CONFIDENTIAL

Report: Chilt/IF11007

A indicative fire resistance test performed on 2No duct penetration seals within a plasterboard clad steel stud partition

Test conducted to the principles of BS EN 1366-3: 2009 and the temperatures and pressure conditions of BSEN 1363-1: 1999

Test date: 9th February 2011

committed to excellence

Prepared for: Tenmat Ltd
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Contents

Introduction

Five duct penetration sealing systems were supplied for evaluation, only two of which are subject to this report.

The penetration seals and ducts were supplied for test by the client and delivered during February 2011. Chiltern International Fire Limited (CIFL) constructed a vertical steel stud/plasterboard clad partition and the client installed the specimens into the supporting construction with assistance from CIFL as required.

2 Specification

2.1 Supporting construction

The vertical supporting construction measured 1060mm wide x 1070mm high x nominally 132mm deep.

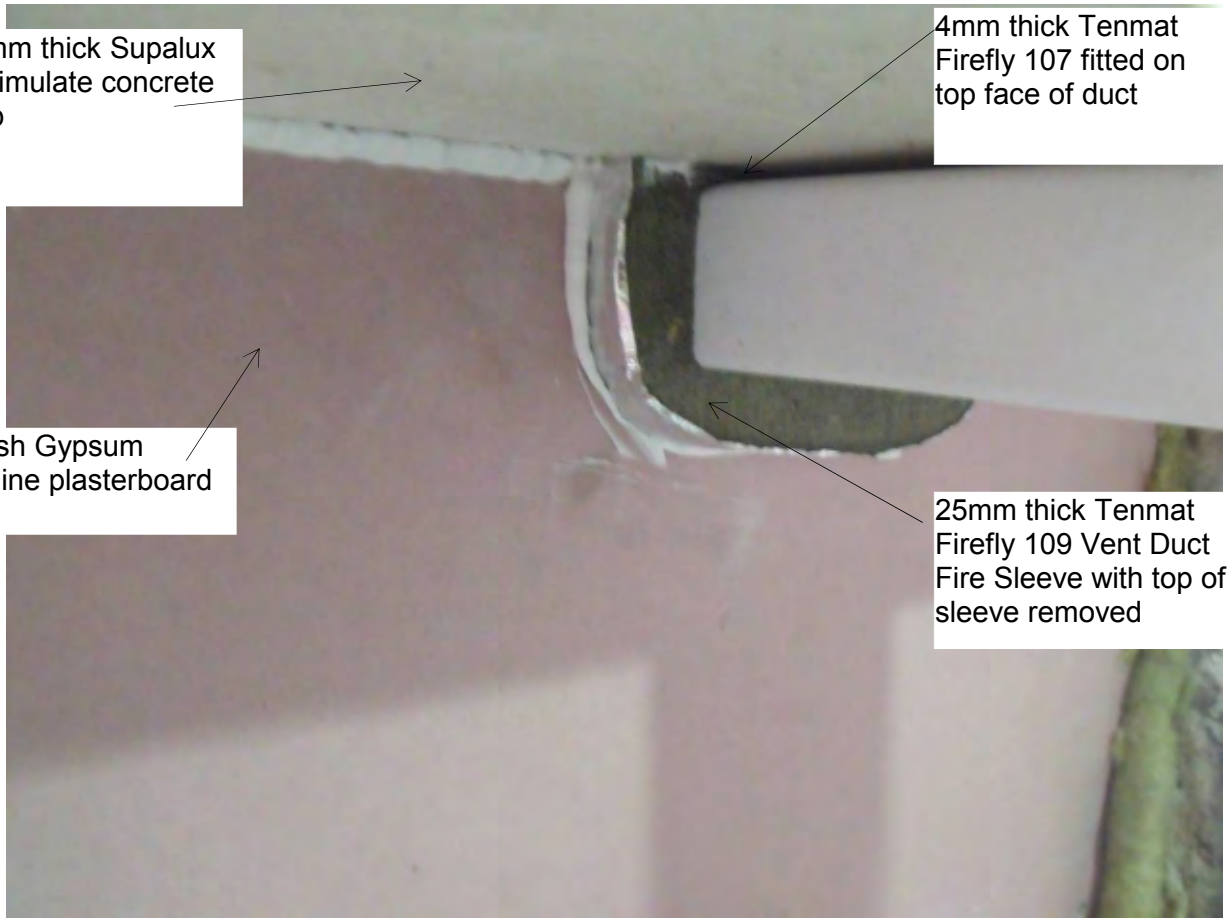
The supporting construction was constructed from 70mm wide British Gypsum galvanised steel studs with accompanying 72mm wide British Gypsum 'U' section head and base tracks. The studs were fitted at 530mm centres and clad with a two layers of 15mm British Gypsum Fireline plasterboard on each face, fixed with 42mm long drywall screws at 300mm centres. A board joint was present down the central stud on each face

An 18mm thick non-combustible liner (18mm thick Supalux board) was fitted at the head of the aperture to simulate a structural concrete slab.

2.2 Penetration sealing specification (See photograhs and Appendix 1)

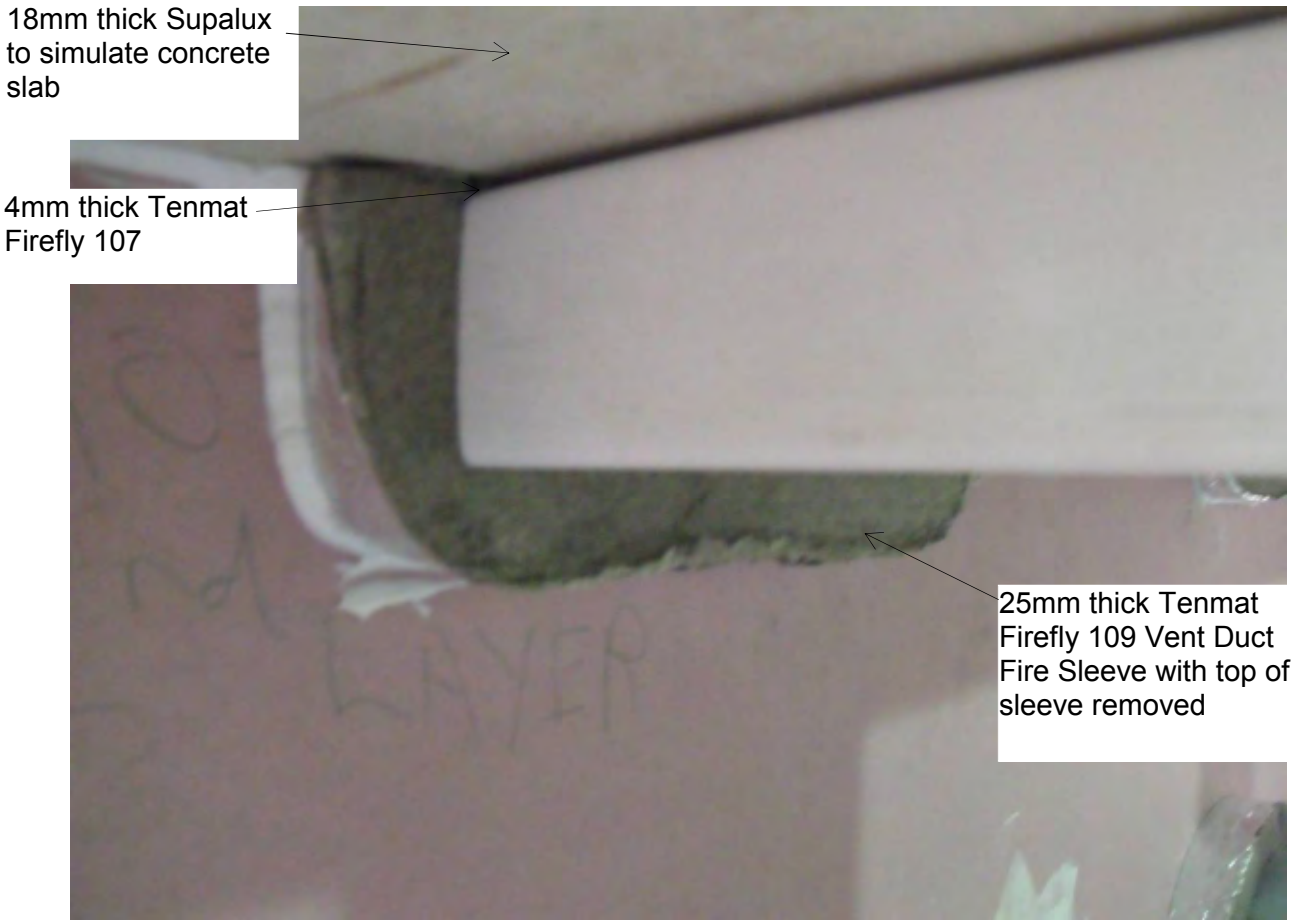
Duct A – comprised a 110mm wide x 54mm high x 1.5mm wall thickness PVC ventilation duct, fitted through a 160mm wide x 79mm high aperture at the head of the partition and central between the studs.

Duct A – sealing system – comprised a Tenmat Firefly 109 Vent Duct Fire Sleeve with the top removed, measuring 180mm long with a nominal wall thickness of 25mm, fitted around the top and sides of the duct. The fire sleeve protruded nominally 25mm from each face of the aperture. The top of the duct was protected with a layer of Tenmat Firefly 107 intumescent, 4mm thick x 110mm wide x 180mm deep, fitted between the duct and soffit.



Duct B – comprised a 204mm wide x 60mm high x 1.5mm wall thickness, PVC ventilation duct, fitted through a 254mm wide x 85mm high aperture at the head of the partition and central between the studs.

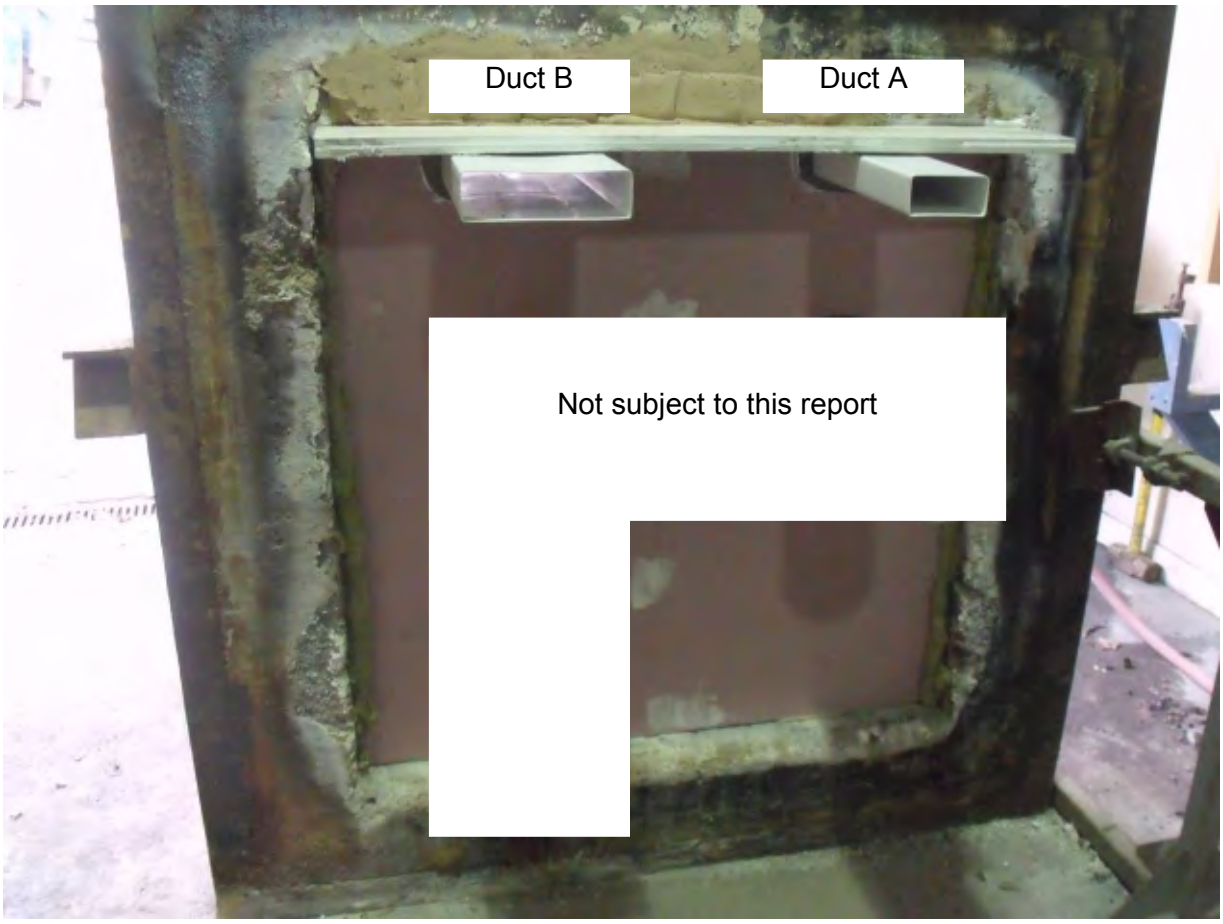
Duct B – sealing system – comprised a Tenmat Firefly 109 Vent Duct Fire Sleeve with the top removed, measuring 180mm long with a nominal wall thickness of 25mm, fitted around the top and sides of the duct. The fire sleeve protruded nominally 25mm from each face of the aperture. The top of the duct was protected with a layer of Tenmat Firefly 107 intumescent, 4mm thick x 204mm wide x 180mm deep, fitted between the duct and soffit.



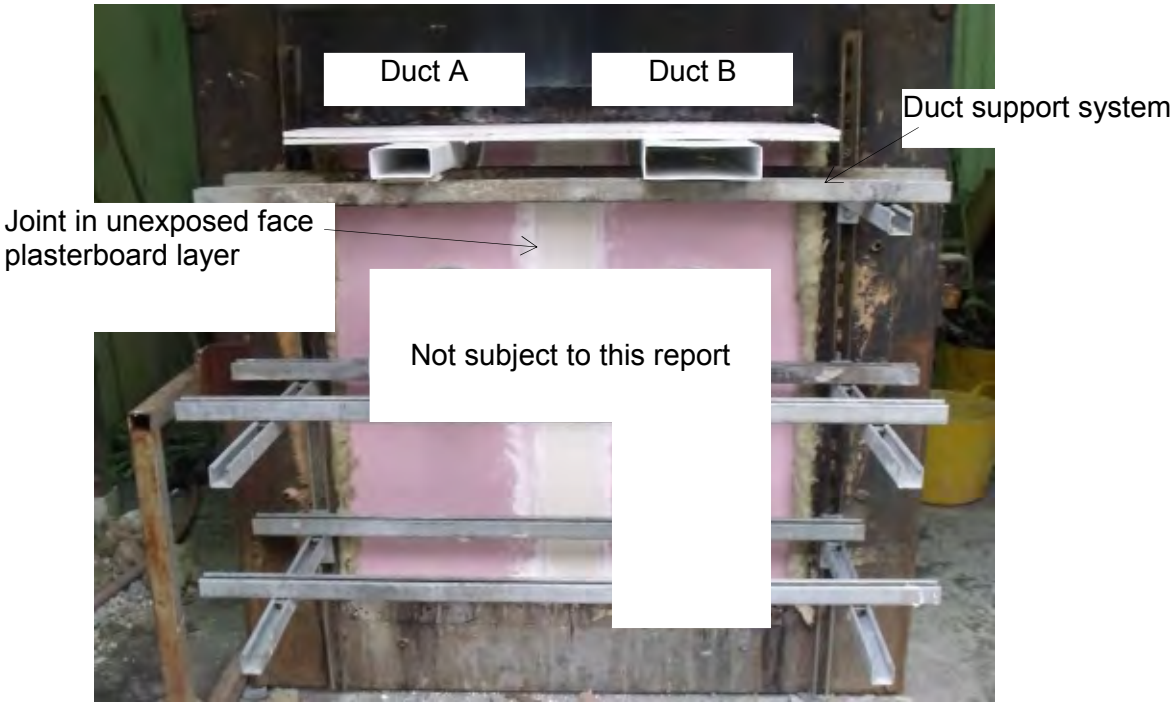
Both ducts were tested uncapped (open/open) on both faces to simulate an open /open ventilated duct system end use application.

The ducts were supported laterally at 150mm and 450mm on the unexposed face of the partition and were unsupported on the exposed face.

Exposed face prior to testing



Unexposed face prior to testing



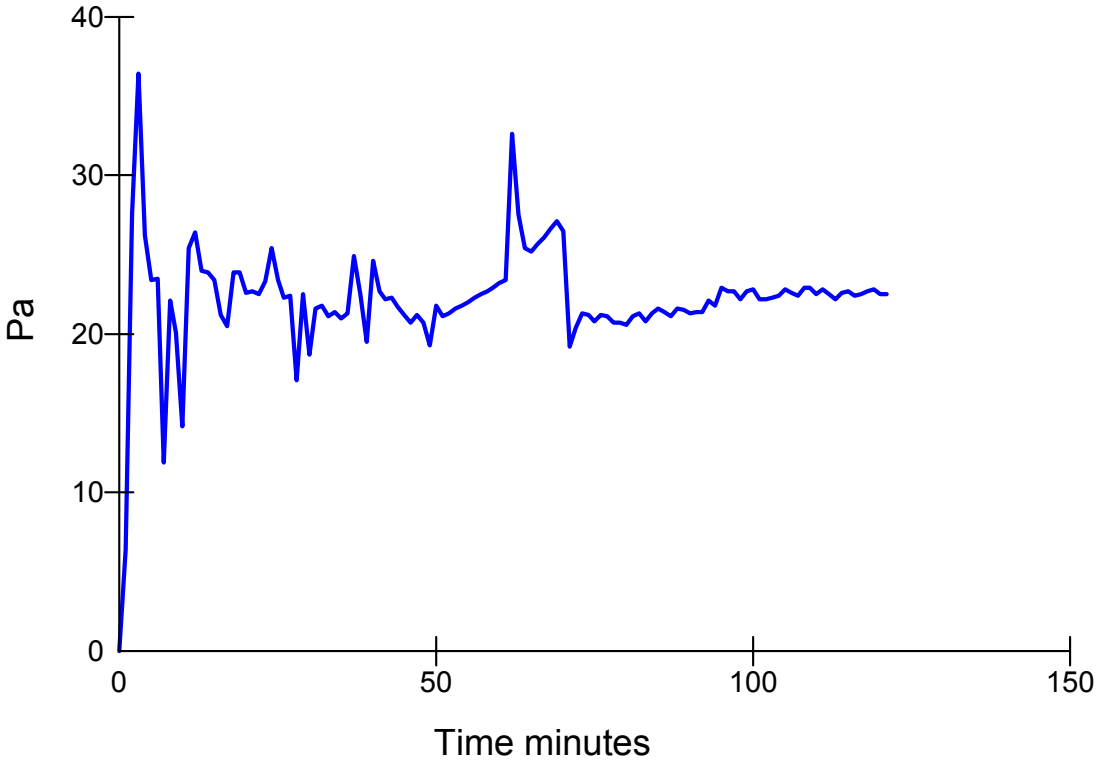
3 Test conditions

3.1 Ambient temperature.

The ambient temperature of the test area at commencement of test was 10°C. The ambient temperature for the duration of the test has been tabulated in the Appendix 2.

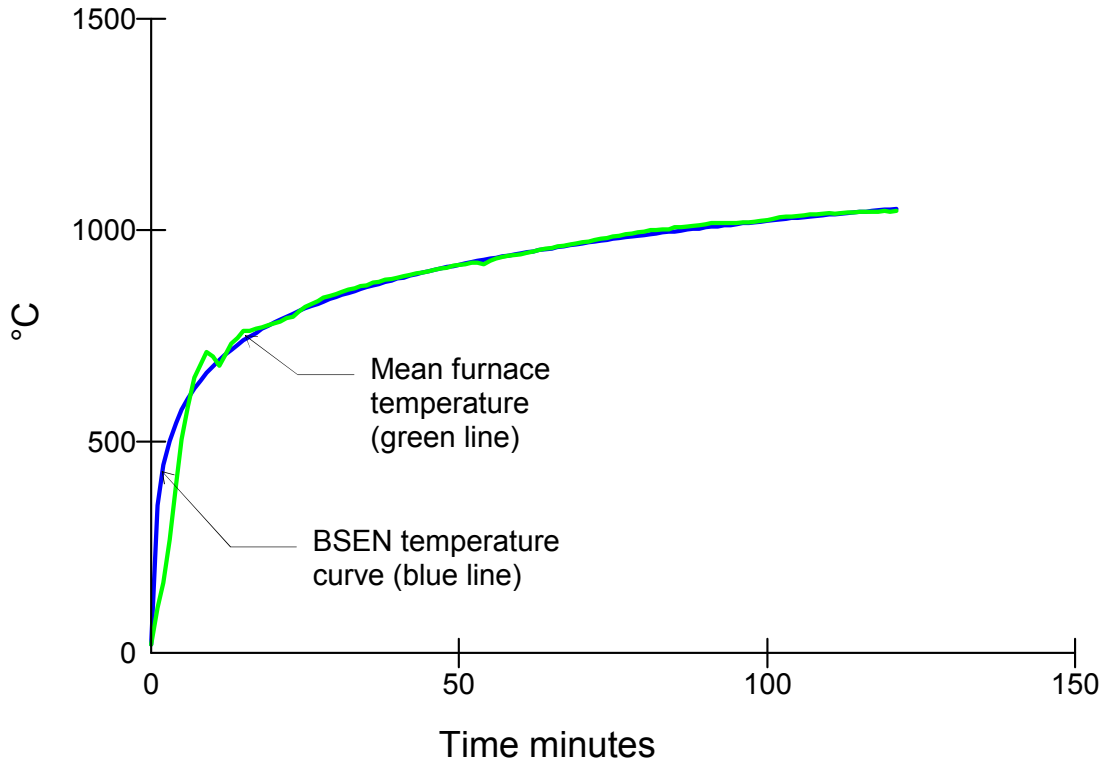
3.2 Pressure readings.

After the first 5 minutes of the test, the furnace pressure was maintained at 21.7 ± 5 Pa and after 10 minutes was maintained at 21.7 ± 3 Pa with respect to atmosphere equating to 20 Pa at the top of the uppermost seal. The pressure readings have been tabulated in Appendix 2 and are shown graphically below:



3.3 Furnace temperature

The furnace was controlled to follow the temperature/time relationship specified in BSEN 1363: Part 1: 1999 Section 5.1.1 as closely as possible, using the average of four plate thermometers suitably distributed within the furnace. The temperatures recorded have been tabulated in Appendix 2 and are shown graphically below:



3.4 Thermocouple positions

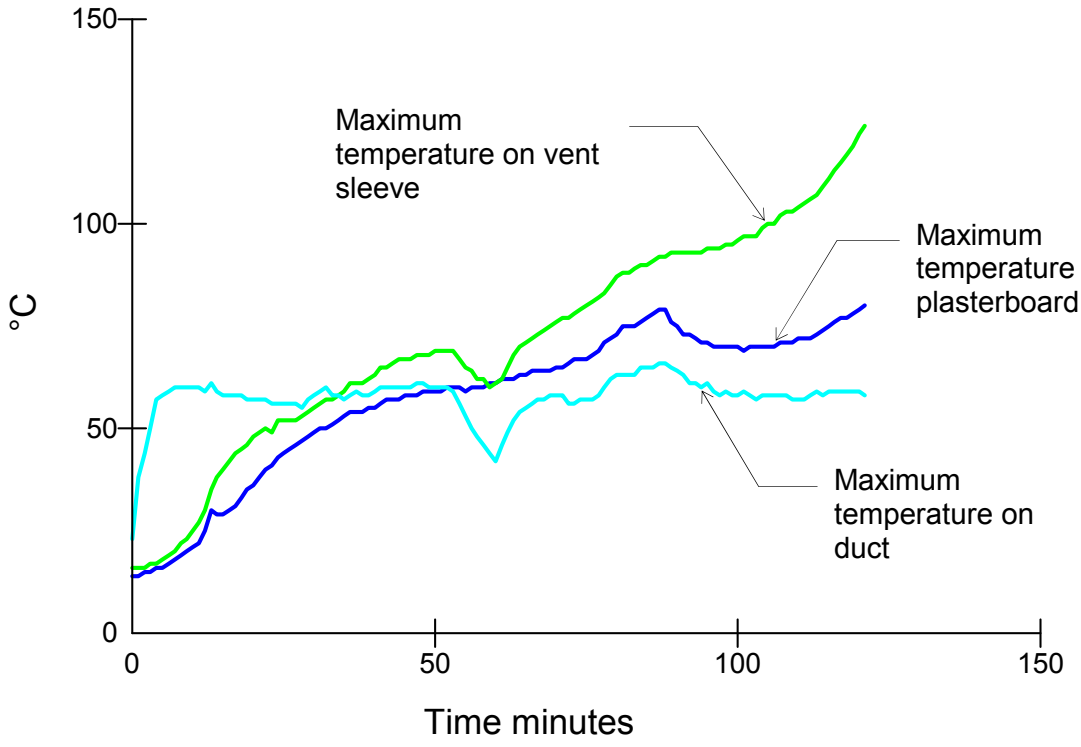
The temperature on the unexposed face was monitored by means of the following thermocouples: (see Appendix 1, figure 3)

Specimen Identification	Thermocouple number	Position
-	1-4	Furnace thermocouples
-	10	Ambient temperature
Duct A	11	On plasterboard 25mm from Vent Duct Fire Sleeve
Duct A	12	On Vent Duct Fire Sleeve 25mm from plasterboard
Duct A	13	On Duct 25mm from Vent Duct Fire Sleeve
Duct B	14	On plasterboard 25mm from Vent Duct Fire Sleeve
Duct B	15	On Vent Duct Fire Sleeve 25mm from plasterboard
Duct B	16	On Duct 25mm from Vent Duct Fire Sleeve
-	26	Laboratory ambient

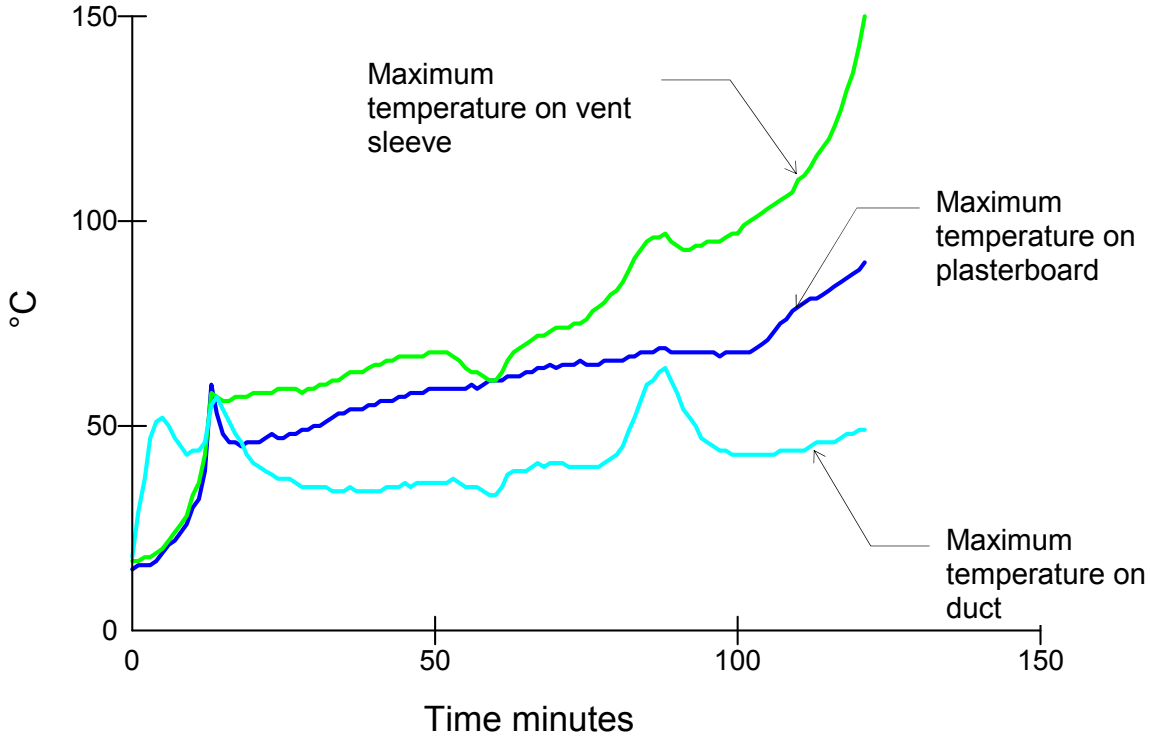
The temperatures recorded have been tabulated in Appendix 2.

3.5 Unexposed face temperatures

Duct A



Duct B



3.6 Observations

All comments relate to the unexposed face unless otherwise specified, (reference to Appendix 1 - figure 1).

Time (minutes)	Duct	Comments
0.00		Test started
0.35	A/B	The duct has melted and collapsed on the exposed side.
8.22	A/B	The ducts have fully sealed on the exposed side.
121.00		Test terminated, no flaming from ducts A and B

4 Primary observations

8.22	A/B	The ducts have fully sealed on the exposed side.
121.00		Test terminated, no flaming from ducts A and B

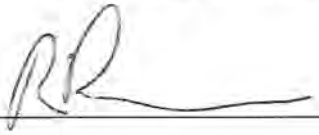
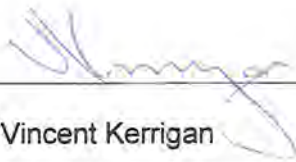
5 Limitations

These test results relate to an investigation which utilised the test methodology given in BS EN 1366-3: 2009: the full requirements of the Standard were not, however, complied with. The information is provided for the test sponsor's information only and should not be used to demonstrate performance against the Standard nor compliance with a regulatory requirement. The test was not conducted under the requirements of UKAS accreditation

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.

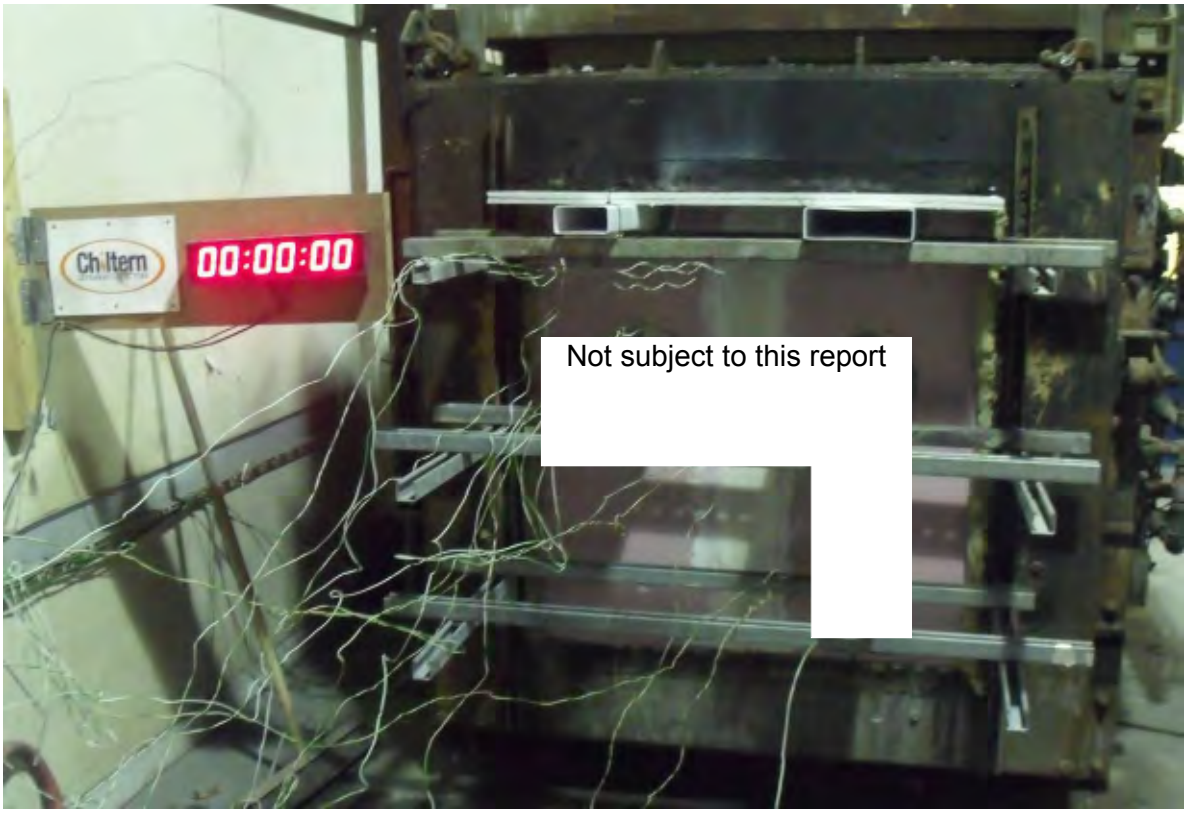
The penetration sealing systems contained within this report were tested in a section of plasterboard partition which was not subject to the level of distortion that would be expected in a full 3m high partitioning system. When considering the suitability of these results for extrapolation to full height partitions this should be taken into consideration. The test pressure conditions were to simulate penetrations at the top of a 3m partition.

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. CIFL 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.

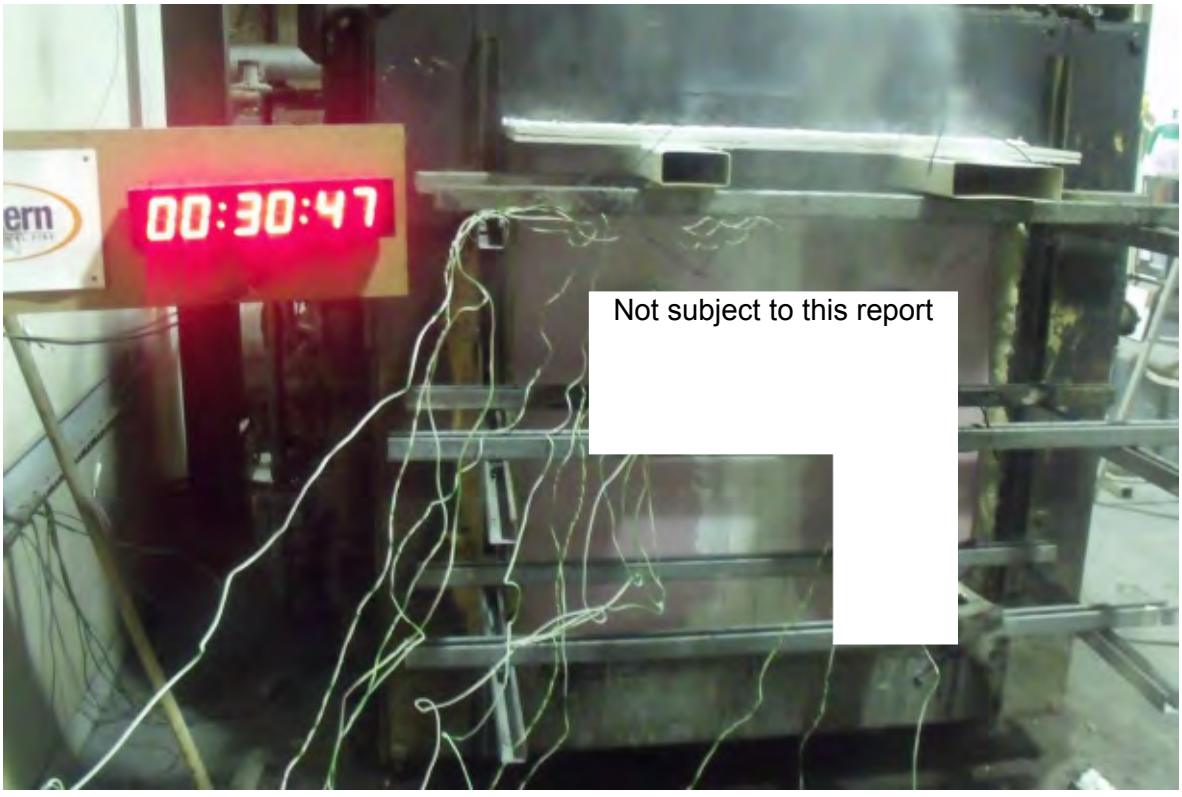
Signature:		
Name:	Ross Newman	Vincent Kerrigan
Title:	Principal Test Engineer	Technical Manager
Date of issue:		16-03-2011

6 Photographs

Start of test

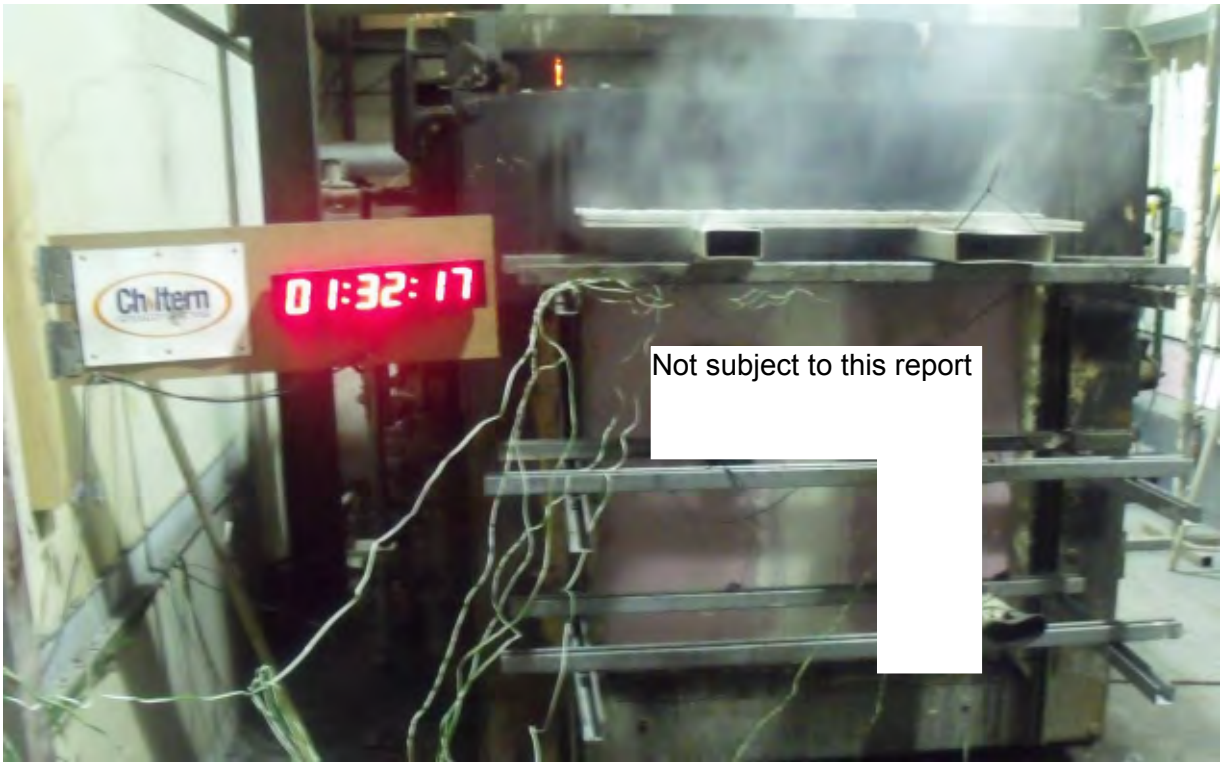


After 30 minutes

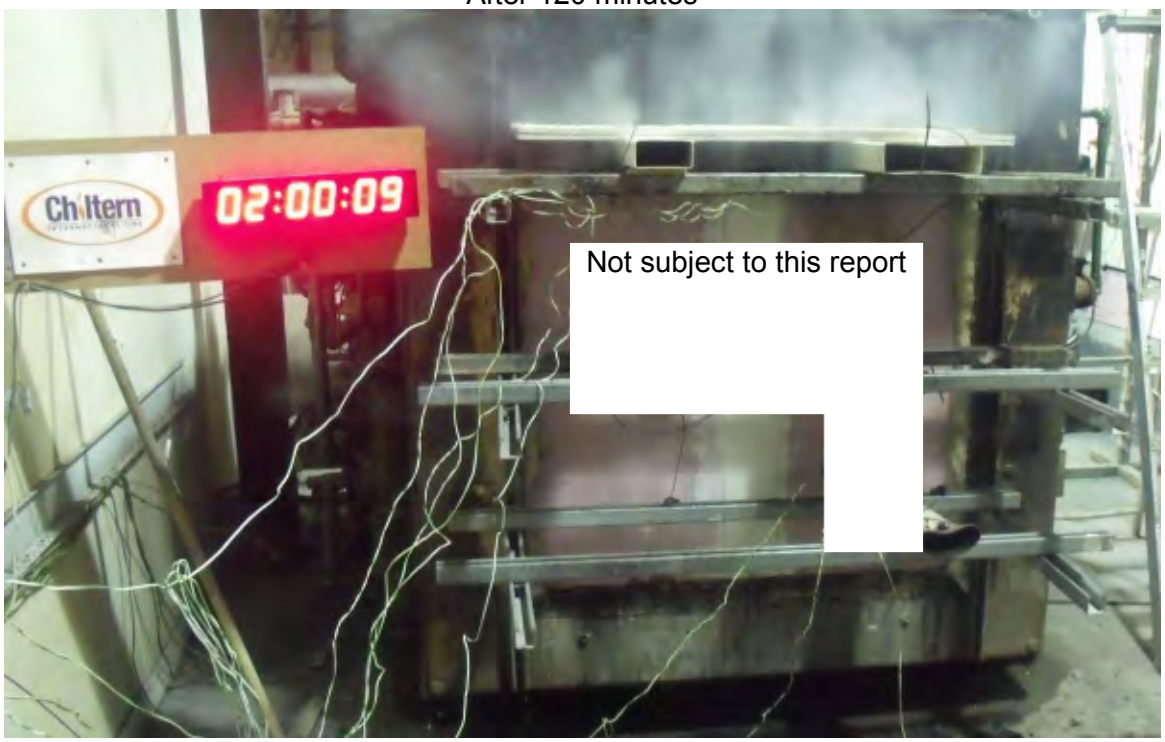


After 60 minutes

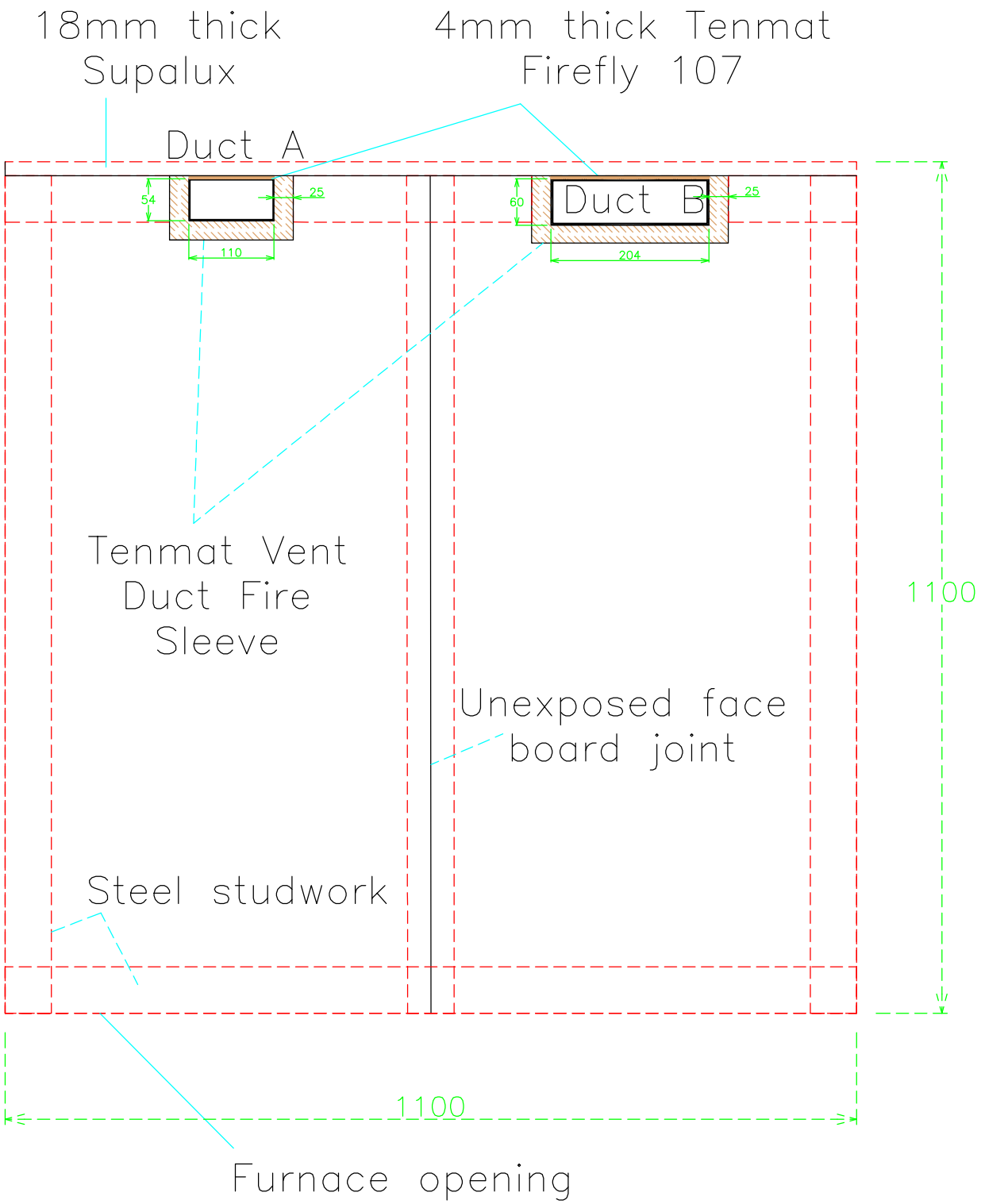
After 92 minutes



After 120 minutes



Appendix 1 – Figures 1 - 3



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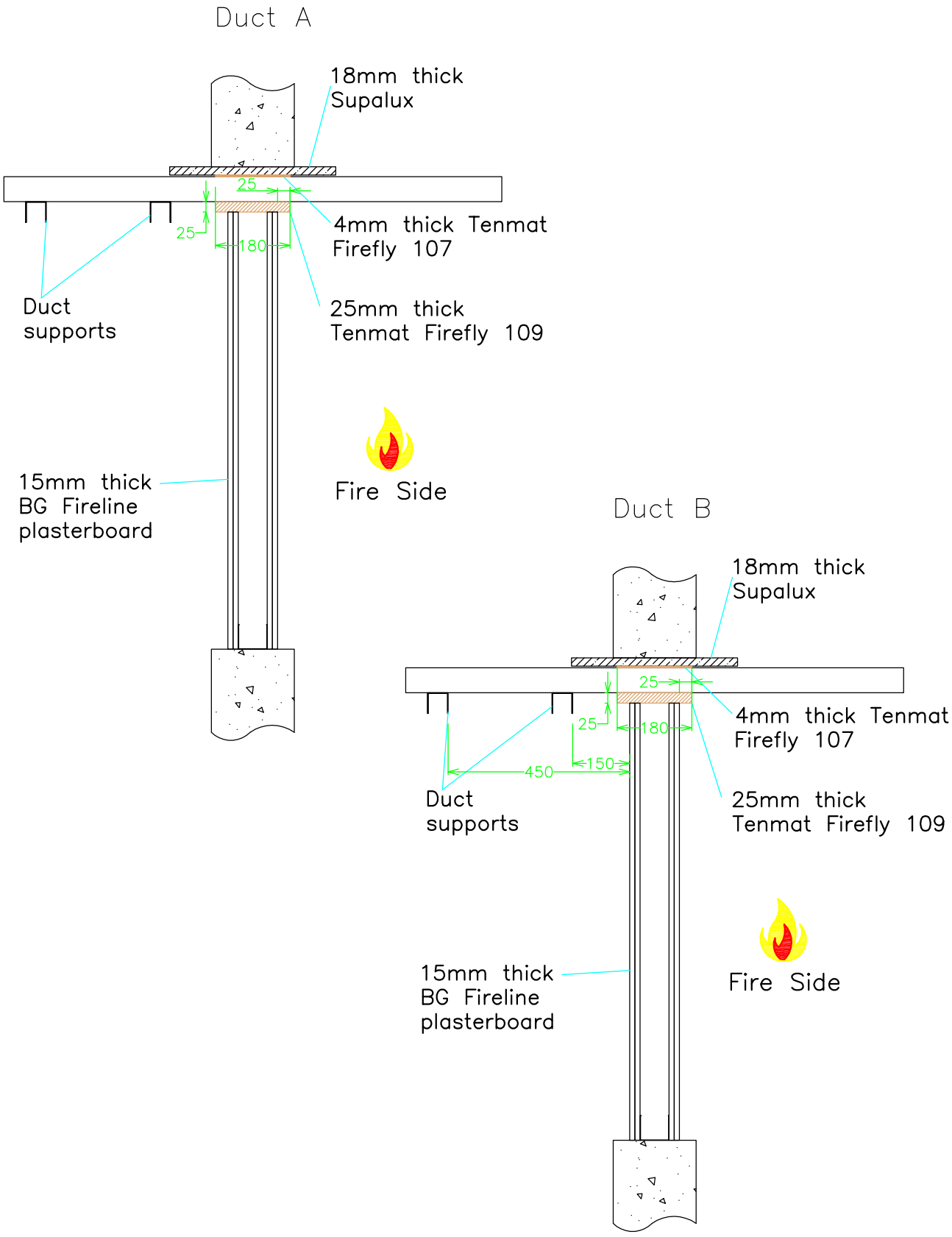
Title: Unexposed face elevation (All dimensions in mm)		
Date Drawn: 07/03/11	Drawn By: ARD	Scale: NTS
Project No.: Chilt/IF11007		Appendix 1

Vertical cross sections



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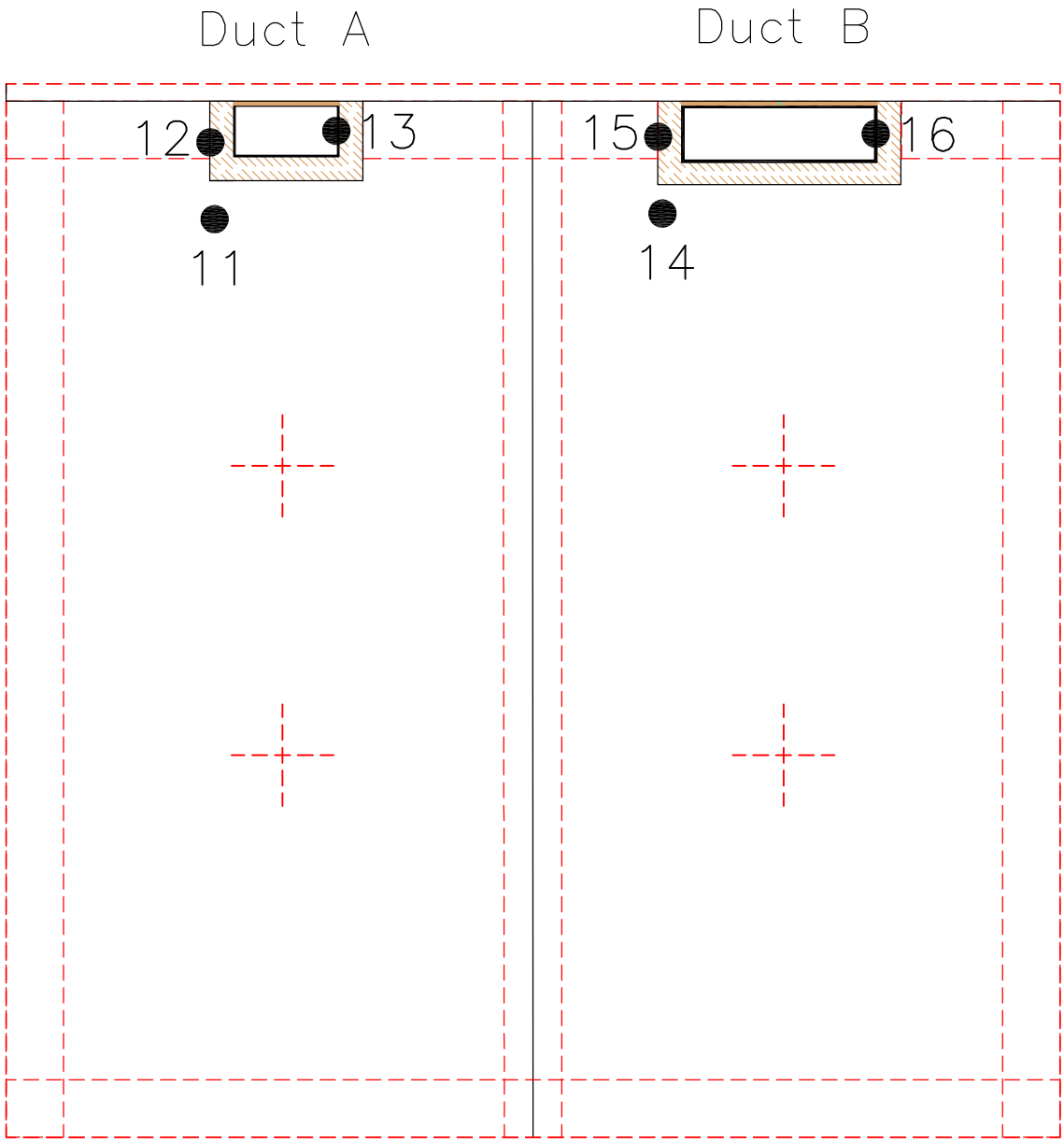
Title		
Vertical cross sections (All dimensions in mm)		
Date Drawn 07/03/11	Drawn By ARD	Scale NTS
Project No. Chilt/IF11007		Appendix 1



: Furnace Thermocouples

: Unexposed Face Thermocouples

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Title	Unexposed face showing thermocouple positions	
Date Drawn 07/03/11	Drawn By ARD	Scale NTS
Project No. Chilt/IF11007		Appendix 1

Appendix 2 - raw test data

(see Figure 3 of Appendix 1 for channel locations)

Time	Chan 0	Chan 1	Chan 2	Chan 3	Chan 4	Chan 5	Chan 11	Chan 12	Chan 13	Chan 14	Chan 15	Chan 16	Chan 26
min	Pa	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
0	0	45	38	34	47	12	14	16	23	15	17	18	11
1	6.4	91	130	82	112	12	14	16	38	16	17	29	11
2	27.6	98	212	97	190	11	15	16	44	16	18	37	11
3	36.4	100	411	97	297	11	15	17	50	16	18	47	11
4	26.2	105	455	424	320	11	16	17	57	17	19	51	11
5	23.4	177	512	664	339	11	16	18	58	19	20	52	11
6	23.5	427	602	786	361	11	17	19	59	21	22	50	11
7	11.9	522	681	810	462	11	18	20	60	22	24	47	11
8	22.1	583	734	797	515	11	19	22	60	24	26	45	11
9	20.1	608	748	801	588	11	20	23	60	26	28	43	11
10	14.2	605	732	764	610	11	21	25	60	30	33	44	11
11	25.4	592	707	735	600	11	22	27	60	32	36	44	11
12	26.4	603	727	769	615	11	25	30	59	39	43	46	11
13	24	626	752	804	639	11	30	35	61	60	58	55	11
14	23.9	641	763	818	656	11	29	38	59	53	57	57	11
15	23.4	658	784	831	672	11	29	40	58	48	56	54	11
16	21.2	663	785	827	676	11	30	42	58	46	56	51	11
17	20.5	667	789	831	681	11	31	44	58	46	57	48	11
18	23.9	674	792	834	686	11	33	45	58	45	57	46	11

Time	Chan 0	Chan 1	Chan 2	Chan 3	Chan 4	Chan 5	Chan 11	Chan 12	Chan 13	Chan 14	Chan 15	Chan 16	Chan 26
min	Pa	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
19	23.9	680	797	838	691	11	35	46	57	46	57	43	11
20	22.6	686	802	843	697	11	36	48	57	46	58	41	11
21	22.7	690	806	845	703	11	38	49	57	46	58	40	11
22	22.5	697	814	854	709	11	40	50	57	47	58	39	11
23	23.3	703	817	857	715	11	41	49	56	48	58	38	11
24	25.4	714	825	871	725	11	43	52	56	47	59	37	11
25	23.4	725	835	884	738	11	44	52	56	47	59	37	11
26	22.3	734	840	892	747	11	45	52	56	48	59	37	11
27	22.4	741	847	897	753	11	46	52	56	48	59	36	11
28	17.1	748	856	904	761	11	47	53	55	49	58	35	11
29	22.5	755	857	908	767	11	48	54	57	49	59	35	10
30	18.7	760	863	912	773	11	49	55	58	50	59	35	10
31	21.6	766	868	917	779	11	50	56	59	50	60	35	10
32	21.8	773	872	922	785	11	50	57	60	51	60	35	10
33	21.1	778	876	924	790	11	51	57	58	52	61	34	10
34	21.4	783	881	929	796	11	52	58	58	53	61	34	10
35	21	788	878	930	801	11	53	59	57	53	62	34	10
36	21.3	793	886	934	805	11	54	61	58	54	63	35	10
37	24.9	799	887	938	810	11	54	61	59	54	63	34	10
38	22.5	802	891	942	813	11	54	61	58	54	63	34	10
39	19.5	806	892	943	817	11	55	62	58	55	64	34	10
40	24.6	810	898	947	821	11	55	63	59	55	65	34	10
41	22.7	814	899	949	824	11	56	65	60	56	65	34	10
42	22.2	817	902	952	828	11	57	65	60	56	66	35	10

Time	Chan 0	Chan 1	Chan 2	Chan 3	Chan 4	Chan 5	Chan 11	Chan 12	Chan 13	Chan 14	Chan 15	Chan 16	Chan 26
min	Pa	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
43	22.3	821	906	954	831	11	57	66	60	56	66	35	10
44	21.7	824	910	958	834	11	57	67	60	57	67	35	10
45	21.2	828	913	961	837	11	58	67	60	57	67	36	10
46	20.7	831	916	962	840	11	58	67	60	58	67	35	10
47	21.2	834	918	965	844	11	58	68	61	58	67	36	10
48	20.7	837	922	967	846	11	59	68	61	58	67	36	10
49	19.3	840	928	971	849	11	59	68	60	59	68	36	10
50	21.8	844	929	972	853	11	59	69	60	59	68	36	10
51	21.1	846	931	975	856	11	59	69	60	59	68	36	10
52	21.3	849	933	976	858	11	60	69	60	59	68	36	10
53	21.6	850	934	976	857	11	60	69	59	59	67	37	10
54	21.8	847	933	973	851	11	60	67	56	59	66	36	10
55	22	851	943	984	856	11	59	65	53	59	64	35	10
56	22.3	856	948	990	862	11	60	64	50	60	63	35	10
57	22.5	859	952	993	865	11	60	62	48	59	63	35	10
58	22.7	862	953	996	868	11	60	62	46	60	62	34	10
59	22.9	866	957	998	870	11	61	60	44	61	61	33	10
60	23.2	868	960	998	872	11	61	61	42	61	61	33	10
61	23.4	877	956	1003	882	11	62	62	46	61	63	35	10
62	32.6	883	958	1006	887	11	62	65	49	62	66	38	10
63	27.5	886	964	1007	888	11	62	68	52	62	68	39	10
64	25.4	890	965	1011	893	11	63	70	54	62	69	39	10
65	25.2	893	965	1013	896	11	63	71	55	63	70	39	10
66	25.7	897	968	1016	900	11	64	72	56	63	71	40	10

Time	Chan 0	Chan 1	Chan 2	Chan 3	Chan 4	Chan 5	Chan 11	Chan 12	Chan 13	Chan 14	Chan 15	Chan 16	Chan 26
min	Pa	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
67	26.1	899	971	1017	902	11	64	73	57	64	72	41	10
68	26.6	901	974	1020	906	11	64	74	57	64	72	40	10
69	27.1	904	976	1022	908	11	64	75	58	65	73	41	10
70	26.5	906	980	1022	911	11	65	76	58	64	74	41	10
71	19.2	910	981	1026	914	11	65	77	58	65	74	41	10
72	20.4	913	984	1029	918	11	66	77	56	65	74	40	10
73	21.3	917	990	1032	920	11	67	78	56	65	75	40	10
74	21.2	919	992	1033	923	11	67	79	57	66	75	40	10
75	20.8	922	992	1035	927	10	67	80	57	65	76	40	10
76	21.2	925	993	1036	930	11	68	81	57	65	78	40	10
77	21.1	926	1000	1039	928	11	69	82	58	65	79	40	10
78	20.7	929	1002	1043	931	11	71	83	60	66	80	41	10
79	20.7	931	1007	1043	934	11	72	85	62	66	82	42	10
80	20.6	934	1007	1045	937	11	73	87	63	66	83	43	10
81	21.1	935	1015	1048	938	11	75	88	63	66	85	45	10
82	21.3	937	1011	1050	940	10	75	88	63	67	88	49	10
83	20.8	939	1015	1051	942	11	75	89	63	67	91	52	10
84	21.3	942	1011	1051	945	10	76	90	65	68	93	56	10
85	21.6	944	1022	1052	946	11	77	90	65	68	95	60	10
86	21.4	946	1015	1054	949	10	78	91	65	68	96	61	10
87	21.1	948	1019	1055	951	10	79	92	66	69	96	63	10
88	21.6	949	1025	1056	951	10	79	92	66	69	97	64	10
89	21.5	953	1021	1060	955	10	76	93	65	68	95	61	10
90	21.3	954	1023	1061	957	10	75	93	64	68	94	58	10

Time	Chan 0	Chan 1	Chan 2	Chan 3	Chan 4	Chan 5	Chan 11	Chan 12	Chan 13	Chan 14	Chan 15	Chan 16	Chan 26
min	Pa	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
91	21.4	955	1031	1061	958	10	73	93	63	68	93	54	10
92	21.4	958	1029	1064	960	10	73	93	61	68	93	52	10
93	22.1	958	1027	1063	960	10	72	93	61	68	94	50	10
94	21.8	958	1027	1063	960	10	71	93	60	68	94	47	10
95	22.9	965	1026	1065	961	10	71	94	61	68	95	46	10
96	22.7	968	1026	1065	963	10	70	94	59	68	95	45	10
97	22.7	969	1030	1064	964	10	70	94	58	67	95	44	10
98	22.2	970	1030	1066	965	10	70	95	59	68	96	44	10
99	22.7	968	1033	1069	966	10	70	95	58	68	97	43	10
100	22.8	969	1035	1070	968	10	70	96	58	68	97	43	10
101	22.2	972	1038	1074	971	10	69	97	59	68	99	43	10
102	22.2	974	1041	1077	973	10	70	97	58	68	100	43	10
103	22.3	976	1042	1077	975	10	70	97	57	69	101	43	10
104	22.4	978	1041	1078	977	10	70	99	58	70	102	43	10
105	22.8	979	1045	1080	979	10	70	100	58	71	103	43	10
106	22.6	980	1045	1080	980	10	70	100	58	73	104	43	10
107	22.4	982	1048	1083	981	10	71	102	58	75	105	44	10
108	22.9	984	1045	1082	983	10	71	103	58	76	106	44	10
109	22.9	986	1048	1083	984	10	71	103	57	78	107	44	10
110	22.5	986	1052	1084	985	10	72	104	57	79	110	44	10
111	22.8	988	1049	1084	986	10	72	105	57	80	111	44	10
112	22.5	990	1048	1085	988	10	72	106	58	81	113	45	10
113	22.2	991	1049	1086	989	10	73	107	59	81	116	46	10
114	22.6	992	1050	1086	990	10	74	109	58	82	118	46	10

Time	Chan 0	Chan 1	Chan 2	Chan 3	Chan 4	Chan 5	Chan 11	Chan 12	Chan 13	Chan 14	Chan 15	Chan 16	Chan 26
min	Pa	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
115	22.7	992	1052	1087	992	10	75	111	59	83	120	46	10
116	22.4	994	1051	1087	992	10	76	113	59	84	123	46	10
117	22.5	995	1052	1088	994	10	77	115	59	85	127	47	10
118	22.7	996	1052	1087	995	10	77	117	59	86	132	48	10
119	22.8	997	1052	1087	996	10	78	119	59	87	136	48	10
120	22.5	997	1051	1086	996	10	79	122	59	88	143	49	10
121	22.5	998	1051	1087	998	10	80	124	58	90	150	49	10