The Building Test Centre
Fire Acoustics Structures

The Building Test Centre
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Report Number **BTC 17747F**

A FIRE RESISTANCE TEST ON A LOADBEARING TIMBER JOIST FLOOR INCORPORATING 4200mm x 245mm x 45mm SOLID JOISTS PROTECTED BY A DOUBLE LAYER OF 15mm GYPROC FIRELINE INCORPORATING NINE DOWNLIGHTERS, CONDUCTED IN ACCORDANCE WITH BS 476: PART 21: 1987: CLAUSE 7.

Test Date: 2nd February 2012

www.btconline.co.uk

Customer: **Tlc Southern Limited**
The Tlc Building
Fleming Way
Crawley
West Sussex
RH10 9JY

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1. FOREWORD

This test report details a fire resistance test conducted on a full scale horizontal loaded timber joist floor. The test sponsor was Tlc Southern Limited.

The test specimen was installed by Alltone Limited. The construction of the specimen took place on the 30th and 31st January 2012. The Building Test Centre played no role in the design or selection of materials comprising the test specimen.

The test was conducted on the 2nd February 2012.

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.

2. REPORT AUTHORISATION

Report Author	Authorised by P.P.
Liam Woodford Technologist	**Paul Miller** BSc. (Hons.) Fire Test Manager

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3. TEST REPORT AMENDMENTS

Page	Amendments	Date

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4. TEST CONSTRUCTION

4.1 Description of Construction

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

245mm x 45mm C16 grade softwood joists were placed, nominally, at 450mm centres, spanning 4000mm length of the test frame. Full-depth noggings were fixed at each end of the joists (within the test aperture) with 3 inch nails. 38mm x 38mm noggings were fixed between the joists to coincide with the outer layer board joints using 3 inch nails.

The tops of the joists were covered with a walking surface of 22mm tongue and groove chipboard flooring (nominally 2400mm long x 600mm wide) which was fixed using 51mm drywall timber screws at 300mm centres.

The underside of the floor was lined with a double layer of 15mm Gyproc FireLine, (nominally 2400mm long x 1200mm wide).

The inner layer was fixed using 51mm Drywall timber screws at 230mm centres.

The outer layer was fixed using 60mm Drywall timber screws at 230mm centres.

All board joints were staggered between layers.

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

Nine downlighters were incorporated into the ceiling. A 64mm diameter hole was cut into the plasterboards to accommodate all of the downlighters. Downlighter LTERD 12WW was positioned at D. Downlighters LTFRD 12WW were positioned at F and G. Downlighters LTFRD 12W were positioned at I and J. Four additional downlighters were positioned into the specimen at positions A, B, C and H.

See figure 7 for the positions of each downlighter.

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4.2 Test Construction Drawings

4.2.1 Horizontal Cross Section

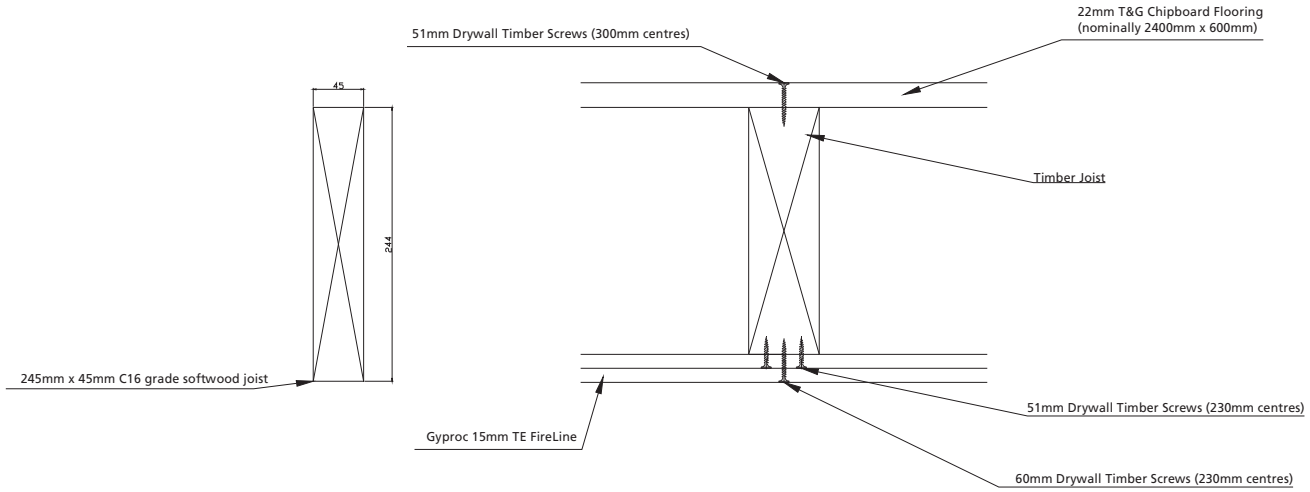

Figure 1 – Horizontal cross section

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4.2.2 Exposed Face Elevation

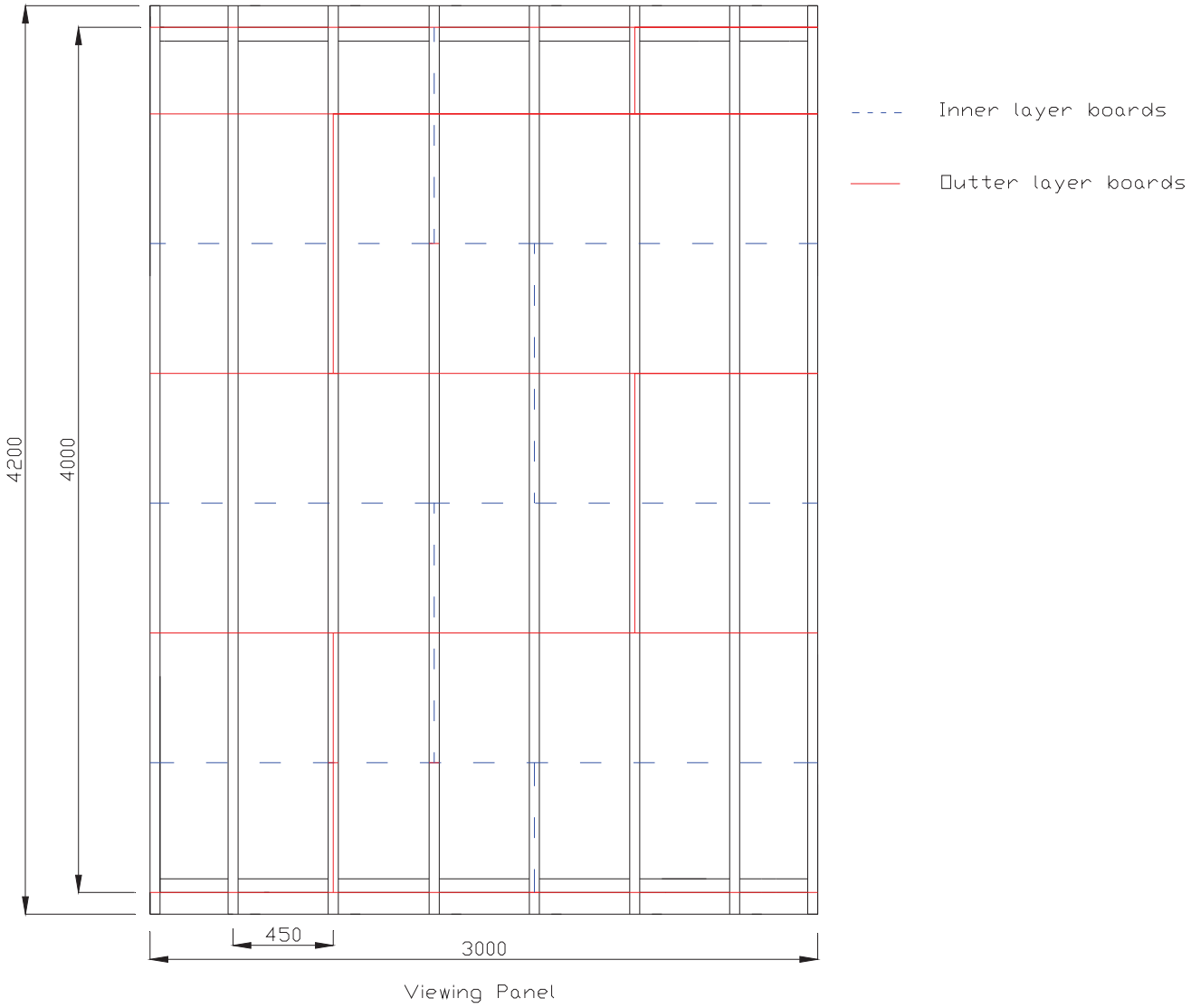

Figure 2 – Exposed Face Elevation

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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5. TEST MATERIALS

5.1 Gyproc FireLine

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

Measured surface density:	13.9kg/m^2
Measured thickness:	15.5mm
Board identification numbers:	18 355 11 04:42
	18 355 11 04:42
	18 355 11 04:42
Measured moisture content:	0.36%

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

Material dimensions were measured by The Building Test Centre.

5.2 Joists

ii) Nominally, 4200mm (long) x 244mm (deep) x 47mm (wide), C16 grade softwood joists, supplied by The Building Test Centre. (38mm x 38mm noggings were also made from the same grade softwood)

Measured dimensions:	4208mm x 245mm x 45mm
Mass per joist:	23.30kg
Measured moisture content:	19.00%

The surface density and thickness were calculated using a selection of timber used in the test specimen. The moisture content of the timber joists and flooring was determined using samples dried to constant weight in an oven at 102°C.

All joists supplied by Alltone.

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5.3 Chipboard Tongue and Groove Flooring

iii) Nominally 2400mm (long) x 600mm (wide) x 22mm (thick), supplied by The Building Test Centre.

Measured surface density:	13.9 kg/m^2
Measured thickness:	22mm
Measure moisture content:	7.15%

The surface density and thickness were calculated using a selection of timber used in the test specimen. The moisture content of the timber joists and flooring was determined using samples dried to constant weight in an oven at 102°C.

All chipboard tongue and groove flooring supplied by Alltone.

5.4 Fasteners

iv) 51mm Gyproc Drywall Timber Screws
v) 60mm Gyproc Drywall Timber Screws
vi) 3inch nails

All fasteners supplied by The Building Test Centre.

5.5 Miscellaneous Components

vii) Gyproc Joint Filler
viii) Gyproc Paper Tape
ix) Gyproc Bonding Coat

All miscellaneous components supplied by The Building Test Centre.

5.6 Downlighters

x) LT FRD 12 WW (two included)
xi) LT FRD 12 W (two included)
xii) LT ERD 12 WW
xiii) Four additional downlighters were positioned into the specimen

All Downlighters were supplied by Far Eastern Manufacturing Ltd

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6. TEST PROCEDURE

The test was conducted fully 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, which 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 10°C.

The furnace pressure was set to control at 18 ± 2 Pa positive with respect to atmosphere, at the top of the specimen. Furnace pressure data is shown in figure 4.

A total load of 18kN (1.5kN/m^2) was applied to 36 equally distributed loading points. Loading requirements were supplied by the sponsor.

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7. TEST RESULTS

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

Loadbearing Capacity:	No Failure
Integrity:	No Failure
Insulation:	No Failure

The test was terminated at 118 minutes at the request of the laboratory.

8. 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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9. TEST DATA

9.1 Observations

Observers: Unexposed face L Cooper, J Lucas
Exposed face L Woodford

Time		*Observations* All observations refer to the exposed face unless otherwise stated.
Hrs	mins	
0	0	Test started.
0	10	Jointing material was flaking away. Board face papers charred. All downlighters had darkened.
0	20	Glass had fallen into furnace from downlighters F and G. Bezel on downlighter B had fallen into furnace.
0	26	Glass had fallen into furnace from downlighters B, D, H, I and J. Bezel on downlighter G had fallen into furnace.
0	30	Board joints had opened to approximately 3-5mm. Bezel on downlighters I and J had fallen into furnace.
0	38	Bezel on downlighters A, D, F and H had fallen into furnace. Glass had fallen into furnace from all downlighters.
0	40	Bezel on all downlighters had fallen into furnace. Intumescents on all downlighters had activated.
0	50	Board joints had opened to approximately 5-8mm.
1	00	No visible change.
1	10	Constant flaming from downlighters F and I.
1	17	Downlighter G had fallen into the furnace.

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Time		*Observations* All observations refer to the exposed face unless otherwise stated.
Hrs	mins	
1	20	Constant flaming from downlighter B. Constant flaming through joint dividing the two centre boards.
1	23	Downlighter C had fallen into the furnace.
1	26	Downlighter J had fallen into the furnace.
1	30	Cracking noises heard from inside furnace. Boards bowing into furnace between screw head's.
1	35	Board joints had opened to approximately 10mm. *Unexposed face* Heavy smoke emissions from perimeter of specimen.
1	36	*Unexposed face* Cracking noises heard from specimen.
1	39	*Unexposed face* Further cracking noises heard from specimen.
1	40	Board joints had opened to approximately 15-18mm. Downlighter I had fallen into the furnace. *Unexposed face* Cracking noises increased. Smoke emissions increased. Visible bow into furnace approximately 800mm from four meter, right-hand side edge, down length of specimen.
1	43	First layer board fall, section around downlighter I, piece approximately 1200mm (long) x 900mm (wide). Second layer board joints had opened to approximately 8-10mm.

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Time		*Observations* All observations refer to the exposed face unless otherwise stated.
Hrs	mins	
1	45	First layer board fall, section around downlighter H, piece approximately 1200mm (long) x 1200mm (wide). First layer board fall, section around downlighter G, piece approximately 1200mm (long x 900mm (wide).
1	50	Second layer board joint dividing the two centre boards had opened to approximately 50mm. *Unexposed face* Smoke increased.
1	51	Second layer board fall, right-hand side of centre board, piece approximately 900mm (long) x 1200mm (wide).
1	52	No visibility inside furnace.
1	53	*Unexposed face* Visible smoke through board joints and boards separating.
1	55	*Unexposed face* Dense black smoke from specimen.
1	58	**TEST TERMINATED** at the request of the laboratory.

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9.2 Furnace Temperature Graph

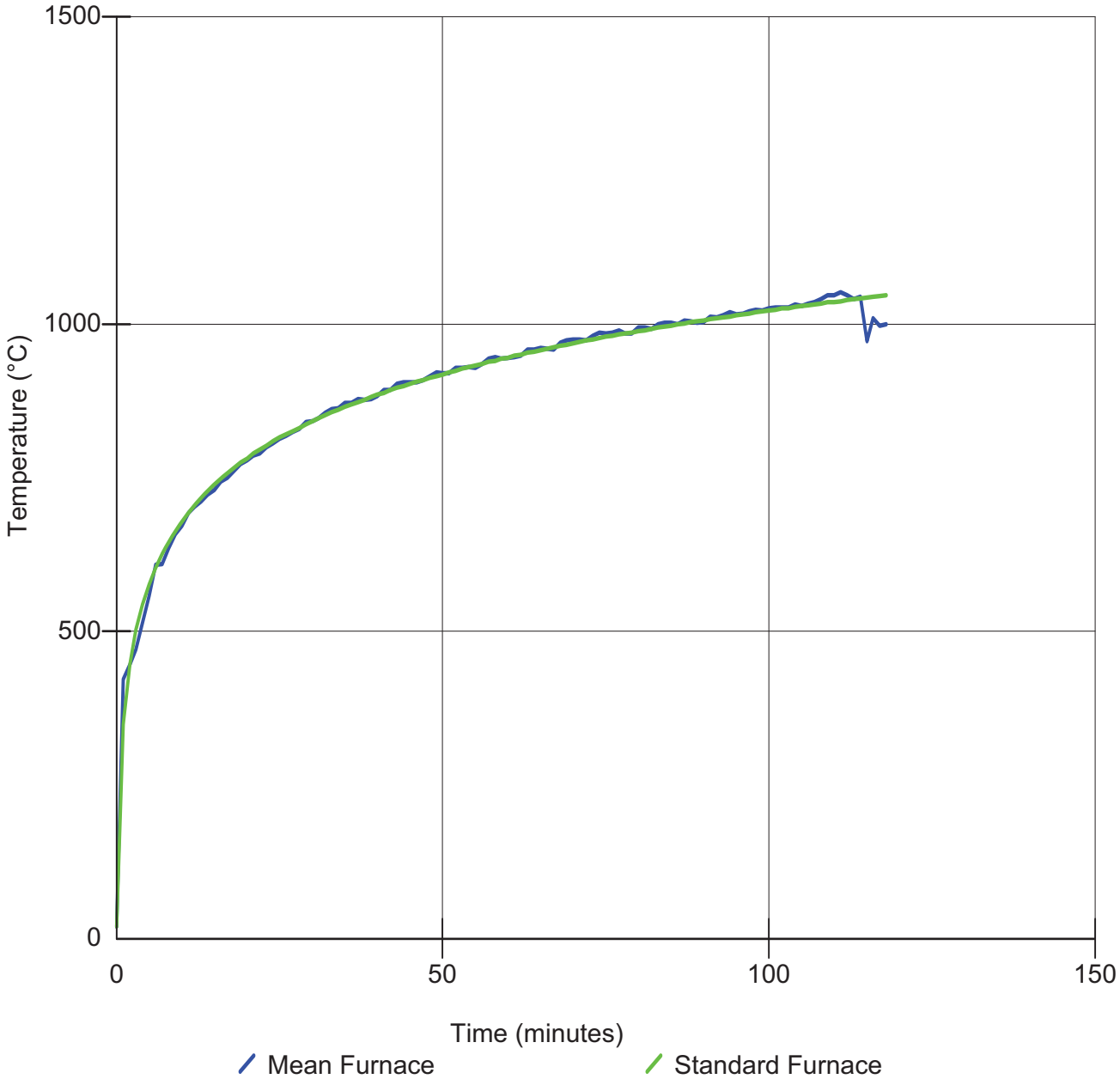

Figure 3 – Furnace temperature graph

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9.3 Furnace Pressure Graph

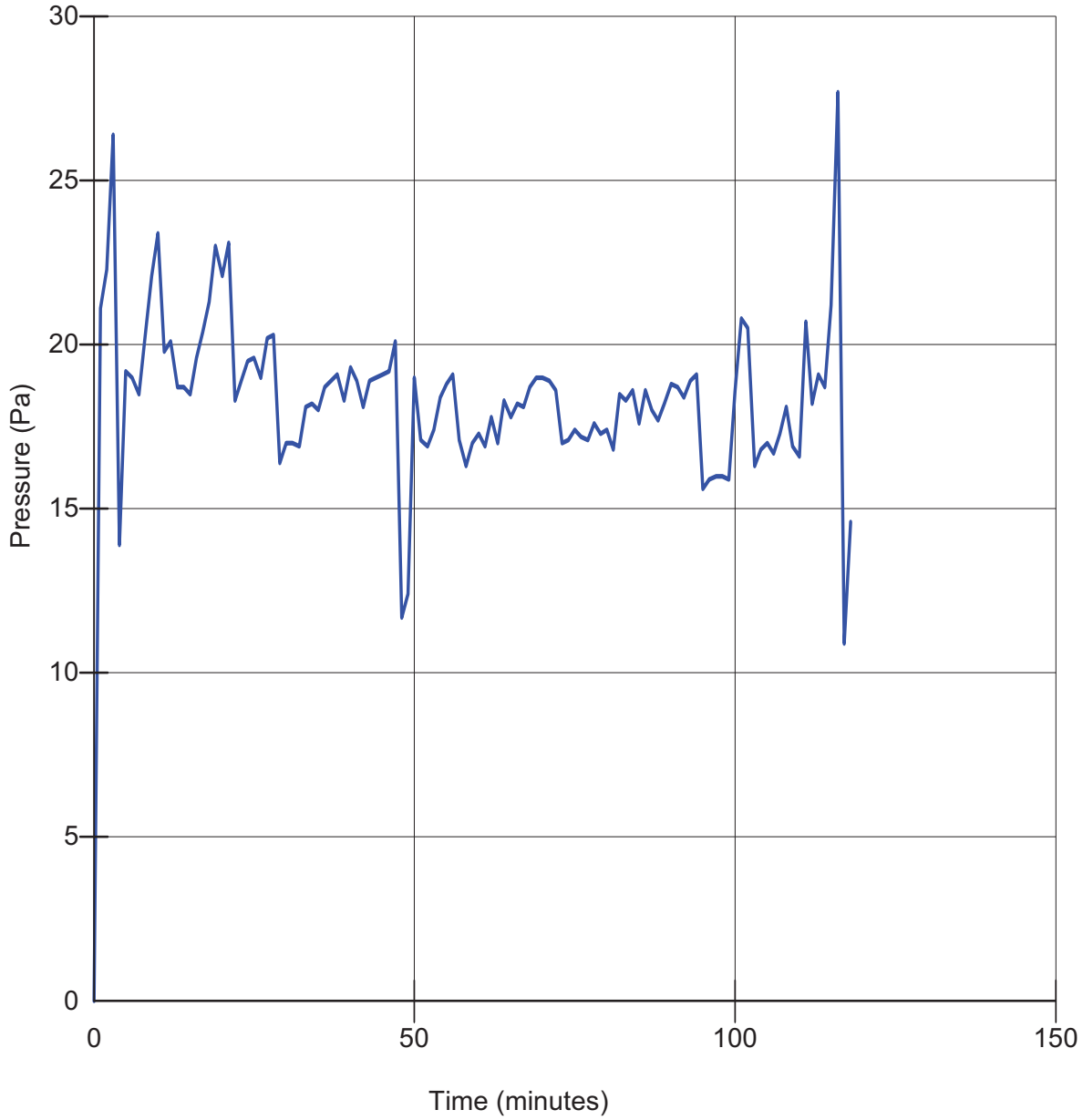

Figure 4 – Furnace pressure graph
The furnace pressure was set to control at 18 ± 2 Pa positive with respect to atmosphere, at the top of the specimen.

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9.4 Unexposed Face Temperature Graph

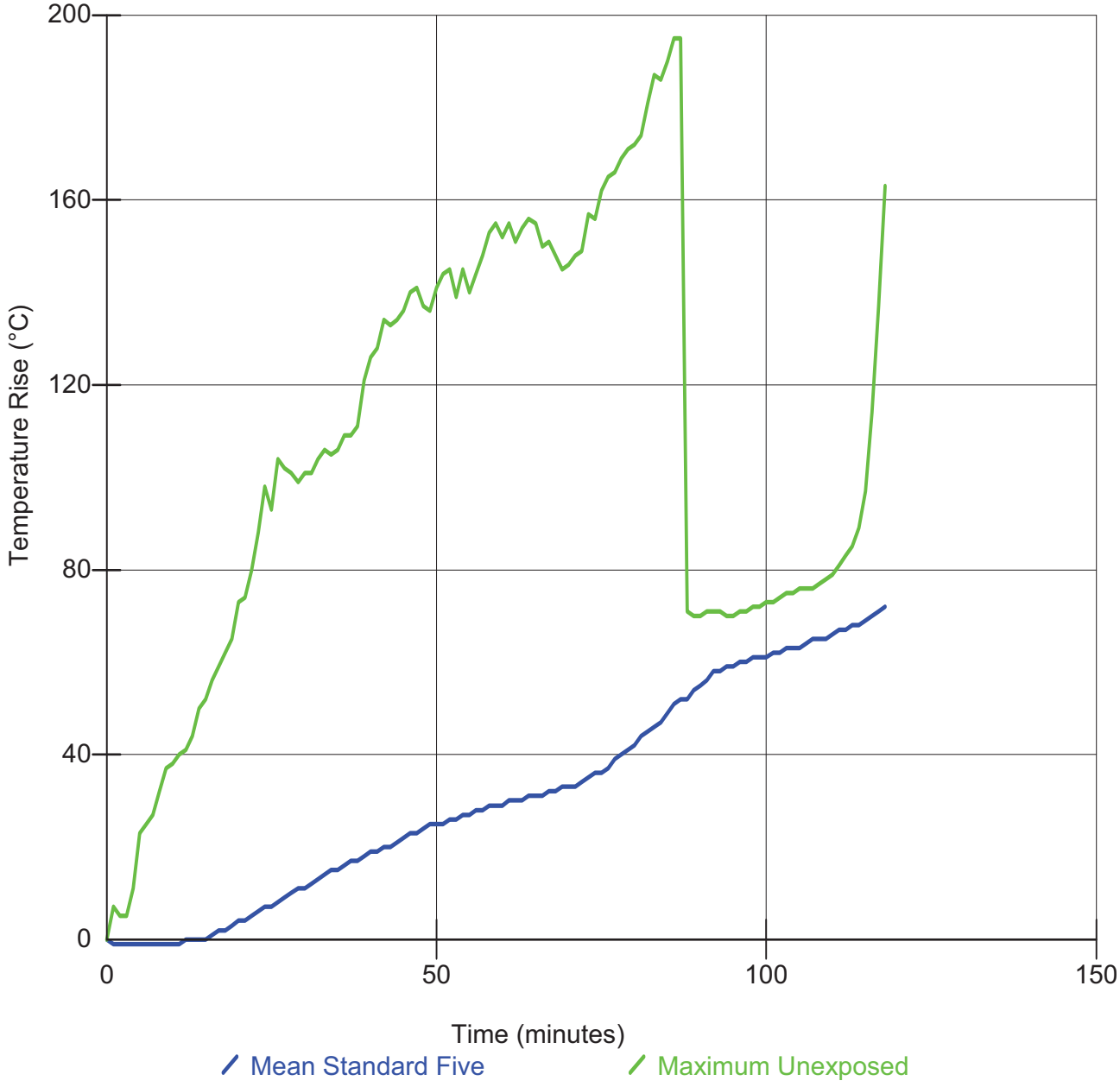

Figure 5 – Unexposed face temperature graph

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9.5 Unexposed Face Thermocouple Layout

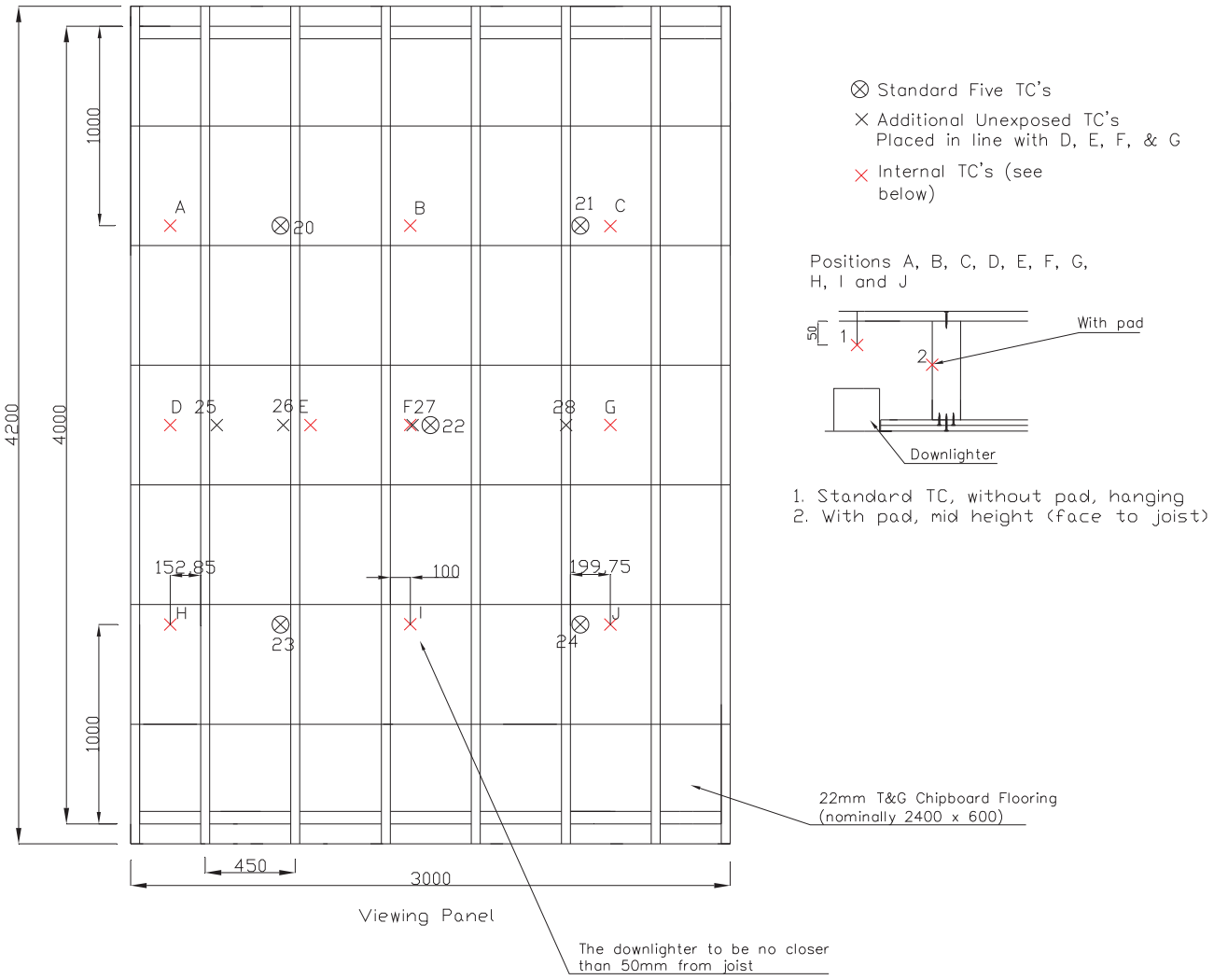

Figure 6 – Unexposed face thermocouple layout

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9.6 Unexposed Face Downlighter Layout

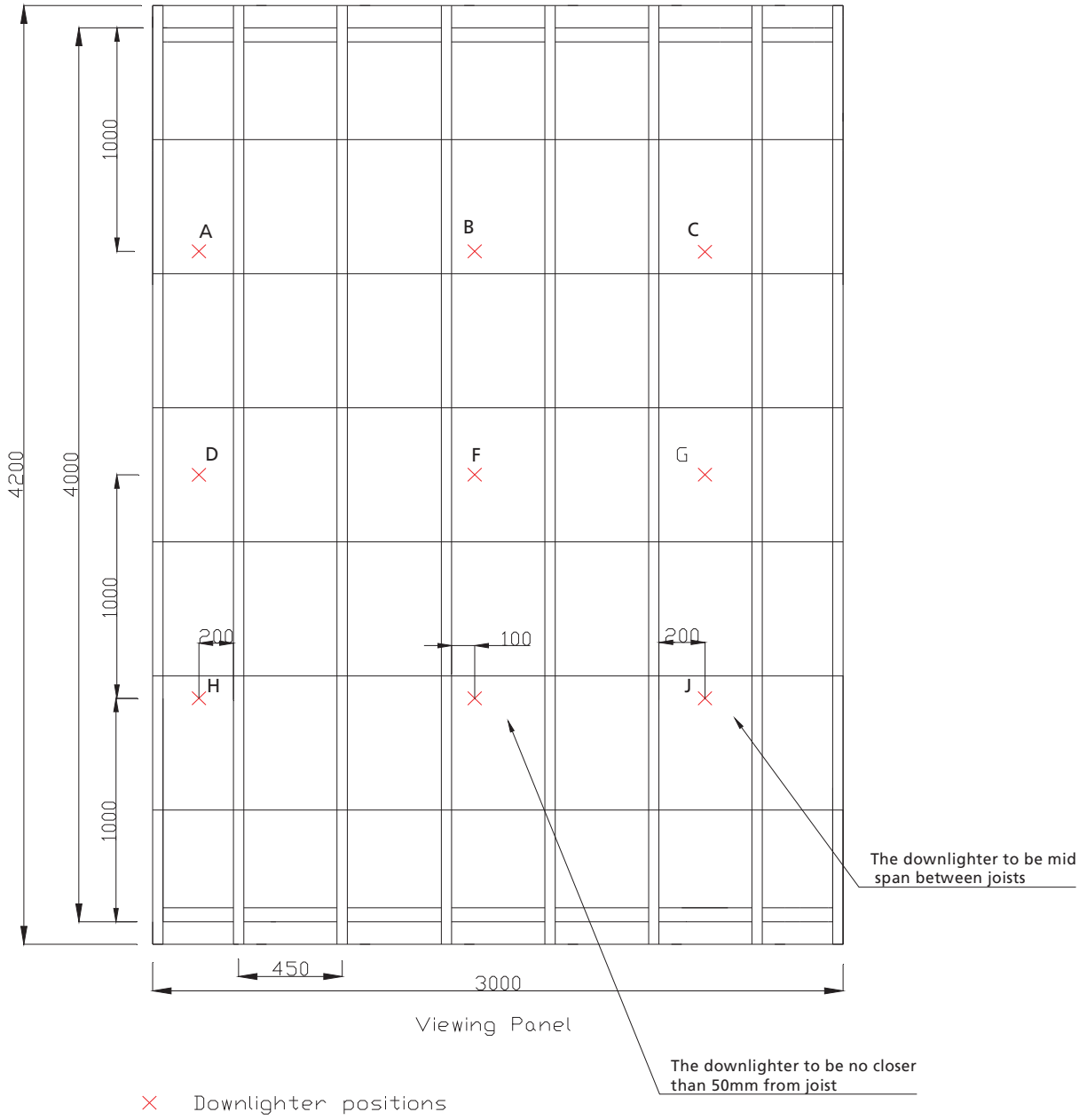

Figure 7 – Unexposed face downlighter layout

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9.7 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	Mean Standard 5
0	0	0	0	0	0	0
1	-1	0	0	0	0	-1
2	-1	-1	0	0	-1	-1
3	-1	0	0	0	0	-1
4	0	0	0	0	-1	-1
5	-1	0	0	0	-1	-1
6	-1	0	0	0	-1	-1
7	-1	0	0	0	-1	-1
8	-1	0	0	0	0	-1
9	-1	0	0	-1	0	-1
10	0	0	0	-1	0	-1
11	0	-1	0	0	0	-1
12	0	0	1	0	0	0
13	0	0	1	0	1	0
14	1	0	1	0	1	0
15	1	0	1	0	2	0
16	2	0	2	1	2	1
17	2	1	3	1	3	2
18	3	1	3	1	3	2
19	4	2	4	2	4	3
20	5	3	5	3	5	4
21	6	3	5	4	5	4
22	7	4	6	4	6	5
23	8	4	7	5	7	6
24	9	5	8	6	8	7
25	10	6	8	7	8	7
26	11	7	9	8	9	8
27	12	7	10	9	10	9
28	12	8	11	10	11	10
29	13	9	12	11	12	11
30	14	9	12	12	12	11
31	15	10	13	13	13	12
32	16	11	14	14	14	13
33	16	12	15	15	15	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	Mean Standard 5
34	17	12	15	15	16	15
35	18	12	16	16	17	15
36	18	13	17	17	18	16
37	19	13	18	18	19	17
38	19	14	18	18	20	17
39	20	14	19	19	20	18
40	20	15	20	20	21	19
41	21	15	21	20	22	19
42	21	16	22	21	23	20
43	21	16	22	21	24	20
44	22	17	23	22	25	21
45	22	17	24	22	26	22
46	23	18	25	23	27	23
47	23	18	26	23	27	23
48	23	19	26	24	28	24
49	24	20	27	25	29	25
50	24	20	28	25	30	25
51	24	20	28	25	31	25
52	25	21	29	26	31	26
53	25	21	29	26	32	26
54	26	22	30	27	33	27
55	26	22	30	27	33	27
56	26	23	31	28	34	28
57	27	23	31	28	35	28
58	27	23	31	28	36	29
59	27	24	31	29	36	29
60	28	24	32	29	36	29
61	28	25	32	30	37	30
62	28	25	32	30	38	30
63	29	25	32	30	38	30
64	29	25	33	31	38	31
65	30	26	33	31	38	31
66	30	26	33	31	39	31
67	31	26	34	32	39	32
68	31	27	34	32	39	32
69	32	27	35	33	40	33

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Time (mins)	Temperature Rise (°C)					
	Thermocouple No. 20	Thermocouple No. 21	Thermocouple No. 22	Thermocouple No. 23	Thermocouple No. 24	Mean Standard 5
70	32	27	35	33	40	33
71	33	27	36	33	40	33
72	34	28	37	34	41	34
73	36	28	38	34	41	35
74	37	29	39	35	42	36
75	38	29	40	35	42	36
76	39	30	42	36	42	37
77	41	30	44	37	43	39
78	42	31	45	38	44	40
79	44	33	47	39	45	41
80	45	33	49	41	44	42
81	47	34	51	42	46	44
82	48	35	52	43	47	45
83	50	37	54	45	48	46
84	51	38	55	46	49	47
85	53	41	57	48	50	49
86	55	42	58	50	50	51
87	59	43	59	52	51	52
88	64	45	60	53	40	52
89	68	46	61	55	41	54
90	70	47	62	57	42	55
91	71	49	63	58	43	56
92	71	51	64	60	45	58
93	71	52	64	60	46	58
94	70	52	65	61	47	59
95	70	53	65	62	48	59
96	70	54	65	62	49	60
97	69	55	66	63	50	60
98	69	56	67	63	51	61
99	69	56	68	63	52	61
100	68	56	68	64	52	61
101	68	57	68	64	53	62
102	68	57	69	65	54	62
103	68	59	70	65	55	63
104	68	59	70	66	56	63
105	68	59	70	66	56	63

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Time (mins)	Temperature Rise (°C)					
	Thermocouple No. 20	Thermocouple No. 21	Thermocouple No. 22	Thermocouple No. 23	Thermocouple No. 24	Mean Standard 5
106	68	60	71	66	57	64
107	69	60	72	67	57	65
108	69	61	73	67	58	65
109	69	62	73	67	58	65
110	70	63	76	67	58	66
111	70	63	76	68	59	67
112	71	64	75	69	59	67
113	72	66	74	70	60	68
114	73	67	73	70	61	68
115	75	68	73	70	61	69
116	78	68	72	71	62	70
117	81	68	73	72	64	71
118	83	68	74	72	66	72

See Figure 6 for thermocouple layout.

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9.8 Additional Unexposed Face Temperature Data

Time (mins)	Temperature Rise (°C)			
	Thermocouple No. 25	Thermocouple No. 26	Thermocouple No. 27	Thermocouple No. 28
0	0	-	0	0
1	0	-	0	7
2	0	-	0	4
3	0	-	0	9
4	0	-	0	13
5	0	-	0	18
6	0	-	0	30
7	0	-	0	30
8	0	-	0	35
9	0	-	0	40
10	1	-	0	45
11	1	-	0	50
12	1	-	0	49
13	2	-	1	47
14	2	-	1	51
15	3	-	1	54
16	3	-	2	57
17	4	-	3	63
18	5	-	4	69
19	5	-	5	74
20	6	-	6	90
21	7	-	7	93
22	8	-	8	99
23	8	-	9	104
24	9	-	10	108
25	10	-	11	111
26	11	-	12	111
27	12	-	13	113
28	13	-	14	117
29	14	-	15	111
30	15	-	16	113
31	16	-	17	121
32	17	-	18	118
33	18	-	19	118

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Time (mins)	Temperature Rise (°C)			
	Thermocouple No. 25	Thermocouple No. 26	Thermocouple No. 27	Thermocouple No. 28
34	19	-	20	121
35	21	-	21	125
36	22	-	22	130
37	23	-	24	129
38	24	-	25	131
39	25	-	27	128
40	27	-	28	130
41	28	-	30	130
42	29	-	31	133
43	30	-	32	130
44	31	-	34	129
45	32	-	35	128
46	33	-	35	130
47	34	-	37	132
48	34	-	37	128
49	35	-	38	132
50	36	-	39	133
51	36	-	39	135
52	36	-	40	131
53	36	-	40	135
54	36	-	40	129
55	37	-	40	126
56	37	-	40	129
57	37	-	40	127
58	37	-	40	125
59	37	-	40	125
60	37	-	40	130
61	37	-	40	132
62	37	-	41	130
63	37	-	40	130
64	37	-	41	130
65	37	-	41	133
66	38	-	41	134
67	38	-	42	143
68	38	-	42	140
69	39	-	42	142

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Time (mins)	Temperature Rise (°C)			
	Thermocouple No. 25	Thermocouple No. 26	Thermocouple No. 27	Thermocouple No. 28
70	40	-	43	150
71	40	-	44	152
72	41	-	45	-
73	42	-	47	-
74	43	-	48	-
75	45	-	50	-
76	46	-	52	-
77	47	-	54	-
78	48	-	56	-
79	49	-	59	-
80	52	-	64	-
81	53	-	71	-
82	54	-	75	-
83	56	-	76	-
84	57	-	76	-
85	58	-	74	-
86	59	-	73	-
87	60	-	72	-
88	52	61	71	-
89	53	61	70	-
90	53	62	70	-
91	54	63	70	-
92	55	64	70	-
93	56	64	70	-
94	56	65	70	-
95	57	65	70	-
96	57	66	71	-
97	58	67	71	-
98	58	67	72	-
99	59	68	72	-
100	59	68	73	-
101	60	69	73	-
102	61	70	74	-
103	61	70	75	-
104	61	71	75	-
105	62	71	76	-

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Time (mins)	Temperature Rise (°C)			
	Thermocouple No. 25	Thermocouple No. 26	Thermocouple No. 27	Thermocouple No. 28
106	62	72	76	-
107	63	72	76	-
108	63	73	77	-
109	64	74	78	-
110	64	76	79	-
111	64	76	81	-
112	65	76	83	-
113	65	73	85	-
114	67	72	89	-
115	67	72	97	-
116	75	72	114	-
117	76	73	137	-
118	72	74	163	-

- Thermocouple broken due to an equipment failure.

See Figure 6 for thermocouple layout.

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9.9 Internal Temperature Data

Time (mins)	Actual Temperature (°C) Position									
	A	A1	B	B1	C	C1	D	D1	F	F1
0	-5	14	15	14	15	14	15	14	16	15
1	21	15	17	14	15	14	22	15	21	15
2	20	14	17	14	15	14	19	15	18	15
3	20	15	18	15	17	14	25	15	23	15
4	25	14	22	15	21	15	28	15	26	15
5	37	15	30	16	27	15	33	15	38	16
6	40	16	43	18	33	17	45	17	53	17
7	42	18	50	23	40	18	45	18	54	18
8	47	20	59	26	45	20	50	21	50	21
9	51	22	63	29	46	23	54	23	53	23
10	53	25	71	32	52	26	60	26	60	26
11	55	27	76	37	60	30	65	29	69	30
12	56	30	79	40	66	34	64	33	77	34
13	59	33	83	44	80	39	62	37	82	39
14	65	37	90	48	89	45	66	41	90	44
15	67	39	92	51	92	51	68	45	94	48
16	70	43	99	54	94	57	72	50	106	52
17	74	47	109	57	97	63	78	53	109	55
18	76	50	120	58	98	67	83	57	110	58
19	80	53	130	61	101	71	89	60	118	61
20	88	56	127	63	101	75	105	63	124	64
21	89	58	119	66	104	77	108	65	121	67
22	95	61	115	73	105	79	114	67	130	69
23	103	63	121	84	112	80	119	68	138	71
24	112	65	123	92	106	81	123	70	137	73
25	107	67	127	100	110	82	126	72	139	74
26	118	69	123	107	118	82	126	73	131	76
27	117	71	125	113	123	82	128	74	130	77
28	115	72	128	116	128	82	132	75	143	78
29	114	73	126	114	137	83	126	76	143	80
30	115	74	134	111	141	84	128	77	154	81
31	115	75	131	108	140	85	136	79	163	83
32	119	77	131	105	136	86	133	80	179	84
33	120	78	131	103	140	87	133	82	177	85

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Time (mins)	Actual Temperature (°C) Position									
	A	A1	B	B1	C	C1	D	D1	F	F1
34	119	79	134	102	136	88	136	83	180	87
35	121	81	139	102	135	88	140	84	178	88
36	123	82	148	102	132	89	145	85	176	89
37	123	83	153	102	133	90	143	87	178	90
38	125	84	151	102	135	90	146	88	183	91
39	136	86	147	102	139	91	143	89	184	92
40	140	87	141	103	146	91	145	90	176	93
41	143	88	134	103	163	92	145	91	172	94
42	148	89	133	104	164	92	147	92	168	95
43	148	90	127	104	159	93	145	93	163	96
44	148	91	127	104	157	93	144	94	155	96
45	150	92	123	105	155	94	143	94	152	96
46	155	92	121	105	154	94	146	95	153	97
47	156	93	122	105	154	94	147	96	145	97
48	152	94	122	105	140	95	143	97	132	98
49	150	94	124	105	136	95	147	97	129	98
50	155	95	122	105	139	96	148	98	128	98
51	159	95	123	105	134	96	149	98	123	99
52	160	96	121	106	132	96	146	99	125	99
53	154	96	123	106	131	96	150	99	127	100
54	159	97	121	106	128	97	143	100	126	100
55	155	97	121	106	129	97	141	100	127	101
56	159	97	121	106	124	97	144	101	125	101
57	163	98	121	106	124	97	142	101	127	102
58	167	98	120	107	124	97	140	102	127	102
59	169	98	122	107	127	97	139	102	130	103
60	167	99	127	108	131	97	145	103	133	104
61	169	99	128	108	133	98	146	104	140	105
62	166	99	136	109	137	98	145	104	144	107
63	169	99	141	110	143	98	145	105	149	108
64	171	100	143	112	145	98	145	106	153	111
65	169	100	145	114	152	98	148	107	159	113
66	165	100	151	116	158	99	149	108	167	117
67	165	101	158	119	164	99	158	109	177	121
68	163	101	163	123	171	100	155	111	183	125
69	159	102	169	127	183	102	157	113	191	129

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Time (mins)	Actual Temperature (°C) Position									
	A	A1	B	B1	C	C1	D	D1	F	F1
70	160	102	176	132	190	105	166	115	196	134
71	163	103	181	136	199	108	167	118	204	138
72	163	104	187	141	211	115	170	121	208	144
73	172	106	190	146	216	121	176	124	215	149
74	170	108	193	151	218	127	181	128	220	154
75	176	111	199	155	228	132	186	131	225	158
76	179	113	201	159	232	137	191	135	231	164
77	181	116	205	162	248	143	193	139	234	169
78	183	119	211	168	245	149	195	142	240	174
79	185	123	215	172	251	153	202	146	245	179
80	187	126	220	176	267	159	203	150	249	184
81	189	128	224	180	277	166	208	154	252	189
82	195	132	230	185	295	173	210	157	260	194
83	201	136	233	189	382	188	214	161	265	199
84	200	139	239	195	385	202	219	166	267	204
85	205	143	242	199	390	213	223	170	274	209
86	209	146	246	203	389	221	227	174	276	215
87	210	149	254	209	395	229	232	178	282	219
88	216	153	257	213	403	237	234	182	285	224
89	220	156	259	219	410	245	238	186	290	230
90	221	160	263	224	412	252	243	191	294	235
91	225	163	272	230	421	259	245	195	299	239
92	228	167	274	235	409	267	251	200	302	244
93	232	171	281	240	427	273	255	204	308	249
94	235	174	286	245	411	278	254	208	313	254
95	238	178	286	250	400	283	262	212	316	259
96	241	182	292	255	391	287	265	217	321	264
97	244	185	297	261	403	291	266	221	326	269
98	248	189	301	264	403	296	272	226	332	275
99	254	193	306	269	384	300	276	230	335	280
100	258	197	309	274	404	305	281	235	340	285
101	258	201	311	277	415	313	284	240	345	292
102	260	204	318	282	402	321	290	244	349	299
103	263	208	321	287	397	326	293	249	352	304
104	269	212	326	291	402	326	297	253	357	308
105	272	216	344	298	390	327	303	257	361	312

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Time (mins)	Actual Temperature (°C) Position									
	A	A1	B	B1	C	C1	D	D1	F	F1
106	278	221	387	313	393	330	303	261	366	317
107	281	225	377	324	405	335	309	265	367	320
108	286	229	372	331	419	343	310	269	382	326
109	291	233	361	331	435	354	315	273	422	341
110	292	237	366	333	443	363	317	277	443	365
111	295	241	375	339	492	381	321	282	464	390
112	296	245	387	349	523	412	324	287	490	420
113	302	248	420	366	540	437	330	290	507	447
114	304	252	443	386	556	460	340	300	526	471
115	310	257	490	409	561	479	373	311	743	529
116	312	262	526	447	547	480	504	371	791	721
117	322	269	545	483	546	482	530	440	800	788
118	330	279	574	519	555	488	559	488	814	812

See Figure 6 for thermocouple layout.

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Time (mins)	Actual Temperature (°C)									
	Position									
	G	G1	H	H1	I	I1	J	J1	E	E1
0	16	-5	14	14	15	14	15	14	15	15
1	16	14	19	16	16	15	20	14	15	15
2	16	14	20	15	16	14	17	14	15	14
3	17	14	20	15	17	15	26	14	15	15
4	21	14	24	15	22	15	34	15	15	15
5	25	15	31	16	22	15	42	15	16	15
6	30	16	34	17	24	16	46	16	17	15
7	34	17	38	19	30	17	53	18	19	16
8	40	19	44	21	40	20	60	20	22	17
9	43	21	53	24	47	23	66	23	26	18
10	49	25	65	28	56	27	72	27	31	20
11	55	29	74	31	66	30	78	33	36	23
12	60	34	74	34	74	34	82	39	41	26
13	69	40	79	38	82	39	91	46	46	30
14	78	45	85	42	85	44	92	53	50	34
15	83	51	89	46	86	48	96	59	55	38
16	96	56	95	50	90	52	99	64	59	42
17	103	61	102	53	90	55	102	69	63	46
18	107	66	108	56	92	58	102	73	66	50
19	111	69	113	59	99	61	105	76	68	53
20	114	73	117	62	106	63	106	78	71	56
21	116	75	119	64	111	65	106	80	73	59
22	114	77	121	67	113	68	106	82	74	61
23	112	79	122	68	113	70	107	83	77	63
24	109	80	130	70	115	73	107	83	78	65
25	107	80	131	72	114	73	107	84	79	67
26	107	81	131	73	114	74	112	83	80	68
27	106	81	134	75	129	75	117	84	80	69
28	140	81	133	76	129	76	118	85	81	70
29	145	82	136	77	123	78	118	85	82	71
30	153	83	137	78	124	79	119	86	83	73
31	154	84	138	79	124	81	128	87	85	74
32	152	85	138	81	124	83	131	87	86	76
33	160	85	136	82	124	84	136	88	88	77
34	161	86	137	83	120	85	144	89	89	78
35	159	87	136	84	118	87	155	89	89	79

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Time (mins)	Actual Temperature (°C)									
	Position									
	G	G1	H	H1	I	I1	J	J1	E	E1
36	161	88	137	86	124	88	156	90	90	80
37	167	88	138	87	127	89	156	90	91	81
38	168	89	136	88	131	90	154	91	92	83
39	165	89	135	89	138	91	147	91	94	84
40	153	90	135	91	144	92	147	92	95	85
41	151	91	136	91	149	93	148	92	95	86
42	152	91	138	93	155	94	151	93	97	87
43	169	92	134	94	153	95	156	93	97	88
44	176	92	136	94	151	96	155	94	99	89
45	180	92	136	95	153	96	159	94	99	90
46	180	93	137	96	156	97	161	94	100	91
47	169	93	138	96	147	97	157	94	101	91
48	141	94	136	97	148	98	152	95	101	92
49	135	94	133	98	150	98	152	95	102	92
50	151	94	135	98	149	98	152	95	102	93
51	147	95	133	99	145	99	152	95	102	93
52	140	95	136	99	143	99	153	96	103	93
53	141	95	135	100	141	100	150	96	104	94
54	145	96	133	101	143	100	154	96	104	94
55	145	96	135	101	140	101	155	96	104	94
56	146	96	136	102	144	102	156	96	105	95
57	139	96	138	103	140	102	153	97	105	95
58	140	96	135	103	142	103	157	97	105	95
59	145	97	138	104	145	104	154	97	105	95
60	146	97	135	105	146	105	157	97	106	95
61	151	97	138	106	145	107	157	97	106	95
62	154	97	137	107	148	109	158	98	107	95
63	159	98	143	108	151	111	157	98	107	95
64	164	98	142	109	157	114	164	98	108	96
65	175	98	145	110	162	117	168	99	109	96
66	184	99	146	111	168	120	176	100	111	96
67	198	101	144	113	177	125	188	101	114	96
68	207	103	151	114	183	129	197	105	117	96
69	221	108	158	116	191	134	206	112	122	96
70	232	115	161	118	198	139	221	121	128	96
71	275	121	167	121	203	143	224	127	136	96

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Time (mins)	Actual Temperature (°C)									
	Position									
	G	G1	H	H1	I	I1	J	J1	E	E1
72	286	127	176	124	208	148	226	135	145	96
73	293	133	182	127	215	153	235	142	154	97
74	305	139	184	130	221	159	240	147	164	97
75	313	144	191	134	227	164	249	154	172	97
76	293	151	195	138	232	169	254	161	178	97
77	271	157	200	142	233	174	259	168	185	98
78	353	167	205	146	241	179	264	176	189	98
79	398	187	211	151	245	185	279	184	194	99
80	433	201	219	156	250	189	308	193	199	100
81	436	214	225	159	255	194	324	202	206	100
82	454	225	225	164	260	199	325	212	209	101
83	444	237	230	169	264	204	321	220	214	101
84	447	247	234	175	270	209	378	229	219	102
85	445	257	236	179	274	215	432	241	224	103
86	447	266	239	184	280	220	477	260	228	111
87	444	274	246	189	283	225	475	279	232	134
88	465	284	246	193	284	230	485	295	237	148
89	445	295	246	197	290	234	490	310	241	157
90	475	304	253	201	294	239	504	325	246	166
91	456	312	253	206	301	244	484	338	250	173
92	467	320	257	211	302	249	489	350	254	180
93	466	328	260	214	306	253	483	360	258	186
94	477	334	263	218	309	257	491	371	263	192
95	466	340	264	222	311	262	494	379	268	198
96	480	347	266	226	314	266	506	384	272	204
97	478	352	270	228	319	270	496	391	275	209
98	486	356	269	231	321	273	490	396	280	215
99	485	361	274	234	329	279	515	400	284	220
100	505	368	277	237	332	283	515	404	288	225
101	501	377	279	242	331	284	518	413	292	232
102	498	385	283	246	334	288	544	422	297	238
103	501	392	286	250	349	294	522	429	303	244
104	498	397	288	253	371	308	515	431	306	250
105	511	407	289	256	392	330	501	433	308	254
106	554	435	293	259	419	352	494	431	312	259
107	579	462	295	262	443	376	498	434	318	265

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Time (mins)	Actual Temperature (°C)									
	Position									
	G	G1	H	H1	I	I1	J	J1	E	E1
108	593	491	299	265	460	396	509	447	323	271
109	598	519	300	268	480	414	524	463	328	276
110	618	538	304	271	493	430	539	481	337	284
111	800	618	306	274	508	446	690	533	338	290
112	826	773	310	278	518	463	818	681	344	295
113	834	840	317	282	531	477	868	808	349	301
114	831	880	360	297	545	492	893	857	359	309
115	781	829	361	316	712	534	905	885	564	349
116	769	790	368	332	826	789	913	893	730	535
117	763	815	382	346	873	863	874	859	792	719
118	773	845	414	364	908	904	900	888	843	823

See Figure 6 for thermocouple layout.

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9.10 Specimen Vertical Deflection

Time (mins)	Centre Deflection (mm)	Free Edge Deflection (mm)	Maximum Rate of deflection (mm/minute)
0	0	0	0
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	0	0	0
8	0	0	0
9	0	0	0
10	0	0	0
11	0	0	0
12	0	0	0
13	0	0	0
14	0	0	0
15	0	0	0
16	0	0	0
17	0	0	0
18	0	0	0
19	0	0	0
20	0	0	0
21	0	0	0
22	0	0	0
23	0	0	0
24	0	0	0
25	0	0	0
26	0	0	0
27	0	0	0
28	0	0	0
29	0	0	0
30	1	0	0
31	1	0	0
32	1	0	0
33	2	0	0

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Time (mins)	Centre Deflection (mm)	Free Edge Deflection (mm)	Maximum Rate of deflection (mm/minute)
34	2	0	0
35	2	0	0
36	2	0	0
37	3	0	0
38	3	0	0
39	3	0	0
40	3	0	0
41	4	0	0
42	4	0	0
43	4	0	0
44	4	0	0
45	4	0	0
46	4	0	0
47	5	0	0
48	5	0	0
49	5	0	0
50	5	0	0
51	5	0	0
52	6	0	0
53	6	0	0
54	6	0	0
55	6	0	0
56	6	0	0
57	6	0	0
58	7	0	0
59	7	0	0
60	7	0	0
61	7	0	0
62	7	0	0
63	7	0	0
64	7	0	0
65	7	0	0
66	7	0	0
67	8	0	0
68	8	0	0
69	8	0	0

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Time (mins)	Centre Deflection (mm)	Free Edge Deflection (mm)	Maximum Rate of deflection (mm/minute)
70	8	0	0
71	8	0	0
72	8	0	0
73	8	0	0
74	8	0	0
75	8	0	0
76	8	0	0
77	8	0	0
78	8	0	0
79	9	0	0
80	9	0	0
81	9	0	0
82	9	0	0
83	10	0	0
84	10	0	0
85	11	0	0
86	11	0	0
87	11	0	0
88	12	0	0
89	12	0	0
90	13	0	0
91	14	0	0
92	14	0	0
93	15	0	0
94	16	0	0
95	17	0	1
96	18	0	0
97	19	0	1
98	19	0	0
99	20	0	1
100	21	0	0
101	22	0	1
102	24	0	1
103	25	0	0
104	26	0	1
105	27	0	1

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Time (mins)	Centre Deflection (mm)	Free Edge Deflection (mm)	Maximum Rate of deflection (mm/minute)
106	28	0	1
107	30	0	1
108	31	0	1
109	32	0	1
110	34	0	1
111	35	0	1
112	37	0	1
113	39	0	1
114	41	0	1
115	43	0	1
116	46	0	2
117	53	0	3
118	66	0	7

The centre deflection was recorded at the approximate centre of the specimen. The free edge deflection was measured at 50mm from the free edge of the specimen. Positive readings indicate deflection into the furnace.

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10. PHOTOGRAPHS

Downlighter LTERD 12WW prior to installation

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10.2 Downlighter LTFRD 12WW prior to installation

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10.3 Downlighter LTFRD 12W prior to installation

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10.4 Exposed face prior to test

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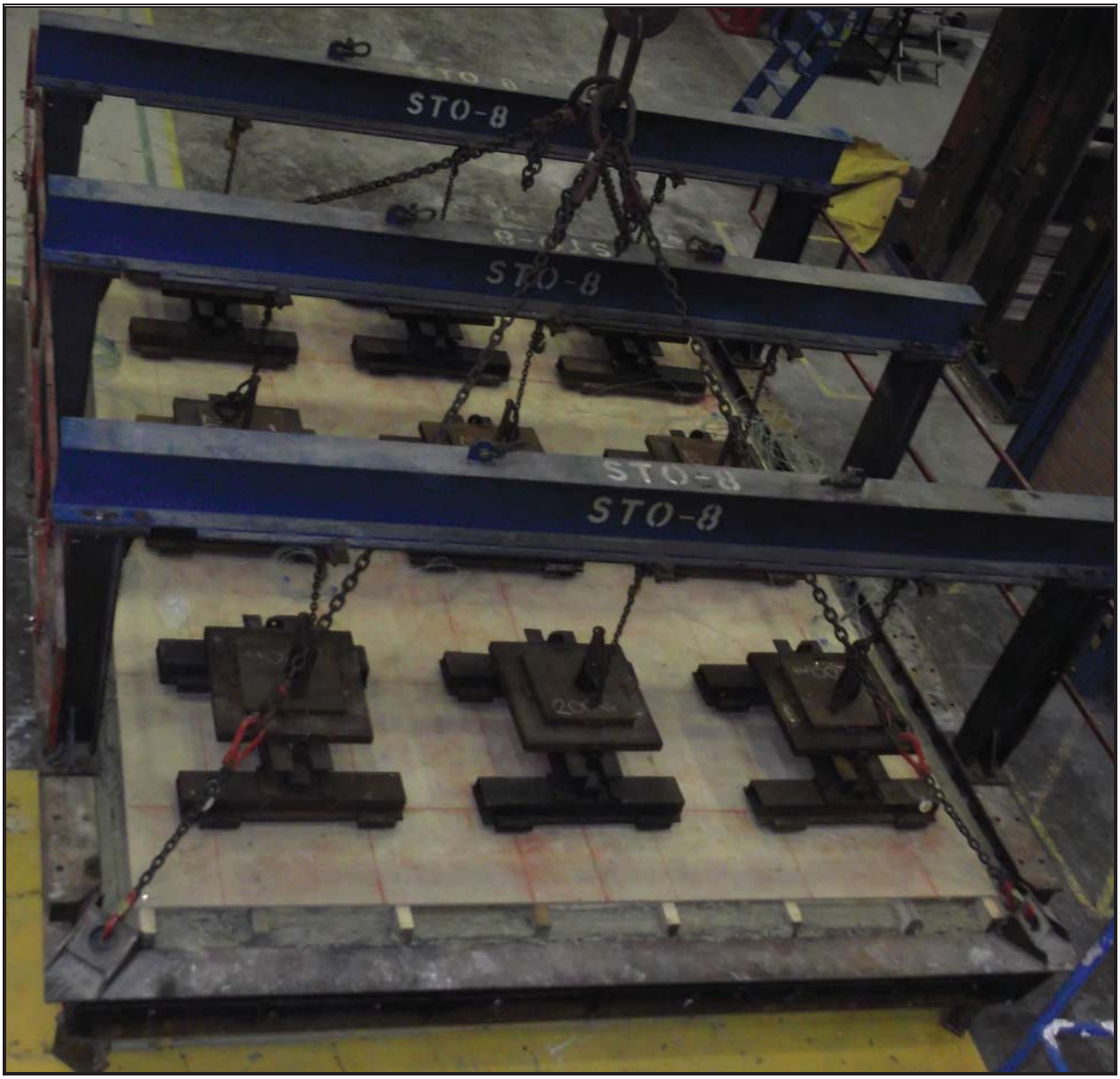
10.5 Unexposed face prior to test



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10.6 Unexposed face at 1 hour, 43 minutes

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10.7 Unexposed face at 1 hour, 45 minutes

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10.8 Unexposed face at 1hour, 50 minutes