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Testing, calibrating, advising.



Title:

The fire resistance performance of a non-loadbearing steel stud partition system when tested in accordance with BS EN 1364-1: 2015 and BS EN 1363-1: 2012

WF Report No:

399438



Prepared for:

Knauf UK GmbH

Kemsley Fields Business Park
Sittingbourne
Kent
ME9 8SR

Test date:

18th May 2018



Contents

	Page No
1 Introduction.....	3
2 Specimen verification	3
2.1 Conditioning	4
2.2 Sampling	4
3 Description of specimen	4
4 Test conditions	5
4.1 Ambient temperature	5
4.2 Pressure readings	5
4.3 Furnace temperature	5
4.4 Unexposed face temperatures.....	7
4.5 Radiation	8
4.6 Deflection	9
4.7 Internal stud temperatures.....	11
5 Observations	14
6 Expression of results	15
7 Limitations	16
8 Field of direct application of test results	16
9 Description of construction	17
10 Photographs	19
Appendix 1 – Client drawings	24
Appendix 2 – figures 1 – 4.....	24
Appendix 3 – raw test data	

1 Introduction

The partition components and installation instructions were delivered to Exova Warringtonfire during May 2018. Exova Warringtonfire constructed and installed the specimen into a refractory lined steel restraint frame.

2 Specimen verification

From the exposed face out: 2No. layer of 12.5mm thick Knauf Fire Panel tapered edge plasterboard fixed to the vertical studs, head and base track with a galvanised steel Knauf Flat Fixing Plate behind the outer board layer horizontal joint only.

The studwork consisted of 5No. Knauf 'C-T' studs fitted at 600mm centres within Knauf 'J' channel, which was fitted at the head, base and right edge of the restraint frame when viewed from the unexposed face.

1No. layer of 19mm thick Knauf Core board square edge was fitted within the 'C-T' studs. The Core board included a horizontal joint at 2700mm from the base of the sample to which Knauf core board channel was fitted over the top edge. A section of 150mm wide 19mm Knauf Core board was then screwed behind this joint between the 'C-T' studs in the wall cavity.

See figures 1 and 2 of appendix 1 for board joints.

The component parts of the specimen were identified and, where appropriate, moisture content readings and board weights were measured on either the original specimen, or, samples provided by the sponsor.

Representative samples of 19mm Knauf Core board square edge and 12.5mm thick Knauf Fire Panel plasterboard tapered edge were measured for moisture content using the oven drying technique for gypsum based products detailed in Annex F section F.3.2 of BS EN 1363-1 2012. The free moisture content of the Knauf Fire panel was found to be 1.53% and of the Knauf Core board, 1.75% respectively, calculated as a percentage of the pre oven dried weight.

Representative samples of 19mm Knauf Core board and 12.5mm thick Knauf Fire Panel plasterboard were measured for board weight. Figures of 16.3kg/m² for the Knauf Fire Panel and 9.9kg/m² for the Knauf Core board were recorded. The measurement was taken from a pre oven dried sample. (Weights stated by manufacturer to be nominally 10kg/m² for the Knauf Fire Panel and 16.3kg/m² for the Knauf Core board).

2.1 Conditioning

Exova Warringtonfire stored the specimens in climatic conditions approximate to those expected in normal service, and used the guidelines of annex F.1 of BS EN 1363 – 1: 2012 to establish a suitable conditioned level where possible.

2.2 Sampling

Exova Warringtonfire were not involved in factory sampling of the components used for the specimen subject to this report.

3 Description of specimen

The specimen measured 3000mm high x 3000mm wide x nominally 87mm thick.

See section 9 and Appendix 1 for full description.

Viewed from the unexposed face, the left vertical edge was left unrestrained. The gap between the unrestrained edge and the restraint frame was filled with rock mineral fibre.

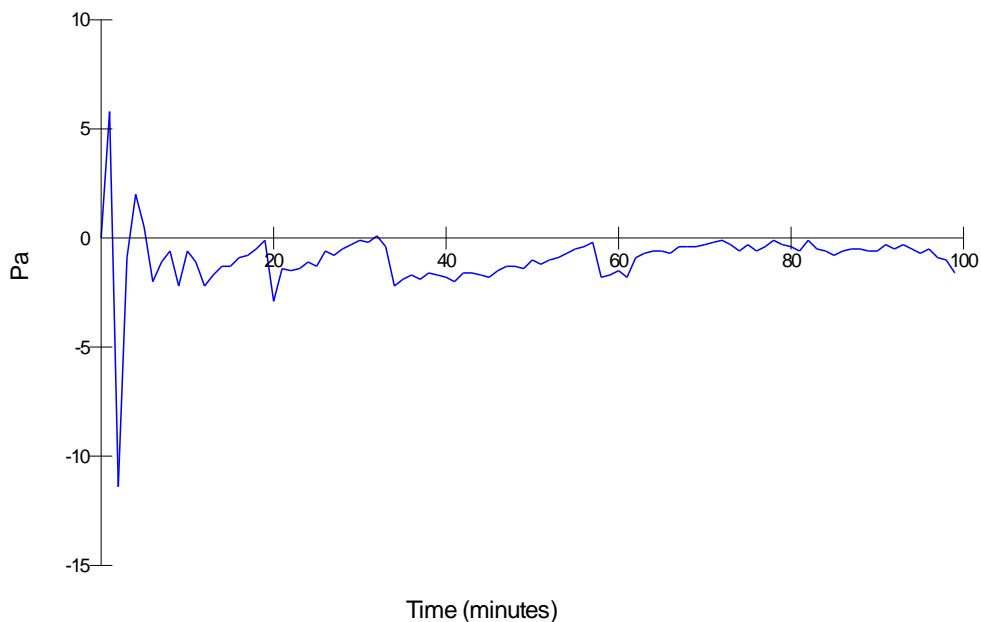
4 Test conditions

4.1 Ambient temperature

The ambient temperature of the test area at commencement of test was 16°C.

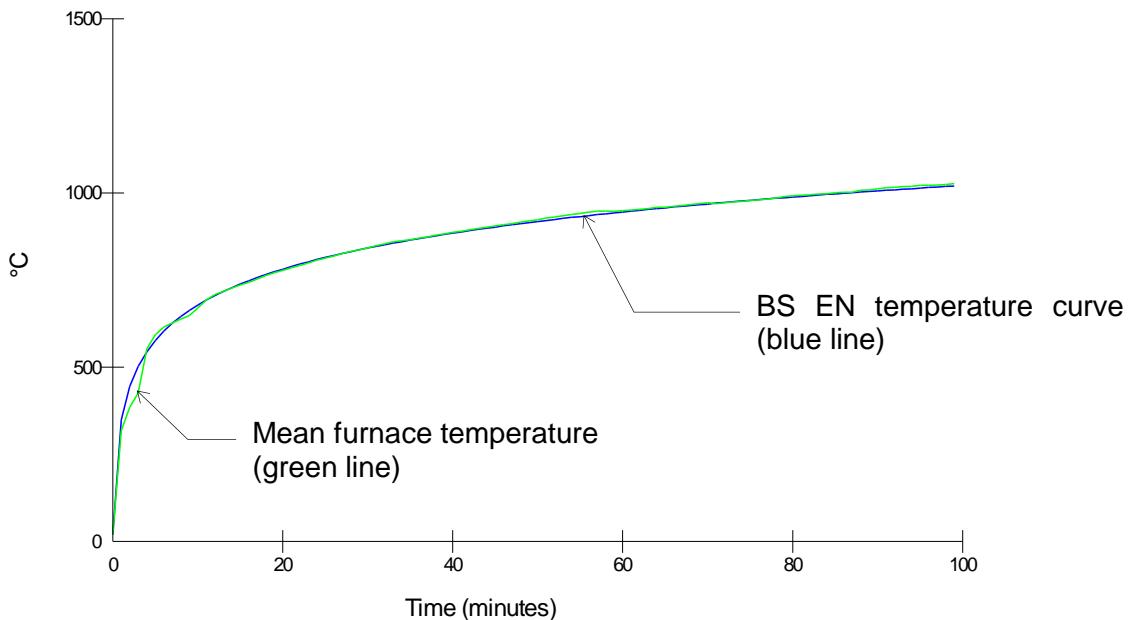
4.2 Pressure readings

After the first 5 minutes of the test, the furnace pressure was maintained at -1.3 ± 5 Pa and after 10 minutes was maintained at -1.3 ± 3 Pa with respect to atmosphere, at the notional floor level which equates to a recorded reading of 20 Pa at the head of the wall. The pressures recorded are shown graphically below:



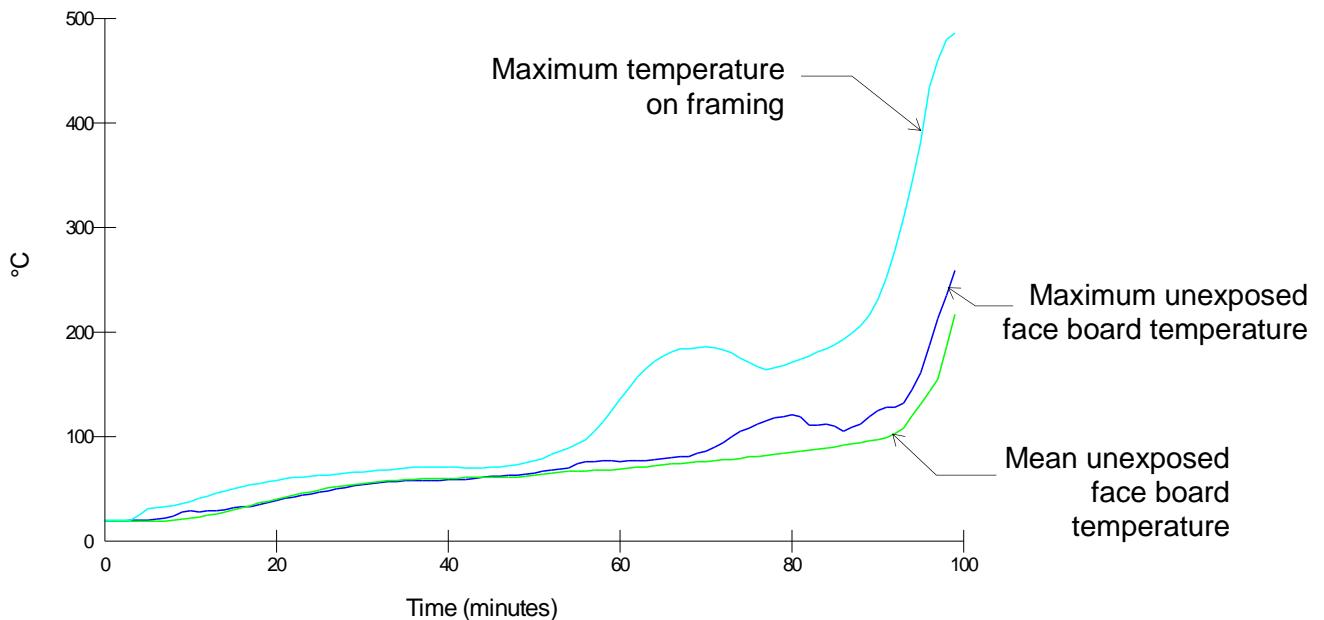
4.3 Furnace temperature

The furnace was controlled to follow the temperature/time relationship specified in BS EN 1363-1: 2012 as closely as possible, using the average of nine plate thermocouples suitably distributed within the furnace. The temperatures recorded are shown graphically below:



4.4 Unexposed face temperatures

The temperature of the unexposed face was monitored by means of five thermocouples measuring the average board temperature and seven thermocouples measuring the maximum board temperature. Three thermocouples were fixed to the head track and studs (See Figure 4 of Appendix 1 for thermocouple locations). The temperatures recorded have been tabulated in Appendix 2 and are shown graphically below:

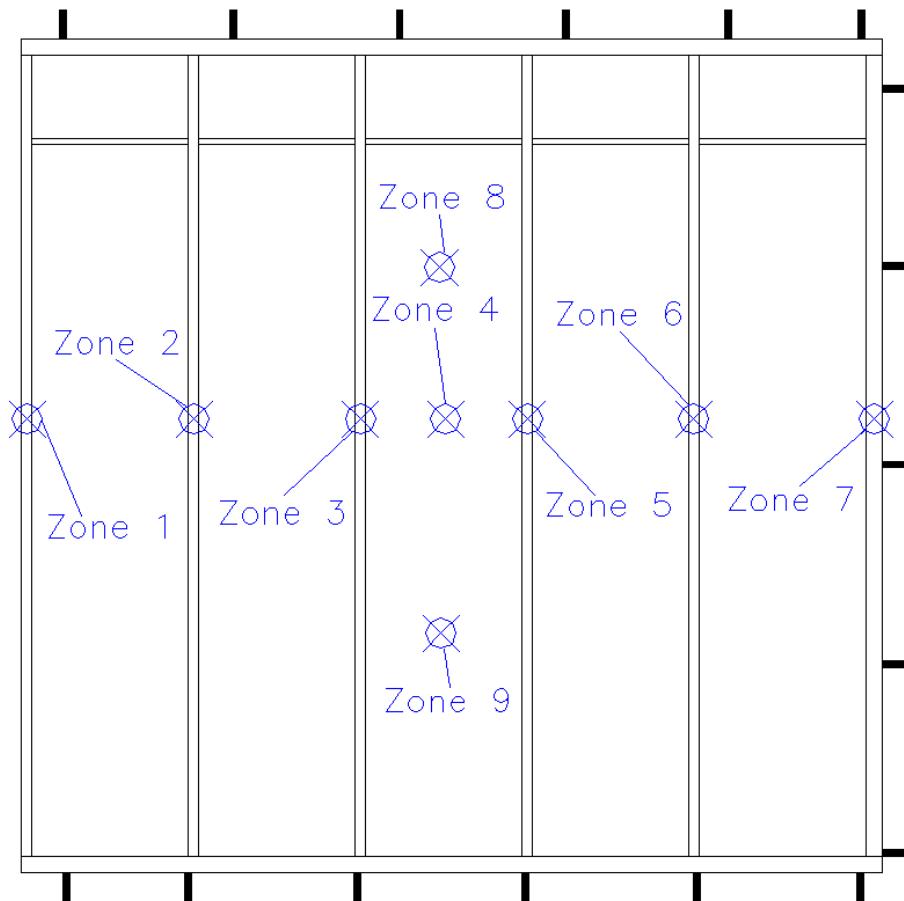


4.5 Radiation

A medtherm heatflux radiometer was used to measure the radiation 1m away from the specimen. Due to a malfunction with the equipment, we were unable to determine the radiant heat emitted from the specimen for the duration of the test.

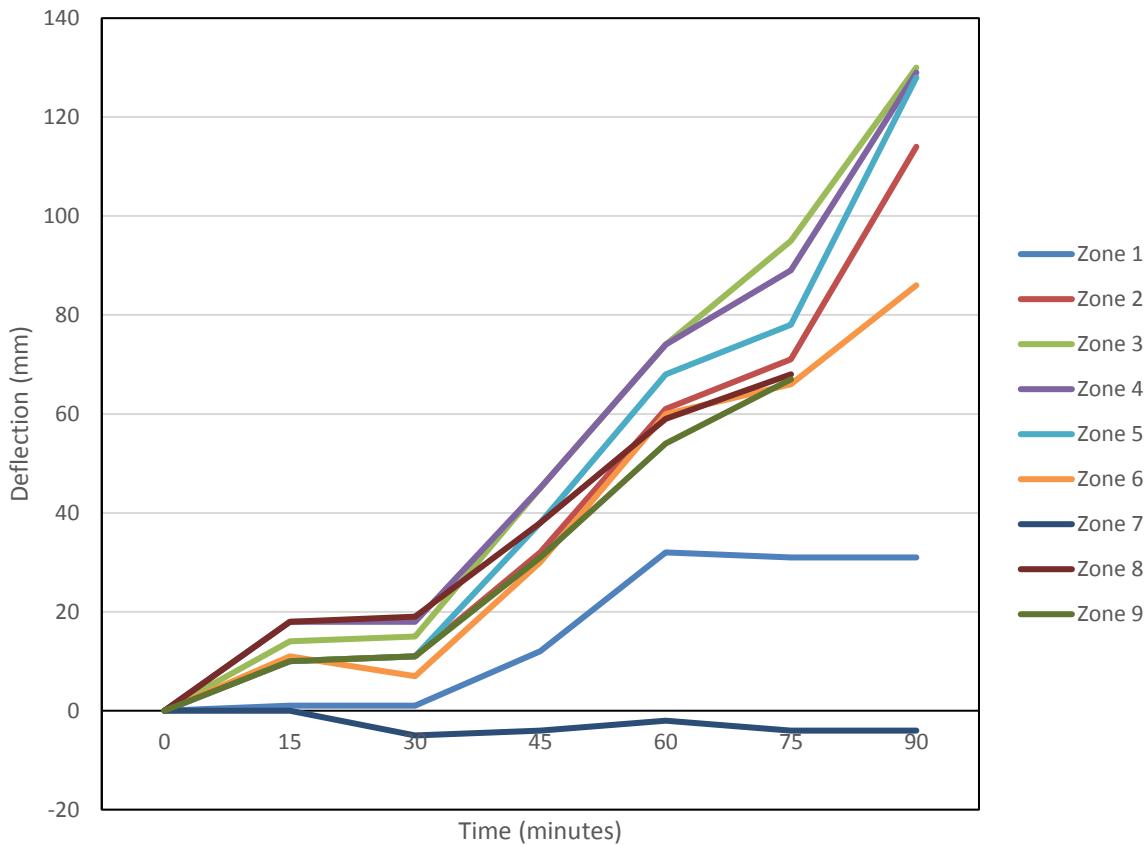
4.6 Deflection

The deflection of the specimen partition was measured from the centre point, and at mid height on each stud. The readings have been tabulated and are shown graphically below. A positive reading represents deflection in towards the furnace.
A negative reading represents deflection away from the furnace.



Time (minutes)	15	30	45	60	75	90
Zone 1 (mm)	1	1	12	32	31	31
Zone 2 (mm)	10	11	32	61	71	114
Zone 3 (mm)	14	15	45	74	95	130
Zone 4 (mm)	18	18	45	74	89	129
Zone 5 (mm)	10	11	38	68	78	128
Zone 6 (mm)	11	7	30	60	66	86
Zone 7 (mm)	0	-5	-4	-2	-4	-4
Zone 8 (mm)	18	19	38	59	68	-
Zone 9 (mm)	10	11	31	54	67	-

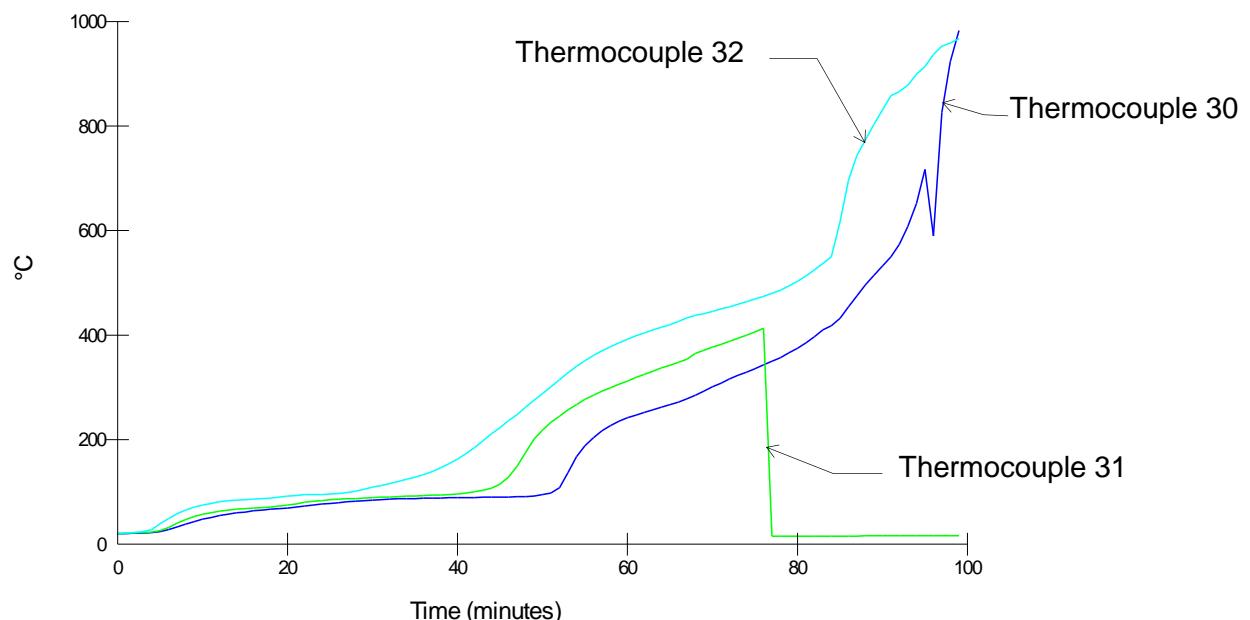
Deflection graph



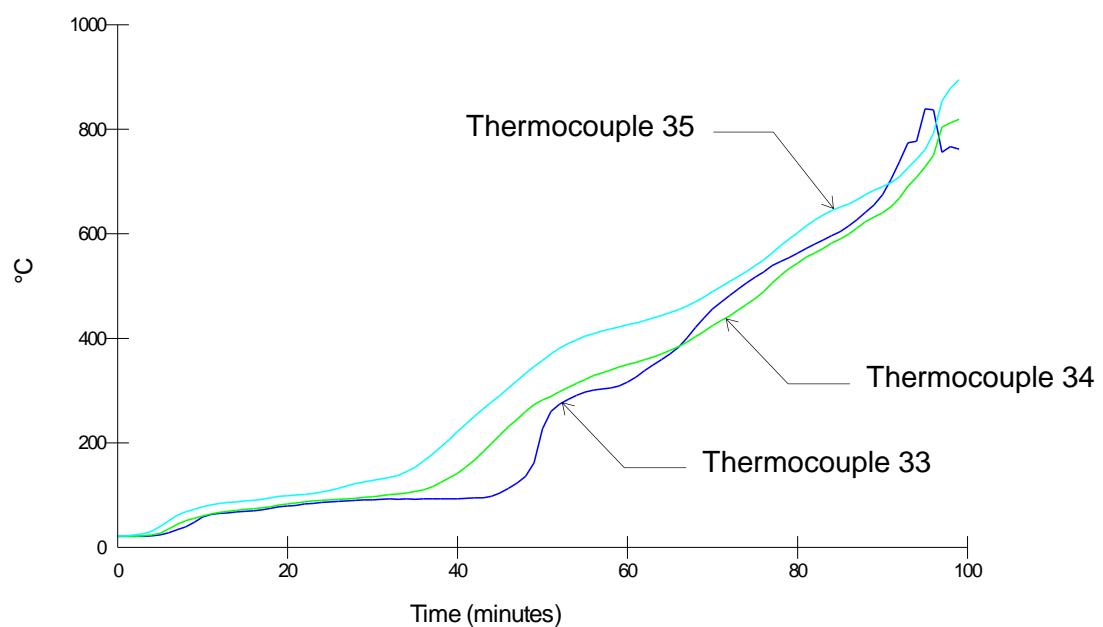
4.7 Internal stud temperatures

Thirteen additional thermocouples were fitted internally for the client's information, three per stud at mid height on the four central studs and one on the back of the exposed face inner board layer (See figure 4 of Appendix 1 for thermocouple locations). The temperatures recorded have been tabulated in Appendix 2 and are shown graphically below:

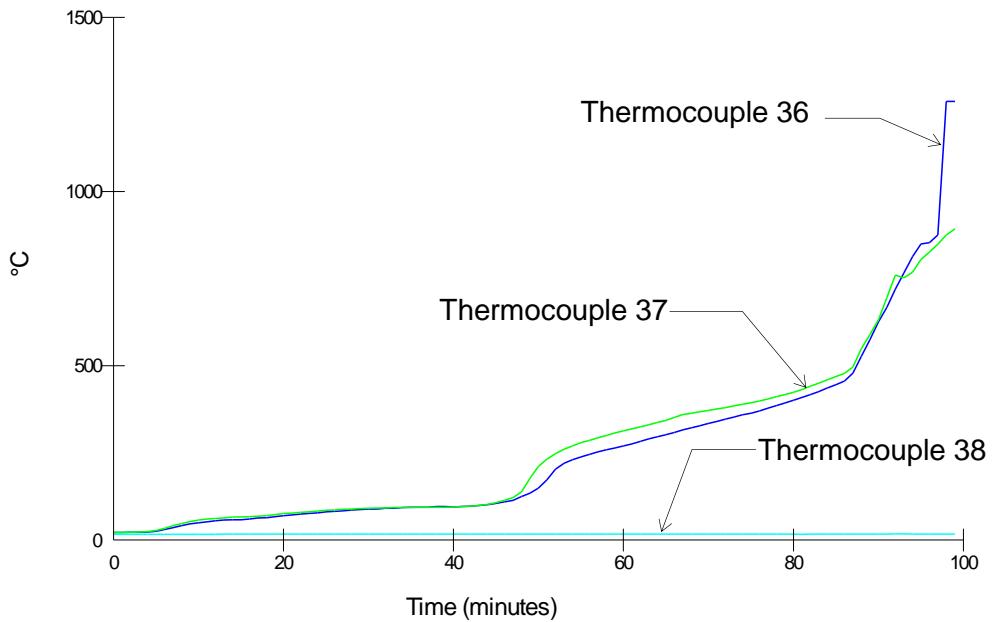
Outer left central stud



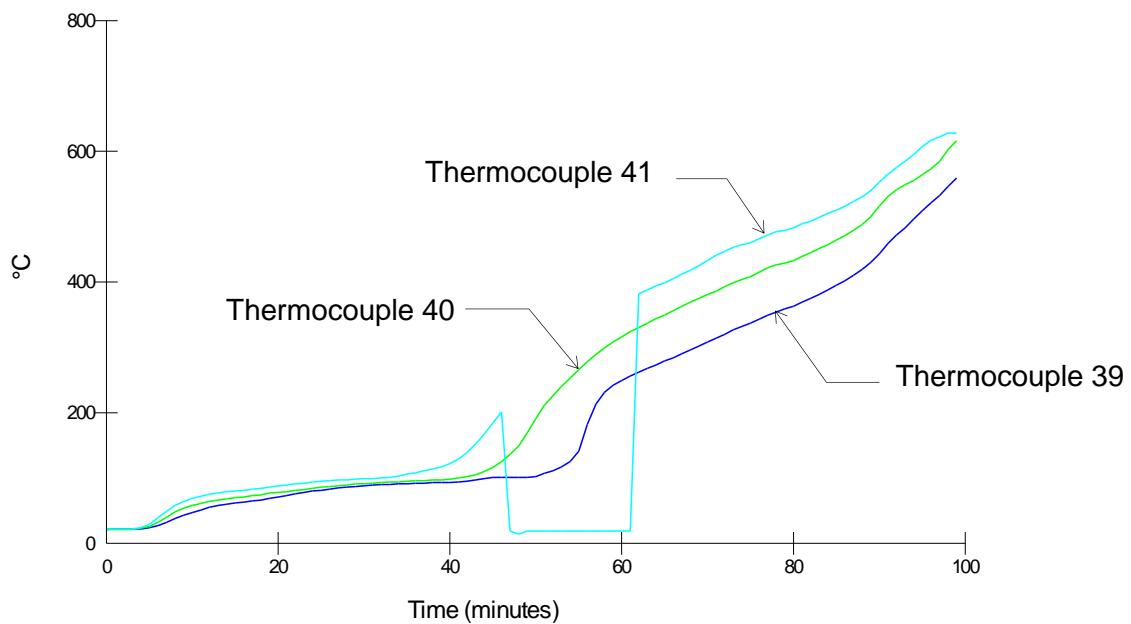
Left central stud



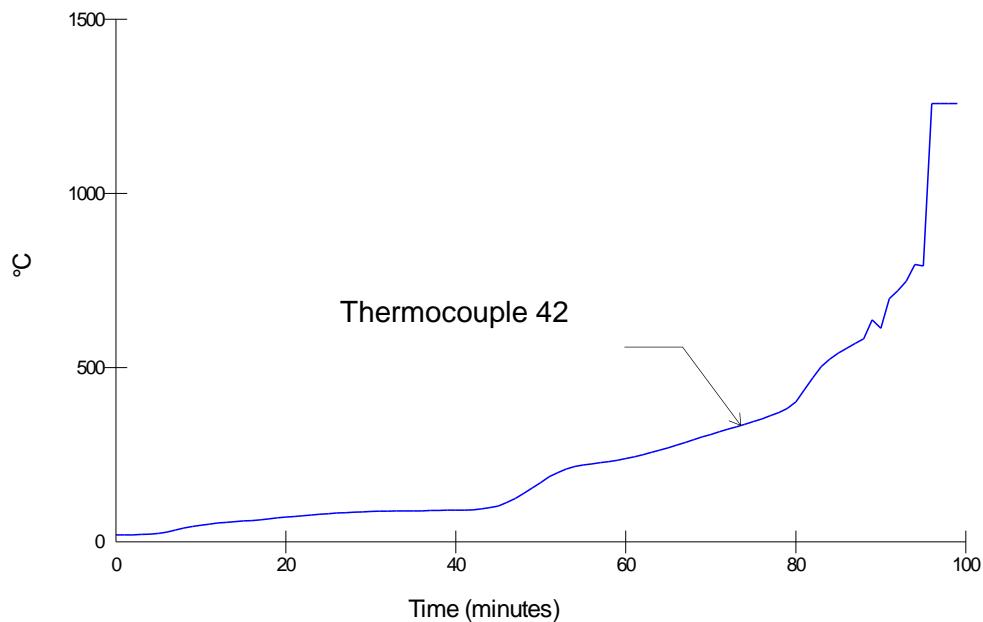
Right central stud



Outer right central stud



Back of exposed face plasterboard inner layer



5 Observations

All observations relate to the unexposed face unless stated otherwise.

Time (minutes)	Comments
00:00	Test started.
4.19	There is smoke issuing from along the head of the partition.
12.55	There is moisture running down from across the head of the partition.
32.30	Exposed face, cracks begin to appear across the top layer of plasterboard.
34.12	There is discolouration at the top left corner of the partition.
46.49	There is discolouration across the head of the partition and at the top of the vertical studs.
49.01	There is discolouration along the top half of the fixed edge.
50.18	There is an increase in the amount of smoke issuing from across the head of the partition.
50.38	There is further discolouration at the top of the vertical studs.
52.42	There is smoke issuing from the middle of the fixed edge.
56.10	There is severe discolouration at the top of all vertical studs.
61.57	There is severe discolouration across the 300mm boards at the top of the specimen.
73.45	Exposed face, the first board layer is starting to fall away.
77.25	A gaps are appearing between the boards and the studs across the specimen.
92.31	Exposed face, the top layer of board has fallen away.
95.40	There is a glow visible at the centre of the core board channel.
99.00	Test terminated.

6 Expression of results

Integrity	
Cotton pad	99 (ninety nine) minutes*
Continuous flaming	99 (ninety nine) minutes*
Gap gauges	99 (ninety nine) minutes*
Insulation	
Average set	99 (ninety nine) minutes*
Standard set (maximum)	86 (eighty six) minutes
Radiation (time to 15kW/m ²)	-**

* No failure of this test criteria had occurred at termination of the test at 99 minutes

** Laboratory was unable to measure radiation

7 Limitations

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 procedure outline in EN 1364-1, EN 1363-1, and where appropriate EN 1363-2. Any significant deviation with respect to size, construction details, loads, stresses and edge or end conditions other than those allowed under the field of direct application in the relevant test method is not covered by this report.

The results only relate to the behaviour 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. Exova Warringtonfire 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.

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.

	Written by:	Checked by:	Authorised by:
Signature:			
Name:	Nikolas Whitelock	Eliot Power	Mark Cummings
Title:	Lead Technical Officer	Technical Officer	Technical Manager
Date of issue:	28/09/2018	28/09/2018	28/09/2018

8 Field of direct application of test results

The results of the test are directly applicable to similar constructions where one or more of the changes listed in BS EN 1364-1: 2015, Clause 13, are made and the construction continues to comply with that appropriate design code for its stiffness and stability. Other changes are not permitted by the document. A copy of the field of direct application is available from Exova Warringtonfire upon request.

9 Description of construction

(Refers to Appendix 1 - figures 1 to 4)

Internal framework

		Description	Dimensions (mm)	Key to figures
Head and base track		Knauf 'J' Channel galvanised steel Material number: 243977*	62 wide x 70 high (unexposed face) x 25 high (exposed face) x 0.92 thick x 3000 long	1
Stud – fixed edge		Knauf 'J' Channel galvanised steel Material number: 243977*	62 wide x 70 high (unexposed face) x 25 high (exposed face) x 0.92 thick x 3000 long	2
Studs – fitted at 600mm centres		Knauf 'C-T' Studs galvanised steel. Friction fitted between head and base track (see figures 1, 2 and 3) Material number: 243804*	60 wide x 38.5 high x 0.92 thick x 2990-2992 long	3
Fixing details	Head track and right side end stud	Knauf Nailable Plugs located at 50mm from the ends and at nominally 600mm centres. Material number: 258326*	6 x 35 long	4
	Base track	Knauf Nailable Plugs located at 50mm from the ends and at nominally 600mm centres. Material number: 258327*	8 x 100 long	5
Behind exposed face outer board horizontal joints		Knauf Flat Fixing Plate (Material number: 258300*) – fixed to each stud with 2No. 35mm long Knauf Drywall Jackpoint Screws. Material number: 258319*	70 wide x 3000 long x 0.7 thick	6
Behind unexposed face board horizontal joints		Knauf Core board Channel Material number: 243799*	20mm wide x 0.55 thick x 10/20 flange	7
		Knauf Core board Fillet	19 thick x 150 wide	8
Perimeter sealing – head, base track and right side end stud		Knauf Intumescent and Acoustic Mastic applied between all perimeter frame work and the restraint frame. Material number: 258381*	2No continuous beads	-

The base track was sat on 1No. layer of 19mm thick Knauf Core board (Key to figures 9) so as to reduce the overall height of the partition to 3000mm. The left end vertical stud remained unrestrained.

*Stated by client, not verified by laboratory

Cladding – see figures 1 and 2 of appendix 1 for board joints

		Description	Dimensions (mm)	Weight (kg/m ²)	Moisture content	Key to figures
Plasterboard – exposed face		2No. layers of Knauf Fire Panel plasterboard Manufacturers stated nominal board weight 10kg/m ² Material number: 243493*	12.5 thick	9.9**	1.53%	10
Plasterboard – unexposed face		1No. layer of Knauf Core board plasterboard square edge Manufacturers stated nominal board weight 16.3kg/m ² Material number: 81062*	19 thick	16.3**	1.75%	11
Perimeter sealing		Knauf Intumescent and Acoustic applied around the perimeter of the specimen before and after fitting of the exposed face boards Material number: 258381*	2No. continuous beads	-	-	-
Fixing		Knauf Drywall Jackpoint Screws fitted at the perimeter of all exposed face boards and at the vertical centre of the full width boards. (10mm from board edges and 40mm from board corners)	25 (material number:258318*) and 35 (material number:258319*) long at nominally 300 centres	-	-	12
Plasterboard finishing	Joints	Knauf Paper Tape fitted over the joint, finished with Knauf Joint Filler Material number: 258337*	-	-	-	-
	Screw heads	Knauf Joint Filler applied over the screw heads Material number: 258179*	-	-	-	-

*Stated by client, not verified by laboratory

**Weight as measured by laboratory.

***Knauf Core Board plasterboard was friction fitted within the steel perimeter framing and vertical studs. The 'J' channels contain 29mm high tabs within the web of the channel located at nominally 300mm spacing which are foldable to secure the board. See photos on page 23.

10 Photographs

Exposed face prior to testing



Unexposed face at start of test



At 15 minutes



At 30 minutes



At 45 minutes



At 60 minutes



At 75 minutes



At 90 minutes



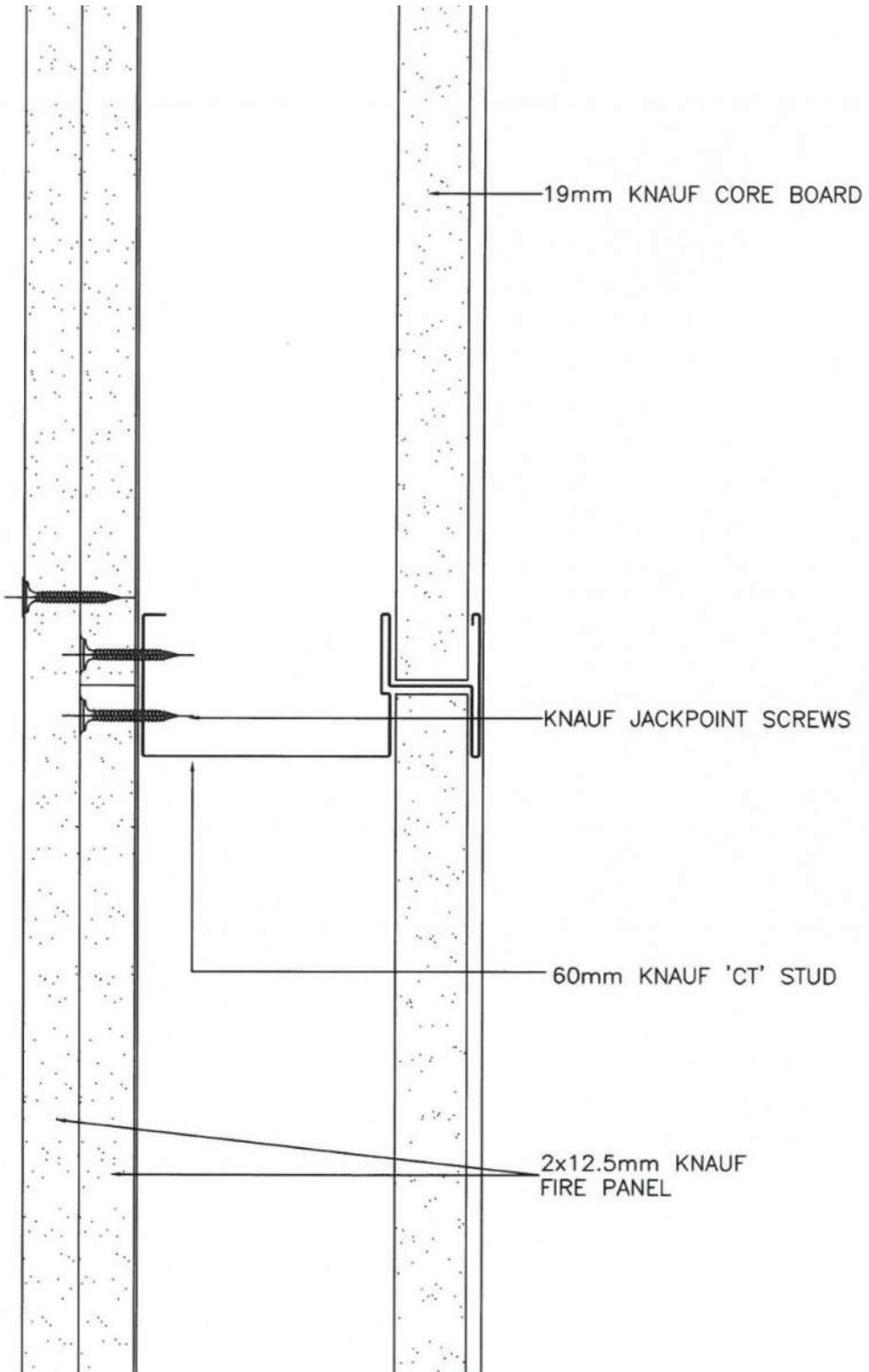
Exposed face post test

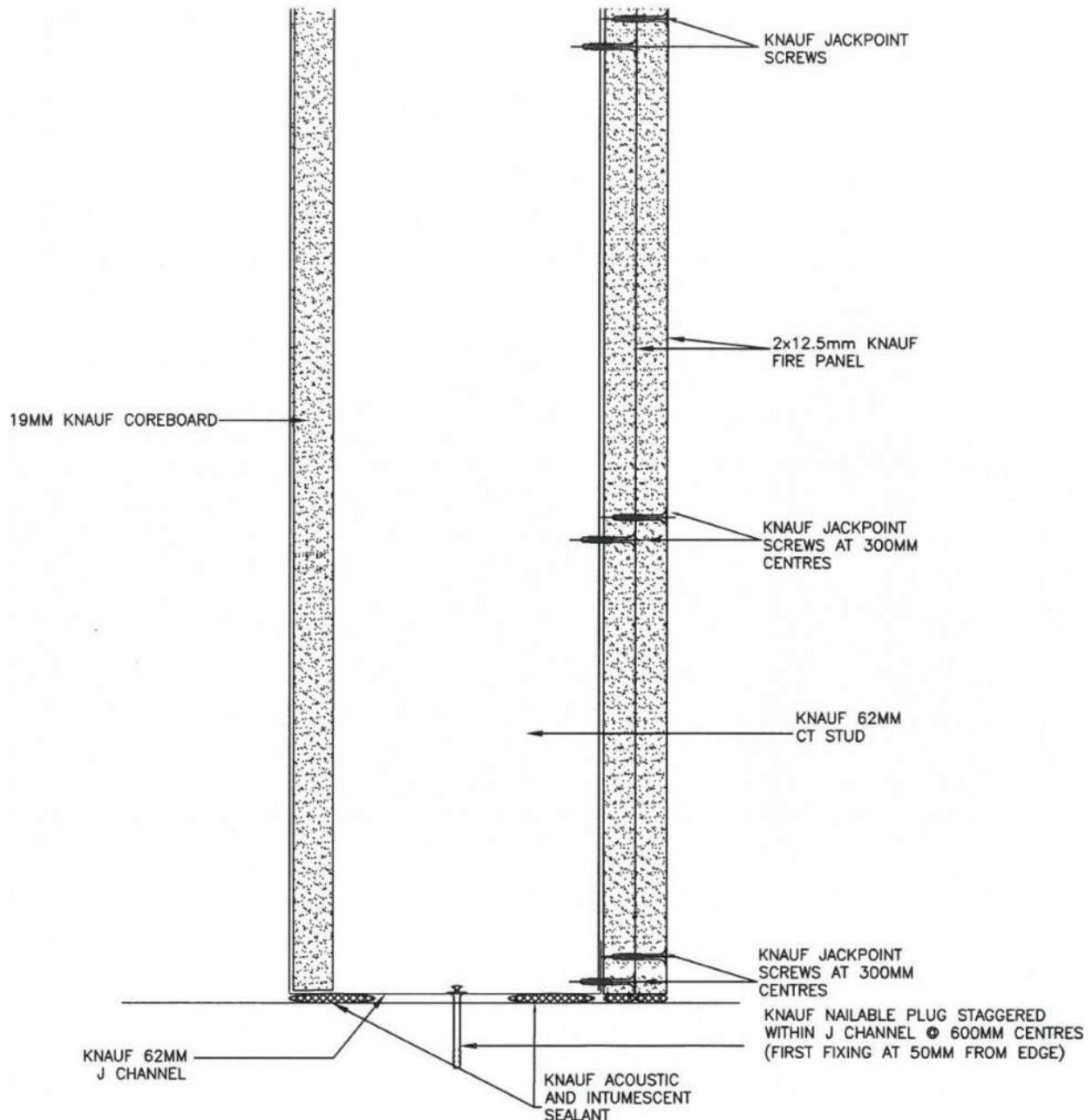


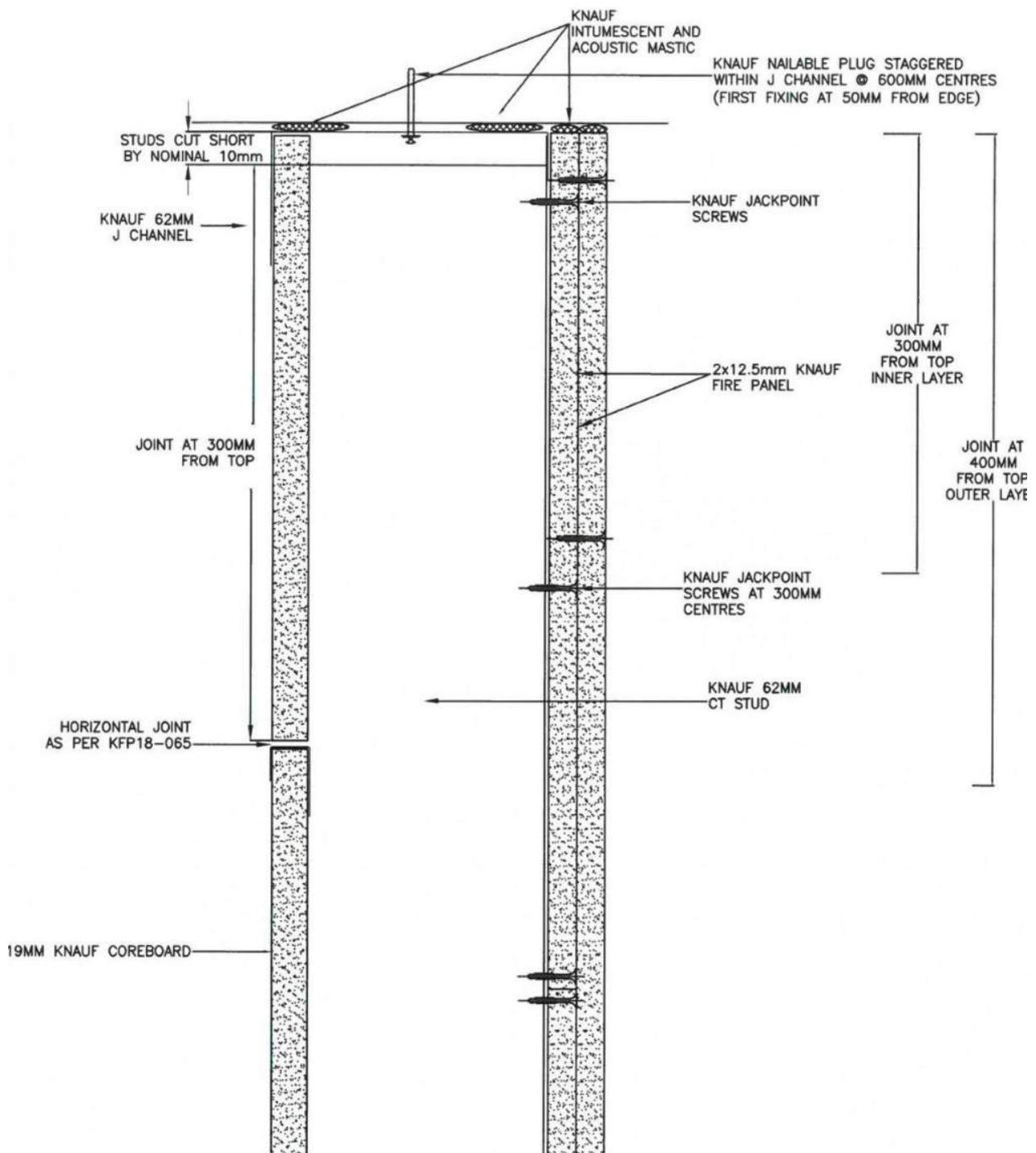
'J' Channel foldable board fixing tabs



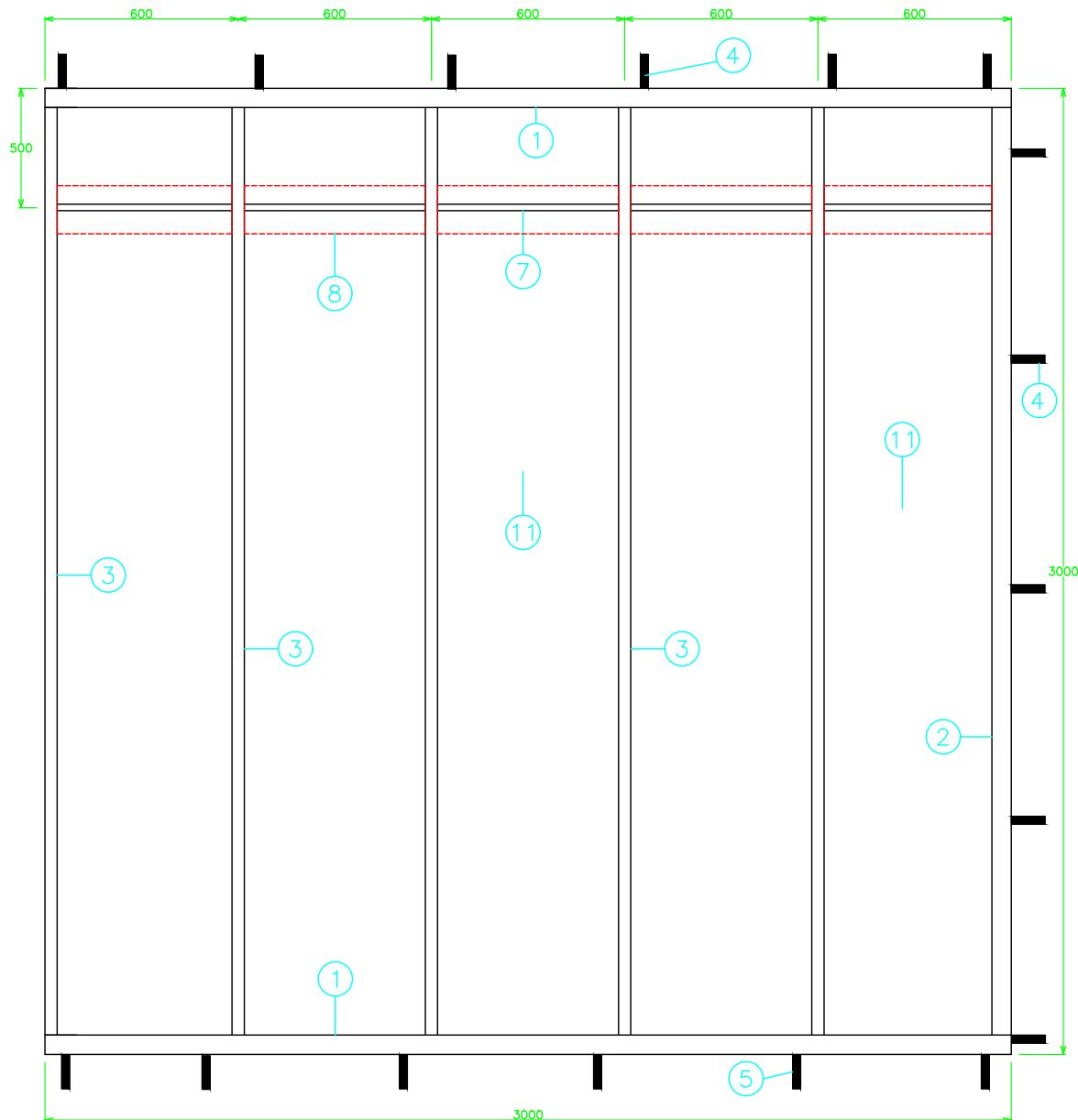
Appendix 1 – Client drawings



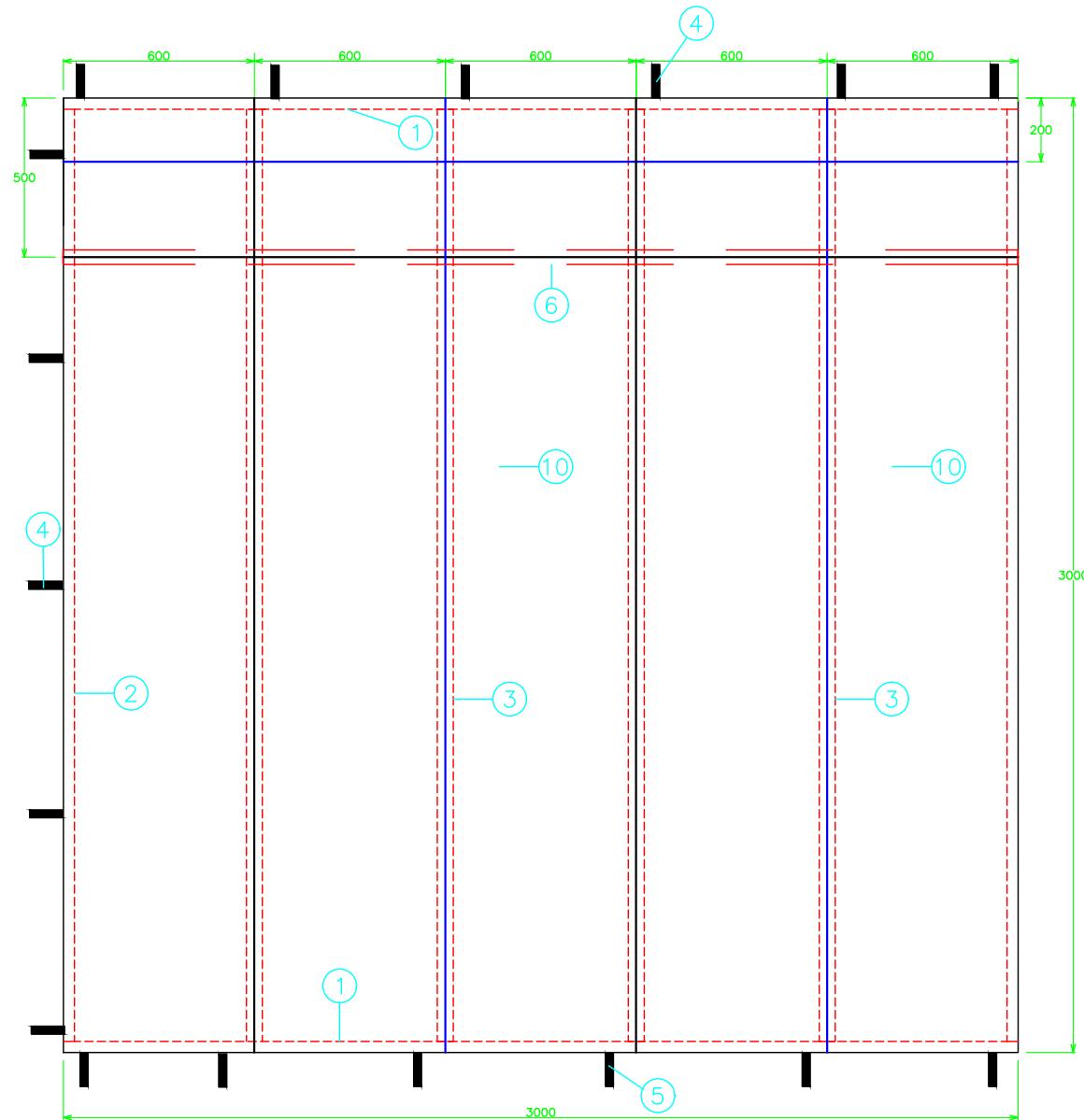




Appendix 2 – figures 1 – 4



19mm thick Knauf Coreboard plasterboard layout

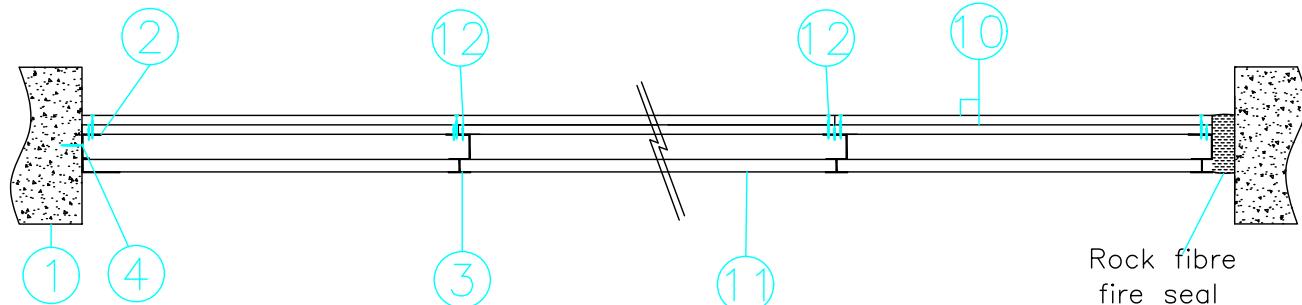


2 layers of 12.5mm thick Knauf Fire Panel plasterboard
 joint on outer board exposed face= _____ (black line)
 joint on inner board= _____ (blue line)



Fire side

Section A-A



Rock fibre fire seal

Refractory lined restraint frame

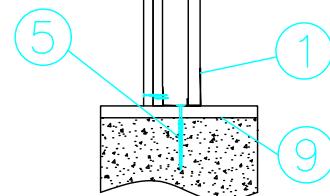
Knauf Jackpoint screws fixed into steel studs (not shown)

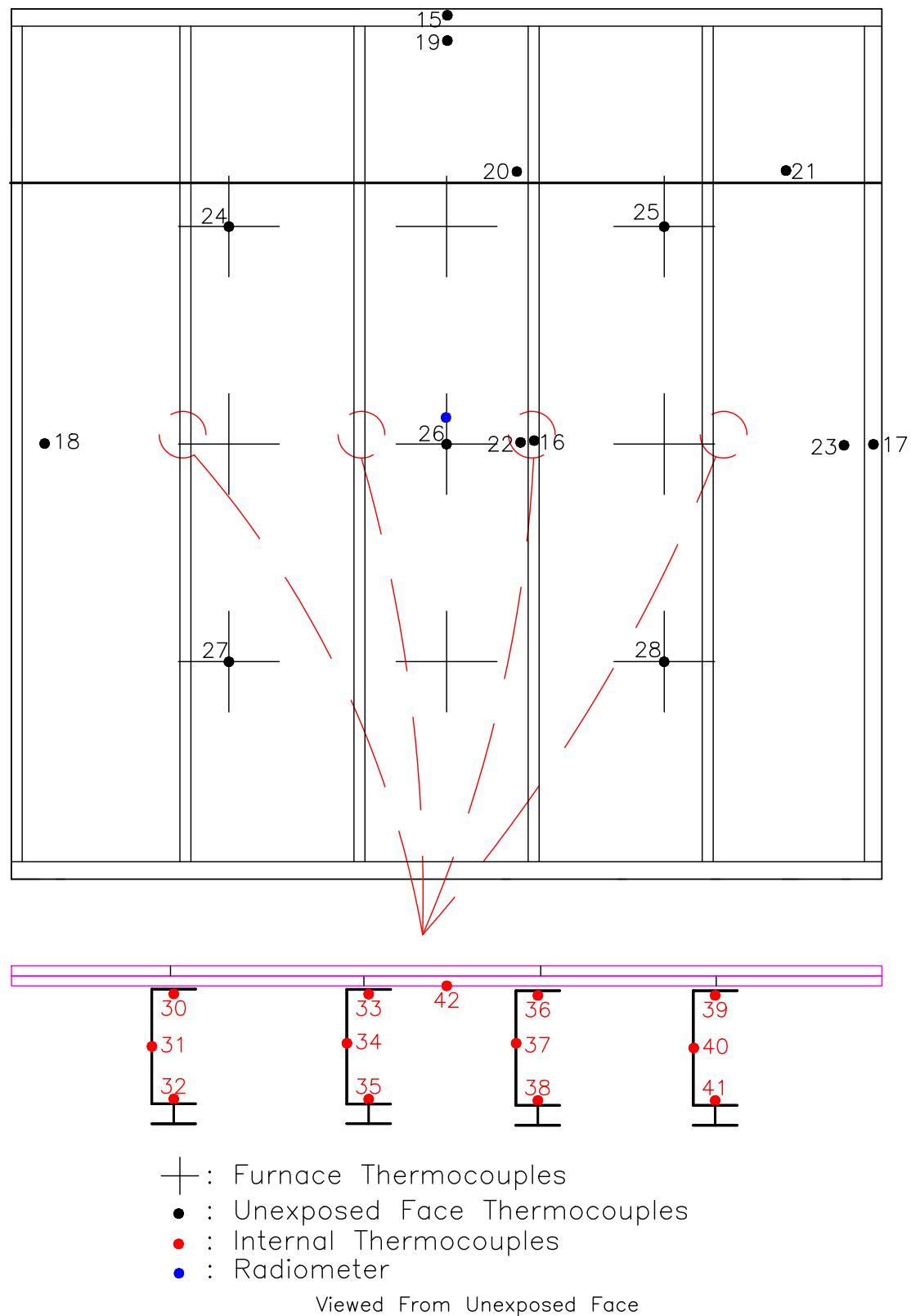
35mm Knauf Drywall Screws

Section B-B



Fire side





Appendix 3 - raw test data

(see figure 4 of appendix 2 for channel locations)

Time	Chan 15	Chan 16	Chan 17	Chan 18	Chan 19	Chan 20	Chan 21	Chan 22	Chan 23	Chan 24	Chan 25	Chan 26	Chan 27	Chan 28	Chan 30	Chan 31
min	°C															
0	16	20	17	19	19	18	19	19	18	19	19	19	18	19	20	20
1	17	20	17	19	19	18	19	19	18	19	18	19	18	19	20	21
2	18	20	17	19	19	18	19	19	18	19	18	19	18	19	21	22
3	20	20	18	19	20	19	19	19	18	19	18	19	18	19	21	22
4	25	20	18	19	20	19	19	19	18	19	18	19	18	19	22	23
5	31	20	18	19	20	19	19	19	18	19	18	19	18	19	24	26
6	32	21	21	19	21	19	19	19	19	19	18	19	19	19	28	32
7	33	21	27	19	22	19	19	19	19	19	17	19	19	19	33	40
8	34	21	31	19	24	20	19	20	19	20	17	20	19	20	38	47
9	36	23	34	20	28	20	19	21	20	21	17	21	20	20	43	53
10	38	24	37	21	29	21	20	22	21	22	16	21	22	21	48	57
11	41	26	41	22	28	22	20	23	22	23	16	23	23	22	51	60
12	42	28	43	23	29	24	21	24	23	25	15	24	24	23	55	63
13	43	29	46	24	29	25	21	26	25	26	14	25	26	24	57	65
14	46	31	48	26	30	26	22	27	27	28	12	26	28	26	60	67
15	47	33	50	28	32	28	23	29	29	30	10	27	30	27	61	68
16	50	34	52	30	33	29	24	31	31	32	9	26	31	29	64	69
17	51	36	54	32	33	31	25	32	33	34	8	26	33	30	65	70
18	52	38	55	34	34	33	26	34	35	37	7	26	35	32	67	71
19	53	39	57	35	34	34	27	36	37	38	-22	27	36	33	68	73
20	55	41	58	37	35	35	28	37	39	40	-13	28	38	35	69	75
21	56	42	60	38	36	37	29	39	41	42	42	29	40	36	71	77
22	58	44	61	40	37	38	30	41	42	44	42	30	41	37	73	80
23	59	45	61	41	38	40	31	43	44	46	44	32	43	39	75	82
24	60	47	62	43	40	41	32	44	45	47	46	33	44	40	77	83

Time	Chan 15	Chan 16	Chan 17	Chan 18	Chan 19	Chan 20	Chan 21	Chan 22	Chan 23	Chan 24	Chan 25	Chan 26	Chan 27	Chan 28	Chan 30	Chan 31
min	°C															
25	61	48	63	44	41	43	33	46	47	49	48	35	46	41	78	85
26	62	49	63	46	42	44	34	48	48	51	50	36	47	43	79	86
27	63	51	64	48	43	46	35	50	50	52	51	38	49	44	81	87
28	64	52	65	49	45	48	36	51	51	53	53	39	50	46	82	87
29	64	54	66	50	46	49	37	53	52	54	54	40	52	47	83	88
30	65	55	66	51	47	50	38	54	53	55	55	41	53	49	84	89
31	66	56	67	52	48	51	39	55	54	56	56	42	54	50	85	90
32	66	57	68	53	49	52	40	56	54	56	57	43	55	52	86	90
33	67	58	68	54	49	53	41	57	55	57	58	44	56	53	87	91
34	67	59	69	54	50	54	42	57	56	57	58	45	57	54	87	92
35	67	60	70	55	50	54	42	58	56	57	59	46	57	55	87	92
36	67	61	71	56	50	55	43	58	56	58	59	46	58	56	88	93
37	68	61	71	56	51	55	44	58	57	58	60	47	58	56	88	94
38	69	61	71	57	51	56	45	58	57	58	60	47	59	57	88	94
39	69	62	71	57	51	56	46	58	57	58	60	47	59	58	89	95
40	70	62	71	57	51	56	47	59	57	58	60	48	59	58	89	96
41	70	63	71	57	51	56	48	59	57	58	60	48	59	59	89	98
42	70	64	70	57	52	57	48	59	57	58	61	48	59	58	89	100
43	70	65	70	57	51	57	49	60	57	58	61	49	59	59	90	103
44	70	66	70	58	51	57	50	61	57	58	61	49	59	59	90	107
45	71	68	70	57	51	58	50	62	56	58	61	49	59	59	90	115
46	71	70	70	57	51	60	51	62	56	58	61	50	59	59	90	128
47	72	71	70	57	53	63	51	63	56	58	61	50	59	59	91	149
48	73	73	70	57	55	63	52	63	56	58	61	51	60	60	91	175
49	75	74	71	57	56	63	53	64	56	58	62	53	61	61	92	201
50	77	76	71	57	58	64	53	65	56	59	63	54	62	61	95	218
51	79	78	71	57	60	64	53	67	56	60	64	56	63	62	98	233
52	83	80	72	58	62	67	54	68	56	61	65	58	65	64	108	245
53	86	83	72	59	66	68	54	69	56	63	66	59	66	65	137	257

Time	Chan 15	Chan 16	Chan 17	Chan 18	Chan 19	Chan 20	Chan 21	Chan 22	Chan 23	Chan 24	Chan 25	Chan 26	Chan 27	Chan 28	Chan 30	Chan 31
min	°C															
54	89	86	73	60	70	70	54	70	57	64	67	59	66	66	167	267
55	93	90	74	61	74	72	55	71	57	65	67	60	66	66	188	277
56	97	92	75	62	76	73	55	71	58	66	67	60	66	66	204	285
57	105	94	76	63	76	74	55	72	59	66	68	60	67	67	217	293
58	114	96	77	63	77	75	55	72	60	67	68	61	67	67	227	299
59	125	96	79	64	77	75	56	73	61	68	68	62	68	68	235	306
60	136	98	81	65	76	76	57	73	63	68	69	62	69	68	242	312
61	146	101	83	65	77	77	57	74	64	69	69	63	70	68	247	319
62	157	104	84	66	77	77	58	74	64	70	70	63	71	69	252	325
63	165	108	86	66	77	77	59	75	65	70	70	64	71	70	257	331
64	172	114	88	67	78	78	59	75	66	71	71	65	72	71	262	337
65	177	121	89	68	78	79	59	76	66	71	71	66	73	71	267	342
66	181	127	91	69	79	80	60	76	66	72	72	66	74	72	272	348
67	184	132	92	69	79	81	60	77	67	72	72	67	74	73	278	354
68	184	138	94	70	79	81	61	77	68	73	73	68	75	73	285	365
69	185	142	96	71	80	84	61	77	68	74	74	68	76	73	293	371
70	186	145	97	72	80	86	61	78	69	74	74	69	76	74	301	377
71	185	148	99	72	80	90	62	79	69	75	75	70	77	75	308	382
72	183	150	100	73	81	94	62	79	70	75	75	70	78	75	316	388
73	180	152	101	73	81	100	62	79	70	76	76	70	78	75	323	394
74	175	154	102	74	81	105	63	79	71	76	77	71	79	76	329	400
75	171	157	103	75	80	108	63	80	71	77	78	72	81	77	336	406
76	167	160	104	75	79	112	63	81	72	77	79	72	81	78	343	413
77	164	163	106	76	79	115	63	81	72	78	79	73	82	78	350	15
78	162	166	107	77	79	118	64	82	73	78	80	74	83	79	357	15
79	161	168	108	78	80	119	64	82	74	79	81	75	84	80	366	15
80	162	171	110	79	81	121	64	83	74	79	82	76	85	81	375	15
81	163	174	111	80	84	119	65	84	75	80	83	77	86	81	385	15
82	165	177	113	80	86	111	65	85	75	81	83	79	87	82	397	15

Time	Chan 15	Chan 16	Chan 17	Chan 18	Chan 19	Chan 20	Chan 21	Chan 22	Chan 23	Chan 24	Chan 25	Chan 26	Chan 27	Chan 28	Chan 30	Chan 31
min	°C															
83	166	181	115	81	90	111	65	87	76	81	84	82	88	83	410	15
84	167	184	117	82	93	112	66	89	77	82	85	84	89	84	418	15
85	168	188	118	83	96	110	66	91	77	83	85	85	90	85	432	15
86	172	193	120	84	101	105	67	93	78	83	86	87	92	86	454	15
87	178	199	121	84	109	103	67	95	79	84	86	88	93	87	475	15
88	184	206	123	85	112	106	68	97	79	85	87	89	94	88	496	16
89	190	216	125	86	119	108	69	101	80	86	88	90	96	89	514	16
90	198	231	127	86	125	110	69	105	80	88	89	92	97	90	532	16
91	205	252	128	86	128	109	69	111	80	89	90	93	99	91	550	16
92	210	278	130	87	128	107	69	121	81	91	91	95	103	93	574	16
93	216	309	132	88	126	105	69	132	82	93	92	98	108	93	608	16
94	224	343	134	89	130	105	70	145	82	95	93	102	120	95	652	16
95	230	382	135	89	135	107	70	161	83	100	94	108	131	96	717	16
96	241	434	137	90	153	113	71	187	83	109	95	115	143	98	590	16
97	254	460	139	91	175	116	72	213	84	121	97	122	155	100	826	16
98	266	480	141	92	200	116	72	235	84	133	99	130	186	103	923	16
99	277	486	143	93	222	115	73	259	85	145	102	139	217	109	983	16

Time	Chan 32	Chan 33	Chan 34	Chan 35	Chan 36	Chan 37	Chan 38	Chan 39	Chan 40	Chan 41	Chan 42
min	°C										
0	21	21	21	22	21	22	16	21	21	22	20
1	21	21	21	22	21	22	16	22	21	22	20
2	22	21	21	24	22	22	16	22	21	22	20
3	24	21	22	26	22	23	16	22	21	22	21
4	28	22	24	31	23	24	16	22	23	24	22
5	39	24	27	40	25	27	16	24	26	29	24
6	49	28	35	51	30	33	16	27	32	39	28
7	58	34	44	61	35	41	16	32	40	49	34
8	65	39	51	68	41	47	16	38	48	58	40
9	71	48	56	73	46	53	16	43	54	64	44
10	75	58	60	78	49	57	16	47	58	69	48
11	78	63	64	81	52	60	16	51	61	72	51
12	81	65	67	84	55	62	16	55	64	75	54
13	83	66	69	86	57	63	17	58	66	77	56
14	84	68	71	87	58	66	17	60	68	79	58
15	85	69	73	89	58	66	17	62	70	80	60
16	86	70	74	90	60	67	17	63	71	81	61
17	87	72	76	92	63	68	17	65	73	83	63
18	88	75	78	95	64	70	17	66	74	84	66
19	90	78	81	98	67	73	17	69	77	86	69
20	92	79	83	99	70	76	17	71	78	88	71
21	93	80	85	100	72	77	17	73	79	89	73
22	95	83	87	101	74	79	17	76	81	91	75
23	95	84	89	103	76	81	17	78	82	92	77
24	95	86	90	106	78	83	17	80	84	94	79
25	96	87	91	109	81	85	17	81	86	95	81
26	97	88	92	113	82	86	17	83	87	96	83

Time	Chan 32	Chan 33	Chan 34	Chan 35	Chan 36	Chan 37	Chan 38	Chan 39	Chan 40	Chan 41	Chan 42
min	°C										
27	99	89	93	118	84	88	17	85	88	97	84
28	101	90	94	122	86	89	17	86	89	97	85
29	105	91	96	125	87	90	17	87	91	98	86
30	109	91	97	128	89	91	17	88	91	99	87
31	112	92	99	131	89	92	17	89	92	99	88
32	116	93	101	134	91	92	17	90	93	100	88
33	120	92	102	138	91	93	17	90	94	101	89
34	124	93	104	145	93	93	17	91	94	103	89
35	128	92	107	153	94	93	17	91	95	106	89
36	133	93	110	165	94	94	17	92	96	108	89
37	139	93	116	178	94	94	17	92	96	111	90
38	146	93	124	192	96	94	17	93	97	114	90
39	154	93	133	206	96	94	17	93	97	117	91
40	163	93	142	222	95	95	17	93	98	122	91
41	173	94	154	236	96	96	17	94	100	129	91
42	185	95	167	251	97	97	17	95	102	139	92
43	198	95	183	265	99	99	17	97	105	152	95
44	211	98	199	278	101	102	17	99	110	167	98
45	223	104	215	291	105	107	17	101	116	184	103
46	236	113	231	305	109	114	17	101	125	201	113
47	248	123	245	319	114	122	17	101	136	19	125
48	262	136	260	333	125	138	17	101	149	14	139
49	275	162	273	346	134	177	17	101	169	19	155
50	288	227	282	358	149	211	17	102	191	19	170
51	301	260	289	370	172	232	17	107	211	19	187
52	315	274	298	381	203	248	17	111	226	19	199
53	328	283	306	390	220	260	17	117	240	19	209
54	340	291	314	397	230	270	17	125	253	19	216
55	351	297	321	404	238	279	17	141	266	19	221

Time	Chan 32	Chan 33	Chan 34	Chan 35	Chan 36	Chan 37	Chan 38	Chan 39	Chan 40	Chan 41	Chan 42
min	°C										
56	361	301	329	409	246	286	17	182	278	19	224
57	370	303	334	414	253	293	17	213	289	19	227
58	378	305	339	418	259	300	17	231	299	19	230
59	385	309	345	422	264	307	17	242	308	19	234
60	392	316	350	426	270	313	17	249	316	19	239
61	399	326	354	429	276	319	17	256	324	19	244
62	404	338	359	434	283	325	17	262	330	382	250
63	410	349	364	439	290	331	17	268	337	388	257
64	415	359	370	444	296	337	17	273	344	394	263
65	420	370	377	449	302	343	17	279	349	399	270
66	426	383	384	455	309	352	17	284	356	405	278
67	433	401	393	462	316	360	17	290	363	412	285
68	438	421	403	470	322	364	17	296	369	418	293
69	441	439	413	479	328	368	17	302	375	425	301
70	445	456	424	489	334	372	17	308	381	433	308
71	450	469	434	499	340	376	17	314	386	441	316
72	454	482	443	509	347	380	17	320	393	447	323
73	459	494	454	518	353	385	17	327	399	453	330
74	464	506	465	528	359	389	17	332	404	457	337
75	469	517	476	539	364	394	17	337	408	460	345
76	474	527	489	550	370	399	17	343	415	466	353
77	480	539	506	563	378	405	17	349	422	472	362
78	486	547	520	577	386	411	17	354	426	477	371
79	494	554	533	590	393	417	17	359	429	479	383
80	503	563	544	602	401	424	17	363	433	483	402
81	513	572	555	615	409	432	16	369	439	489	436
82	525	580	563	626	417	441	17	375	445	493	471
83	537	588	572	636	426	450	17	381	451	499	503
84	550	596	582	644	436	460	17	388	457	505	524

Time	Chan 32	Chan 33	Chan 34	Chan 35	Chan 36	Chan 37	Chan 38	Chan 39	Chan 40	Chan 41	Chan 42
min	°C										
85	617	604	590	651	446	469	17	395	464	510	542
86	696	615	599	657	456	478	17	402	471	516	556
87	744	627	611	665	479	496	17	410	479	523	570
88	773	641	623	675	527	549	17	419	488	530	583
89	803	655	632	683	574	589	17	430	500	540	637
90	831	675	640	690	626	632	17	443	516	553	613
91	858	704	652	698	668	696	17	459	531	565	698
92	866	738	668	709	720	760	18	472	541	575	721
93	878	774	691	726	766	752	18	483	549	585	748
94	899	777	708	743	813	768	17	496	555	595	796
95	914	839	728	761	850	805	17	509	564	607	792
96	937	837	750	792	853	826	17	521	573	617	1258
97	953	756	804	854	875	849	17	532	584	622	1258
98	959	767	812	878	1259	875	17	546	603	628	1258
99	967	762	819	895	1259	893	17	559	616	628	1258