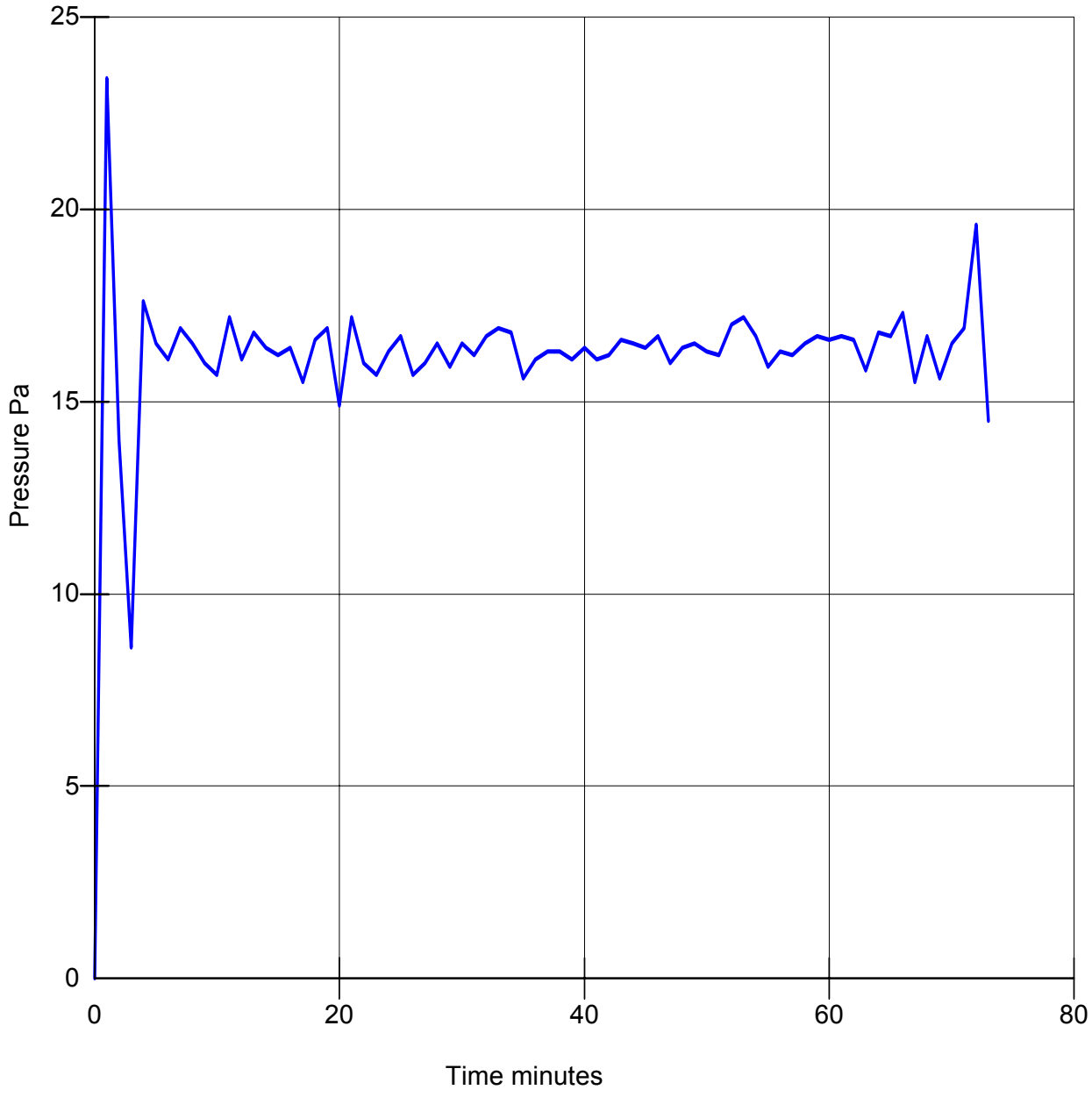

Figure 6. Furnace pressure graph.

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Unexposed Face Temperature Graph

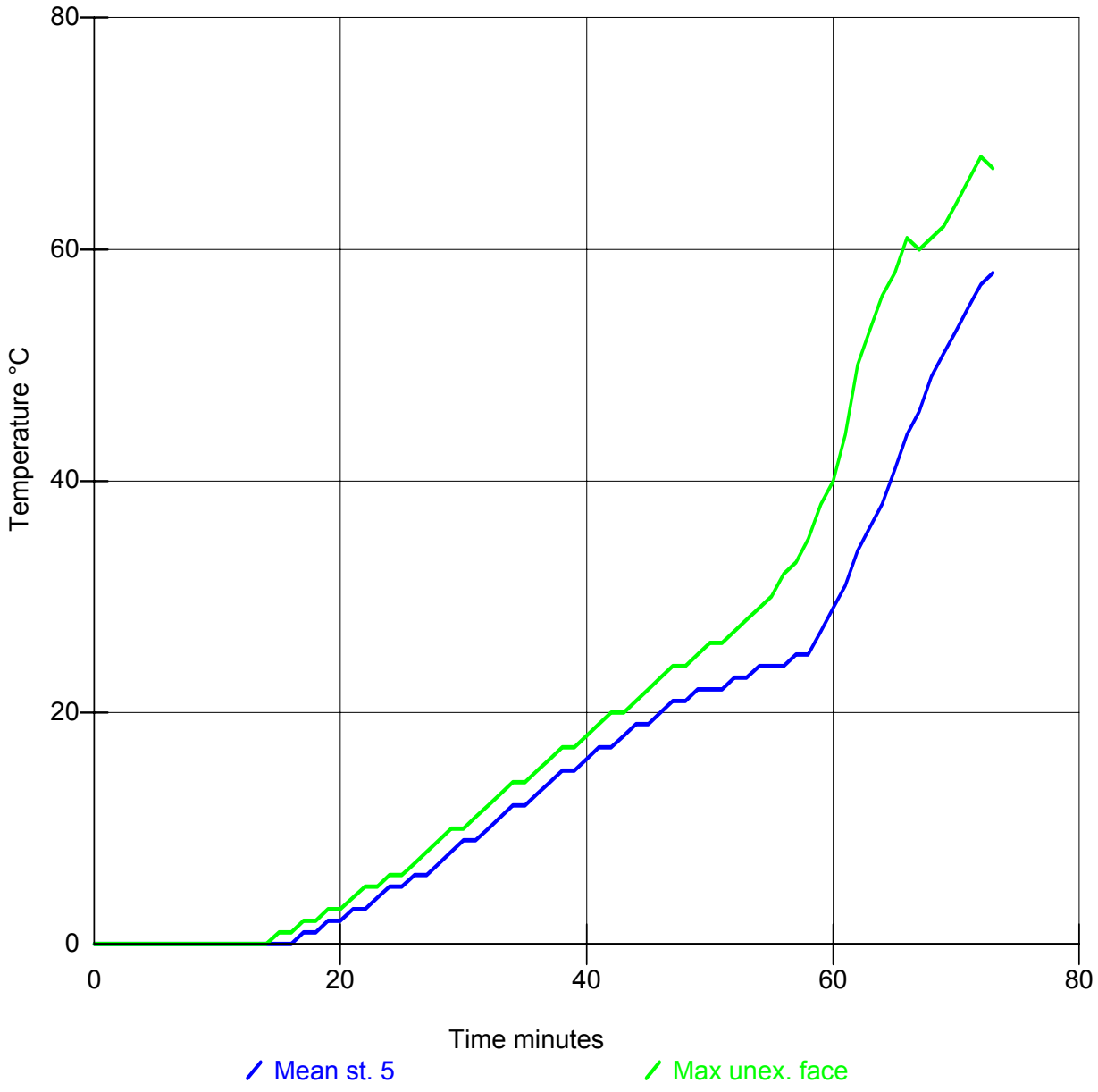

Figure 7. Unexposed face temperature graph.

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Internal Thermocouple Layout

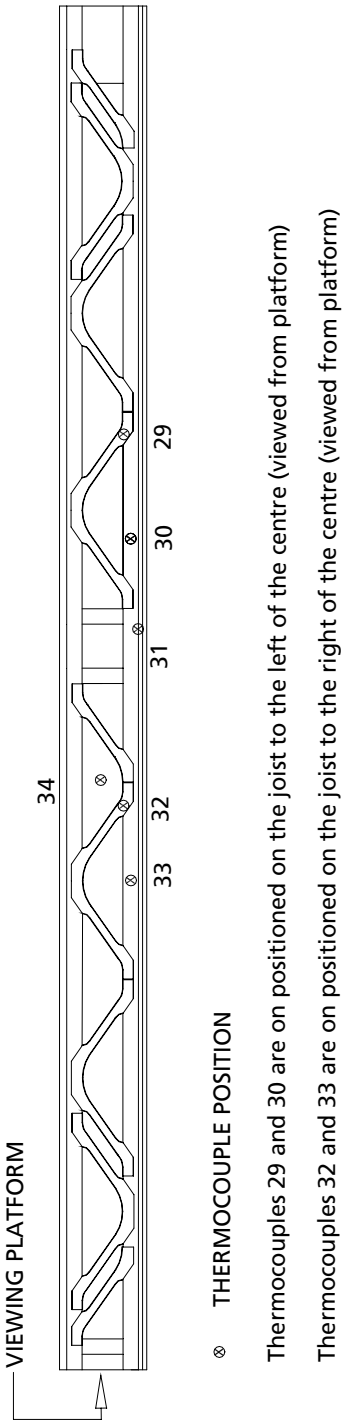

Figure 8. Internal thermocouple layout.

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Plan View Showing Thermocouple Positions

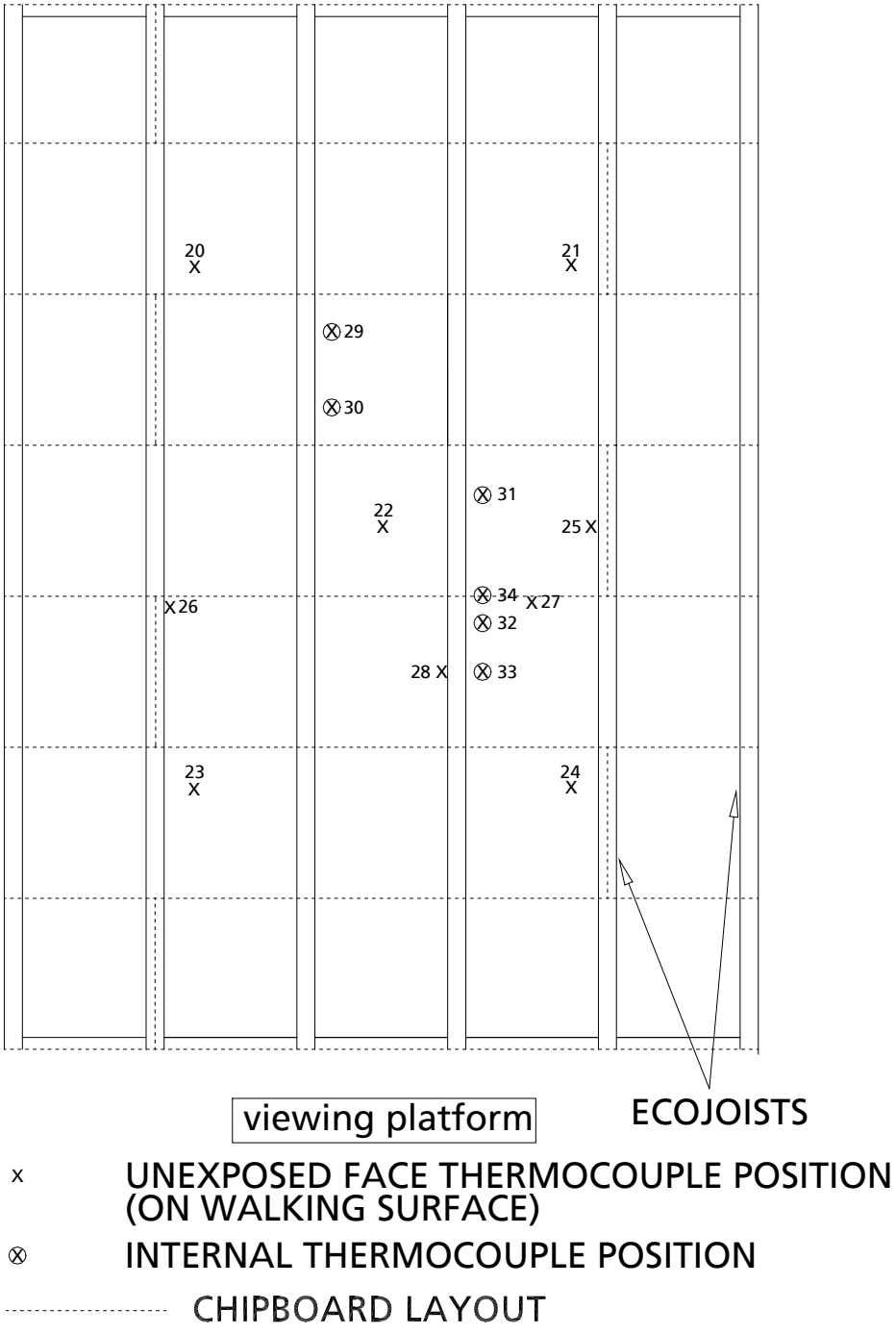

Figure 9. Plan view showing thermocouple layout.

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Unexposed Face Standard Five 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	-1	0	0	0	0
9	-1	-1	0	0	0
10	-1	0	0	0	0
11	-1	-1	0	0	0
12	-1	0	0	0	0
13	-1	0	0	0	0
14	-1	0	0	0	0
15	0	0	0	0	1
16	0	0	0	1	1
17	0	1	1	1	2
18	1	1	1	1	2
19	1	2	2	2	3
20	1	2	2	2	3
21	2	3	3	3	4
22	2	4	3	4	5
23	3	5	4	4	5
24	4	5	5	5	6
25	4	6	5	5	6
26	5	7	6	6	7
27	5	8	6	7	8
28	6	9	7	7	9
29	7	10	8	8	9
30	7	10	9	9	10
31	8	11	9	9	11
32	9	12	10	10	12
33	9	13	11	11	12
34	10	14	12	12	13
35	11	14	12	12	14

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Time (mins)	Temperature Rise (°C)				
	Thermocouple No. 20	Thermocouple No. 21	Thermocouple No. 22	Thermocouple No. 23	Thermocouple No. 24
36	11	15	13	13	15
37	12	16	14	14	15
38	13	17	14	15	16
39	13	17	15	15	17
40	14	18	16	16	18
41	15	19	16	17	18
42	15	19	17	17	19
43	16	20	18	18	20
44	17	21	18	19	21
45	17	21	19	19	21
46	18	22	19	20	22
47	18	23	20	21	23
48	19	23	21	21	23
49	19	24	21	22	24
50	20	24	22	23	24
51	20	24	22	23	25
52	21	24	22	23	25
53	21	25	23	24	26
54	22	26	23	24	26
55	22	26	23	25	26
56	23	26	24	25	26
57	23	26	25	26	27
58	23	26	25	26	29
59	24	27	27	27	33
60	24	28	28	28	38
61	25	29	31	29	44
62	26	30	33	31	50
63	27	32	36	32	53
64	29	34	39	35	56
65	30	37	43	38	58
66	32	40	48	41	61
67	35	43	52	43	60
68	37	46	57	46	61
69	39	48	61	47	62
70	42	50	64	50	62
71	44	52	66	52	62
72	47	54	67	54	63
73	50	57	65	56	64

See figures 8 and 9 for the locations of the thermocouples.

Customer: **Gang-Nail Systems Limited**

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Additional Unexposed Face Thermocouple Data

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

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Time (mins)	Temperature Rise (°C)			
	Thermocouple No. 25	Thermocouple No. 26	Thermocouple No. 27	Thermocouple No. 28
36	14	12	15	12
37	15	14	16	12
38	16	15	16	13
39	16	16	17	14
40	17	17	18	15
41	18	17	19	15
42	18	19	20	16
43	19	19	20	17
44	20	20	21	17
45	20	21	22	18
46	21	22	23	19
47	21	23	24	19
48	22	23	24	20
49	22	24	25	20
50	23	25	26	21
51	23	25	26	21
52	23	26	27	22
53	24	27	28	22
54	24	27	29	23
55	24	28	30	23
56	25	29	32	24
57	25	29	33	24
58	25	30	35	25
59	26	32	38	26
60	26	34	40	27
61	26	36	43	28
62	27	39	46	30
63	28	41	49	32
64	29	44	51	35
65	31	47	53	38
66	33	49	55	42
67	35	51	56	45
68	38	53	57	50
69	42	55	58	55
70	47	57	58	60
71	52	58	59	64
72	64	63	59	68
73	67	63	61	67

See figures 8 and 9 for the locations of the thermocouples.

Customer: **Gang-Nail Systems Limited**

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Internal Thermocouple Data

Time (mins)	Actual Temperature (°C)					
	Thermo-couple No. 29	Thermo-couple No. 30	Thermo-couple No. 31	Thermo-couple No. 32	Thermo-couple No. 33	Thermo-couple No. 34
	Metal web	Lower chord	Upper surface of inner layer of FireLine	Metal web	Lower chord	Mid-height of cavity
0	16	16	16	16	15	17
1	16	15	16	15	15	17
2	16	15	16	15	15	16
3	16	16	17	15	15	17
4	16	16	19	16	16	17
5	17	16	24	16	16	19
6	17	17	32	16	17	23
7	18	19	41	18	19	28
8	21	21	51	22	23	33
9	24	24	60	26	26	38
10	28	28	67	32	30	44
11	33	33	73	37	34	49
12	38	37	77	42	39	53
13	42	41	79	47	43	56
14	46	44	80	51	48	58
15	50	46	82	55	51	61
16	53	50	83	58	55	63
17	56	52	83	60	58	65
18	59	54	84	62	60	66
19	61	57	85	64	63	68
20	63	59	87	66	65	70
21	65	61	90	68	68	71
22	67	65	92	70	72	73
23	70	68	93	73	74	75
24	73	71	94	75	77	79
25	75	73	94	77	78	81
26	77	74	95	79	81	84
27	79	76	96	81	83	86
28	81	78	97	82	85	89
29	83	80	98	84	86	84

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Time (mins)	Actual Temperature (°C)					
	Thermo-couple No. 29	Thermo-couple No. 30	Thermo-couple No. 31	Thermo-couple No. 32	Thermo-couple No. 33	Thermo-couple No. 34
	Metal web	Lower chord	Upper surface of inner layer of FireLine	Metal web	Lower chord	Mid-height of cavity
30	84	82	100	86	88	85
31	85	84	103	87	89	87
32	87	86	108	88	90	88
33	88	87	112	89	92	90
34	89	88	115	90	92	91
35	90	89	117	91	93	92
36	91	91	118	92	93	93
37	92	92	119	92	94	93
38	93	93	120	93	94	94
39	93	93	120	93	95	95
40	93	93	121	94	95	96
41	94	93	122	94	96	107
42	94	94	122	94	96	109
43	94	94	124	95	96	112
44	94	94	125	95	96	112
45	94	94	128	95	96	113
46	95	94	131	95	96	116
47	95	94	136	96	97	121
48	95	94	143	96	97	128
49	95	94	160	96	97	137
50	95	94	172	97	98	148
51	95	94	190	97	99	161
52	95	94	215	98	102	172
53	95	95	235	100	110	182
54	96	95	252	102	118	191
55	97	96	268	104	125	198
56	98	98	281	108	132	208
57	99	100	293	112	140	218
58	100	101	303	117	148	225
59	102	102	313	124	156	235
60	106	106	322	131	166	243
61	119	125	330	138	175	252

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Time (mins)	Actual Temperature (°C)					
	Thermo-couple No. 29	Thermo-couple No. 30	Thermo-couple No. 31	Thermo-couple No. 32	Thermo-couple No. 33	Thermo-couple No. 34
	Metal web	Lower chord	Upper surface of inner layer of FireLine	Metal web	Lower chord	Mid-height of cavity
62	143	149	338	146	185	266
63	161	168	346	155	195	288
64	178	188	354	164	206	321
65	198	210	367	176	217	340
66	220	230	399	193	231	355
67	237	244	433	212	250	367
68	252	259	460	233	271	379
69	266	274	478	255	288	386
70	283	290	490	272	304	404
71	300	304	502	289	321	413
72	803	748	831	484	672	877
73	843	845	797	669	832	914

See figures 8 and 9 for the locations of the thermocouples.

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Specimen Deflection Data

Time (mins)	Vertical Deflection (mm)	Rate of Vertical Deflection (mm/min)
0	-0.8	0.0
1	0.1	0.9
2	1.1	1.0
3	0.9	-0.2
4	1.0	0.1
5	0.9	-0.1
6	0.9	0.0
7	0.9	0.0
8	0.9	0.0
9	1.1	0.2
10	1.2	0.1
11	1.4	0.2
12	1.6	0.2
13	1.9	0.3
14	2.2	0.3
15	2.4	0.2
16	2.7	0.3
17	2.9	0.2
18	3.2	0.3
19	3.4	0.2
20	3.6	0.2
21	3.9	0.3
22	4.4	0.5
23	4.3	-0.1
24	4.6	0.3
25	4.8	0.2
26	5.4	0.6
27	5.4	0.0
28	5.8	0.4
29	6.0	0.2
30	6.4	0.4
31	6.7	0.3
32	7.0	0.3
33	7.3	0.3
34	7.7	0.4
35	8.0	0.3
36	8.4	0.4

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Time (mins)	Vertical Deflection (mm)	Rate of Vertical Deflection (mm/min)
37	8.8	0.4
38	9.2	0.4
39	9.5	0.3
40	9.9	0.4
41	10.2	0.3
42	10.5	0.3
43	10.9	0.4
44	11.2	0.3
45	11.5	0.3
46	11.8	0.3
47	12.1	0.3
48	12.5	0.4
49	12.8	0.3
50	13.2	0.4
51	13.6	0.4
52	13.9	0.3
53	14.4	0.5
54	14.8	0.4
55	15.3	0.5
56	15.7	0.4
57	16.2	0.5
58	16.7	0.5
59	17.2	0.5
60	17.8	0.6
61	18.2	0.4
62	19.2	1.0
63	19.9	0.7
64	20.3	0.4
65	21.4	1.1
66	22.2	0.8
67	24.1	1.9
68	25.8	1.7
69	28.0	2.2
70	30.0	2.0
71	32.5	2.5
72	56.3	23.8
73	82.4	26.1

The deflection was measured at the approximate centre of the specimen.
Positive values indicate deflection in the direction of the load.

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LOADING CALCULATIONS

The dead load was applied by dividing the floor are of 4m x 3m into 6 x 4 matrix of equal rectangles creating 24 uniformly distributed point loads, the load being applied to each geometric centre of each rectangle. This takes no account of joist positions. The test load was calculated based on the joist carrying the heaviest load being subjected to the maximum allowable stress, in accordance with BS 5268: Part 2: 1996.
NOTE: Final loading value was calculated using unrounded intermediate results.

1. Weights and densities of materials used in construction

Joist data:	Weight per unit length	=	4.50 kg/m
Walking Surface:	Weight per unit area	=	14.86 kg/m^2
Ceiling:	Weight per unit area	=	19.78 kg/m^2

2. Required Loading

Total loading	2.300 kN/m^2
Dead load	0.413 kN/m^2
Required applied load	1.89 kN/m^2
	1.134 kN/m

3. Joist reactions

Load points	Joist number and distances between load points and joists (mm)							
	1	2	3	4	5	6	7	8
First left	0	0	600	600	600	600		
Second left	0	0	0	0	0	0		
First right	600	600	600	600	0	0		
Second right	0	0	0	0	0	0		
TOTAL =	0	0.5	1.0	1.0	0.5	0		

Max. joist load = 1.00 x P where P is point load

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Considering the position of the 4 rows of point loads and the resulting joist reactions, the worst affected joist will carry a load of 1.0 x P.

Hence applied load required	=	1.0 x P
		1.134 kN/m (0.6mm c/c)
and 4P		4.536 kN/m
Total floor load		4P x clear span (4.0m)
		18.14kN
Therefore total weight per foot	=	$\frac{1850}{6}$
	=	308 kg

The accuracy of the individual dead weights used in the test were within the tolerance stated in BS 476: Part 21 :1987: Clause 7.

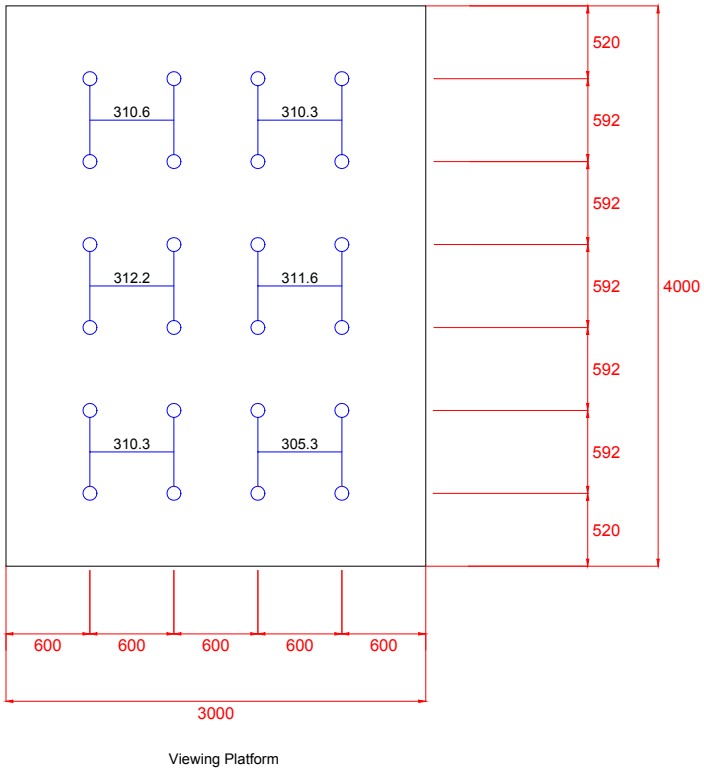

Figure 10. Layout of the actual dead load weights.

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Design Calculations
(supplied by the customer)

Beam Dimensions

Span no.	Span	Centre Line	Overall Chase Width
1	4160.0mm	2080.0mm	274.24mm

Depth	219.0mm	Spacing: 600mm	1 ply

Materials

Top chord	72 x 47 TR26 R / WWOOD
Bottom chord	72 x 47 TR26 R / WWOOD
Webs V size 8	

Loading

Standard uniform loading (N/m^2)

Top chord dead load	200.00
Top chord live load	1800.00
Bottom chord dead load	200.00
Self weight	100.00

Axial Forces (L to R)

Top chord		Bottom chord		Webs				Reactions	
T1	-7777	B1	0	W1	-2870	W9	-907	R1	2870N
T2	-14787	B2	12756	W2	5336	W10	907	R2	2870N
T3	-17770	B3	16819	W3	-5453	W11	-2567		
T4	-18011	B4	17770	W4	2343	W12	2567		
T5	-17224	B5	18011	W5	-2343	W13	5590		
T6	-14211	B6	16437	W6	1098	W14	5470		
T7	-6882	B7	11985	W7	-547	W15	-2870		
		B8	0	W8	-151				

*** Hold beam in line at ends ***

WEB REINFORCEMENTS
Adjustable End Block Reinforcement

from	0.00 to	235.00
NI	0.00 (For a single block)	

Customer: **Gang-Nail Systems Limited**

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Joint Forces

Distance L to R	Moment (Nmm)	Shear Force (N) Left	Right
		0.0	0.0
150		0.0	2225.2
550	1337709	2225.2	2225.2
935	2193993	2225.2	1166.6
1235	2543392	1166.6	1166.6
1534	2892791	1166.6	546.6
1834	3056511	546.6	150.8
2180	3097856	150.8	-451.8
2407	2962552	-451.8	-451.8
2707	2827248	-451.8	-1278.4
3006	2444371	-1278.4	-1278.4
3306	2061494	-1278.4	-2281.0
3691	1183703	-2281.0	-2281.0
4091		-2281.0	0.0
4160		0.0	0.0

Critical Panel Analysis

	Panel	Pitch	Effec. Length	Axial	Bending	Permissible Axial	Bending	Stress Axial	Factor Bend	Total
Top	4	0.0	599	18011	31325	8.20	10.00	0.804	0.092	0.895
Bottom	5	0.0	684	18011	7632	6.00	10.00	0.689	0.025	0.714

Deflection Analysis

Dead Load Deflection	2.539 mm
Total Deflection	11.680 mm
Permissible Deflection	12.480 mm

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PHOTOGRAPHS

Photograph 1. End view of Ecojoist.

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Photograph 2. Ecojoist.

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Photograph 3. End view of Ecojoist.

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Photograph 4. Ecojoists positioned across the 4m length of the test frame.

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Photograph 5. Ecojoists in position with chipboard walking surface being fixed into position.

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Photograph 6. View from below, before FireLine boards and noggings were attached.

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Photograph 7. Exposed face of specimen prior to test.

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Photograph 8. Unexposed face of specimen prior to test.

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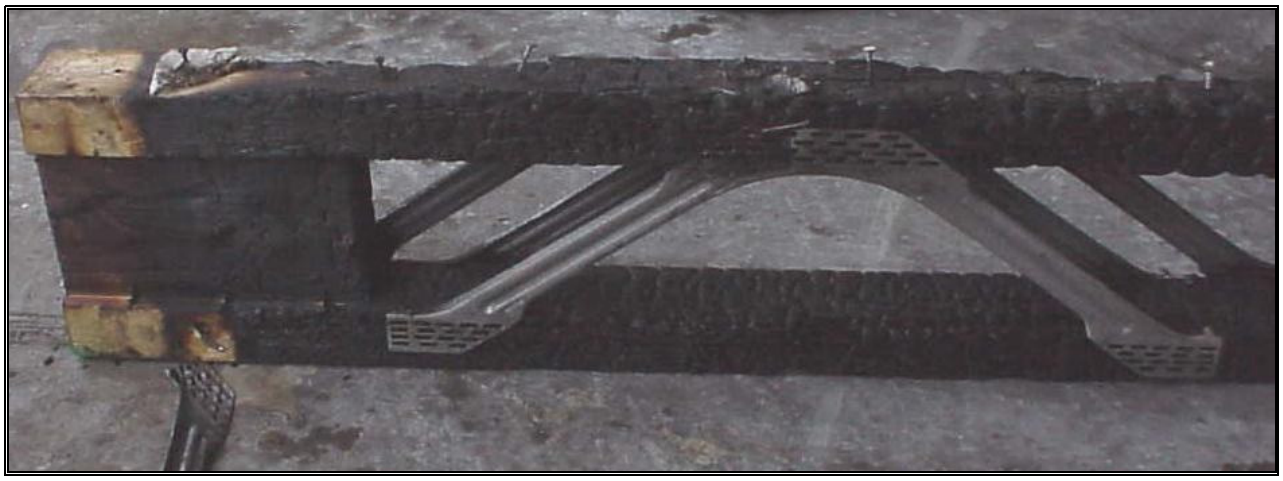

Photograph 9. Joist after test, showing extent of damage (the other joists were in a worse condition than this one, but had fallen into the furnace).

Photograph 10. The same joist as above.