CONFIDENTIAL

Report: Chilt/RF12047

A fire resistance test performed on seven duct penetration sealing systems within a flexible supporting construction

Test conducted in accordance with BSEN 1366-3: 2009 and BSEN 1363-1 1999

Test date: 4th April 2012

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www.chilternfire.co.uk

www.chilterndynamics.co.uk

www.qmark.info

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UKAS TESTING
1762

Contents

1 Introduction

Sixteen ducts and corresponding sealing systems were supplied for testing. The sealing systems were referenced from 1-16. Only systems 3, 5, 7, 11, 12, 15 and 16 are subject to this report. The ducts and sealing systems were installed into a flexible supporting construction, and tested.

2 Specimen verification

The specimens were delivered to Chiltern International Fire Ltd (CIFL) during March 2012. CIFL constructed a 130mm thick steel stud/plasterboard clad partition. The client then subsequently installed the systems into the supporting construction, with assistance from CIFL as required.

3 Description of supporting construction

The supporting construction comprised a 3000mm wide x 3000mm high x 130mm thick steel stud/plasterboard clad partition, built in accordance with BSEN 1366-3: 2009 into a refractory lined steel restraint frame.
The partition framing was comprised of 70mm wide galvanised steel 'C' section studs, at nominally 600mm centres, and 72mm wide galvanised steel 'U' channel head and base track, with 50mm thick, 100kg/m^3 mineral wool insulation friction fitted between the studs, and clad on both faces with 2 layers of 15mm thick type F plasterboard. The supporting construction was fixed on the horizontal edges only; both vertical edges remained free.

4 Description of specimen

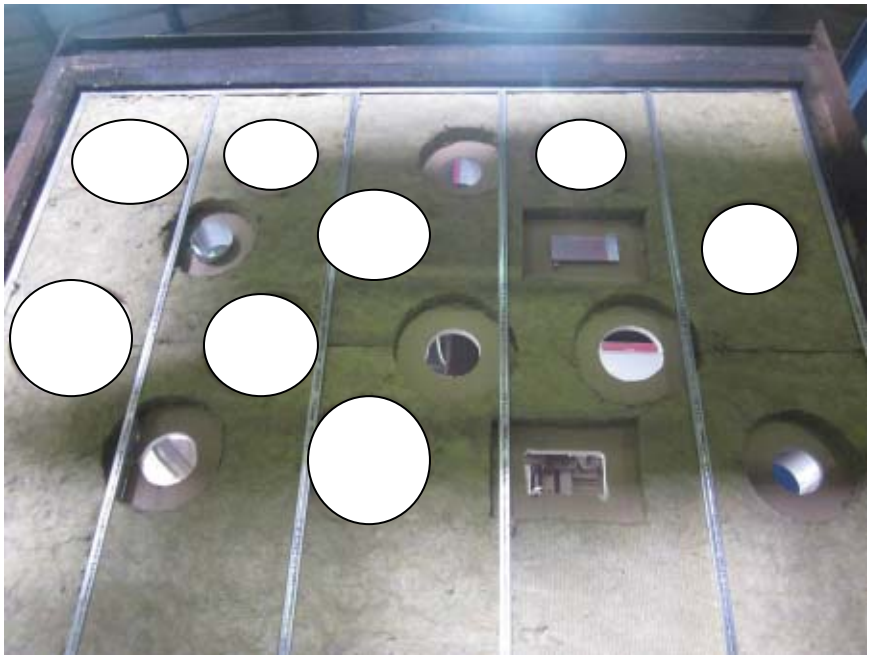
Details of the specimens are shown in Appendix 1. All measurements are in mm and the descriptions are written viewing the specimens from the unexposed face unless stated otherwise.

All ducting was identified as Rigid PVC.

Ducts 3, 11 and 12 were constructed from three sections, the centre section measuring 500mm long fitted through the partition, with a coupling connection to an extension duct 350mm long fitted either side.

Ducts 5, 7, 13, 15 and 16 were nominally 1200mm long with a minimum of 500mm protruding from the both faces.

The mineral wool insulation within the partition cavity was removed for 100mm surrounding the cut out apertures (see below).



4.1 Ducts fitted through the partition (see figures 1 to 3 of appendix 1)

Specimen Reference	Duct size through partition (mm)	Extension ducting with standard HIPS straight coupling either side of partition	Nominal cut out opening size (mm)
3	Ø132.6 x 500 long x 3.8 wall thickness	Ø128.4 x 350 long x 1.7 wall thickness	Nominally Ø160
5	Ø132.6 x 1200 long x 3.8 wall thickness	None required	Nominally Ø160
7	220 wide x 90 high x 1200 long x 2.5 wall thickness	None required	Nominally 244 wide x 116 high
11	Ø132.6 x 500 long x 3.8 wall thickness	Ø128.4 x 350 long x 1.7 wall thickness	Nominally Ø191
12	Ø158 x 500 long x 4.0 wall thickness	Ø153.6 x 350 long x 1.8 wall thickness	Nominally Ø216
13	Ø132.6 x 1200 long x 3.8 wall thickness	None required	Nominally Ø191
15	220 wide x 90 high x 1200 long x 2.5 wall thickness	None required	Nominally 278 wide x 148 high
16	Ø128.4 x 1200 long x 1.7 wall thickness	None required	Nominally Ø155

4.2 Sealing system details

Duct sealing systems 3, 5, 7 and 16 comprised a galvanised steel sleeve (Firesleeve) fitted through the partition and fixed on the unexposed face with 40mm long drywall screws fitted through steel tabs (3No. on circular sleeves, 2No. on top horizontal edge of rectangular sleeve).
Everbuild Firemate intumescent sealant was used to seal the duct to coupler joints on both faces of duct 3, and to seal the Firesleeve to the plasterboard on both faces.
A Verplas intumescent Firewrap was fitted centrally in the Firesleeve, between the duct and Firesleeve.

Specimen Reference	Firesleeve	Sleeve size (mm)	Firewrap	Intumescent size (mm)
3	Verplas galvanised steel Ref. FWS125TX141	Ø157 x 141 long	Verplas Firewrap Ref. FW125T	2No. layers polythene wrapped Firefly 107 4 thick x 100 wide each layer
5	Verplas galvanised steel Ref. FWS125TX141	Ø157 x 141 long	Verplas Firewrap Ref. FW125T	2No. layers polythene wrapped Firefly 107 4 thick x 100 wide each layer
7	Verplas galvanised steel Ref. FWS220X90X141	Nominally 242 wide x 112 high x 141 long	Verplas Firewrap Ref. FW220X90	2No. layers polythene wrapped Firefly 107 4 thick x 100 wide each layer
16	Verplas galvanised steel Ref. FWS125X141	Ø152 x 141 long	Verplas Firewrap Ref. FW125FX230	2No. layers Firefly 107 4 thick x 230 wide – Foil wrapped on the outside

Duct sealing systems 11, 13 and 15 comprised an intumescent Verplas FireCuff fitted through the partition around the duct.
Everbuild Firemate intumescent sealant was used to seal the duct to coupler joints on both faces of duct 11, and to seal the FireCuff to the plasterboard on both faces.

Specimen reference	FireCuff	FireCuff size (mm)	Intumescent size
11	Verplas Ref. FC125TX180	Ø191 x 180 long x nominally 29 thick	Outer layer – Firefly 109 - 25mm thick Inner layer – Firefly 107 - 4 thick
12	Verplas Ref. FC150TX180	Ø216 x 180 long x nominally 29 thick	Outer layer – Firefly 109 - 25mm thick Inner layer – Firefly 107 - 4 thick
13	Verplas Ref. FC125TX180	Ø191 x 180 long x nominally 29 thick	Outer layer – Firefly 109 - 25mm thick Inner layer – Firefly 107 - 4 thick
15	Verplas Ref. FC220X90	278 wide x 148 high x 180 long	Firefly 109 - 25mm thick Firefly 107 - 4 thick fitted on inside on top and bottom

4.3 Service penetrations supports

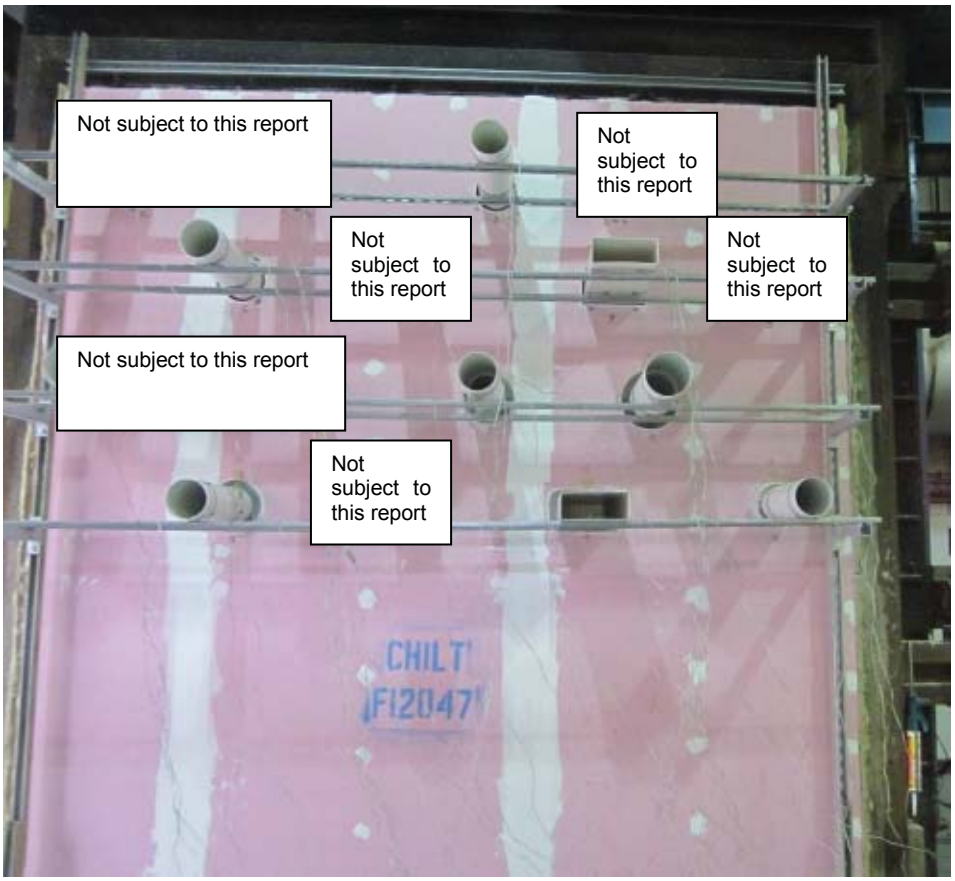
(Read in conjunction with Appendix 1, figures 1 - 4 and photographs)

The service penetration support system consisted of Unistrut steel frame sections and associated attachments.

Unistrut frame section – constructed using 3mm thick profiled steel 'u' channel.

On both faces, 2No 3000mm Unistrut sections were used as vertical supports, bracketed to 2No. Unistrut sections fixed at the top and bottom of the restraint frame. 8No 500mm long Unistrut cantilever arm sections provided support for Unistrut 'U' section channels supporting the ducts at 150mm and 450mm from the wall. All specimens were fixed to the supporting Unistrut 'U' section channels using steel cable ties on the unexposed face only.

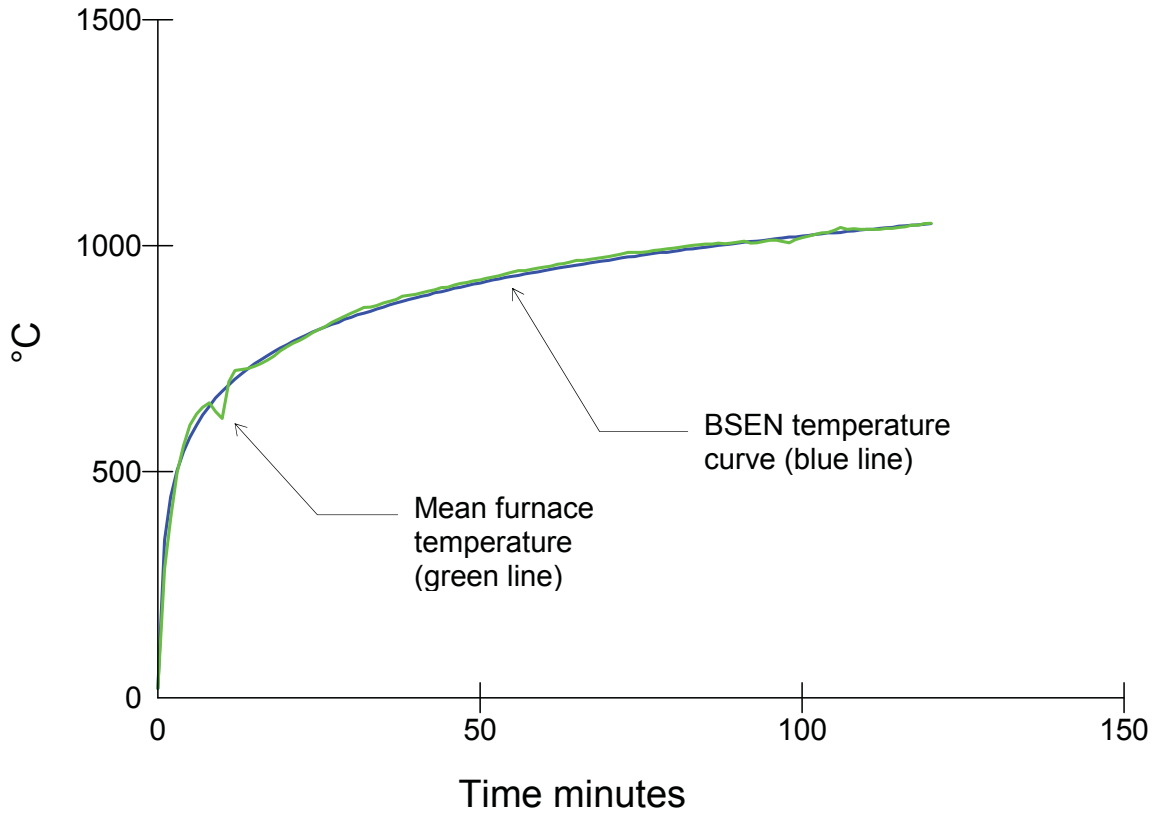
Unexposed face supporting construction



5 Test conditions

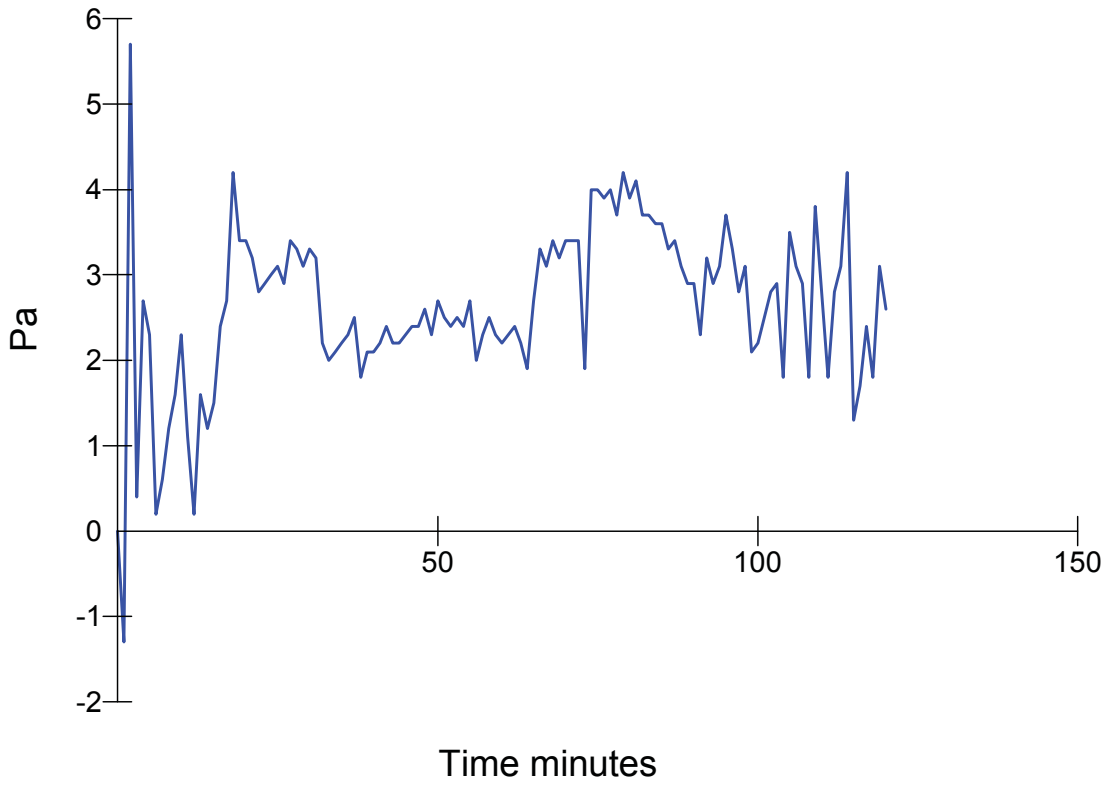
5.1 Furnace temperature

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 nine plate thermometers suitably distributed within the furnace. The temperatures recorded have been tabulated in Appendix 2 and are shown graphically below:



5.2 Pressure readings

After the first 5 minutes of the test, the furnace pressure was maintained at 3 ± 5 Pa and after 10 minutes was maintained at 3 ± 3 Pa with respect to atmosphere, at a point 0.5m from the notional floor level. Therefore equating to 10 Pa at the base of penetration seals 13, 15 and 16. The pressure readings have been tabulated in Appendix 2 and are shown graphically below:



5.3 Ambient temperature

The ambient temperature of the test area at commencement of test was 11° C. The temperature was recorded during the test and has been tabulated in Appendix 2.

5.4 Thermocouple positions (see Appendix 1 figure 4)

The temperature of the unexposed face was monitored by means of the following thermocouples:

Thermocouple Number	Duct reference	Type (location)
1	-	Furnace
2	-	Furnace
3	-	Furnace
4	-	Furnace
5	-	Furnace
6	-	Furnace
7	-	Furnace
8	-	Furnace
9	-	Furnace
11	-	Laboratory ambient
19	3	Fitted on plasterboard 25mm from Firesleeve
20	3	Fitted on duct 25mm from Firesleeve
23	5	Fitted on plasterboard 25mm from Firesleeve
24	5	Fitted on duct 25mm from Firesleeve
27	7	Fitted on plasterboard 25mm from Firesleeve
28	7	Fitted on duct 25mm from Firesleeve
35	11	Fitted on plasterboard 25mm from FireCuff
36	11	Fitted on duct 25mm from FireCuff
37	12	Fitted on plasterboard 25mm from FireCuff
38	12	Fitted on duct 25mm from FireCuff
39	13	Fitted on plasterboard 25mm from FireCuff
40	13	Fitted on duct 25mm from FireCuff
43	15	Fitted on plasterboard 25mm from FireCuff
44	15	Fitted on duct 25mm from FireCuff
45	16	Fitted on plasterboard 25mm from Firesleeve
46	16	Fitted on duct 25mm from Firesleeve

Graphs of each service penetration can be found in Section 10.
The temperatures recorded have been tabulated in the Appendix 2.

6 Observations

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

Time (minutes)	Comments
0.00	Test started.
0.47	There is smoke issuing from all areas of the specimens.
07.10	A cotton pad integrity test was performed on duct 15 at the top of the pipe, no failure.
08.00	Duct 15 has sealed and there is now no glow visible.
75.30	Duct 3, a cotton pad integrity test was performed on the top right of the penetration, no failure.
76.45	Duct 3, a cotton pad integrity test was performed on the top right of the penetration, which resulted in ignition of the cotton pad, thereby constituting **integrity failure.**
79.20	Duct 7, there is a glow visible from the top edge of the duct, no failure.
80.00	Duct 5, there is a glow visible from the top edge of the duct.
81.40	Duct 7, a cotton pad integrity test was performed on the top edge of the duct, which resulted in ignition of the cotton pad, thereby constituting **integrity failure.**
83.00	Duct 5, a cotton pad integrity test was performed on the top edge of the specimen, no failure.
84.53	Duct 5, a cotton pad integrity test was performed on the top edge of the duct, which resulted in ignition of the cotton pad, thereby constituting **integrity failure.**
90.35	Duct 15, there is a glow visible from the left side of the edge of the duct.
92.30	Duct 11, a cotton pad integrity test was performed on the top of the duct which resulted in ignition of the cotton pad, thereby constituting **integrity failure.**
93.35	Duct 15, a cotton pad integrity test was performed on the top of the duct which resulted in ignition of the cotton pad, thereby constituting **integrity failure.**
98.00	Duct 12, there is a glow visible at the head of the duct.
99.00	Duct 13, a cotton pad integrity test was performed on the top of the duct, no failure
100.15	Duct 12, a cotton pad integrity test was performed on the top of the

duct, no failure

100.45 Duct 13, a cotton pad integrity test was performed on the top of the duct, which resulted in ignition of the cotton pad, thereby constituting **integrity failure.**

102.45 Duct 12, a cotton pad integrity test was performed on the top of the sleeve edge, no failure.

103.50 Duct 12, a cotton pad integrity test was performed on the top of the sleeve edge, which resulted in ignition of the cotton pad, thereby constituting **integrity failure.**

120.00 Test terminated, no failure to duct 16.

7 Expression of results

Duct penetration seal	Integrity			Insulation
	Cotton pad	Gap gauge	Continuous flaming	
3	76 (seventy six) minutes	76 (seventy six) minutes*	76 (seventy six) minutes*	2 (two) minutes
5	84 (eighty four) minutes	84 (eighty four) minutes*	84 (eighty four) minutes*	84 (eighty four) minutes*
7	81 (eighty one) minutes	81 (eighty one) minutes*	81 (eighty one) minutes*	70 (seventy) minutes
11	92 (ninety two) minutes	92 (ninety two) minutes*	92 (ninety two) minutes*	92 (ninety two) minutes*
12	103 (one hundred and three) minutes	103 (one hundred and three) minutes	103 (one hundred and three) minutes	103 (one hundred and three) minutes
13	100 (one hundred) minutes	100 (one hundred) minutes*	100 (one hundred) minutes*	100 (one hundred) minutes*
15	93 (ninety three) minutes	93 (ninety three) minutes*	93 (ninety three) minutes*	93 (ninety three) minutes*
16	120 (one hundred and twenty) minutes**	120 (one hundred and twenty) minutes**	120 (one hundred and twenty) minutes**	120 (one hundred and twenty) minutes**

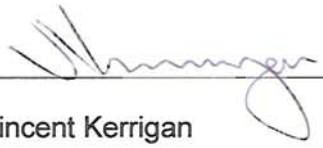
* **Failure criteria was not achieved prior to initial failure**

* * **Failure criteria was not achieved upon termination of the test at 120 minutes**

8 Limitations

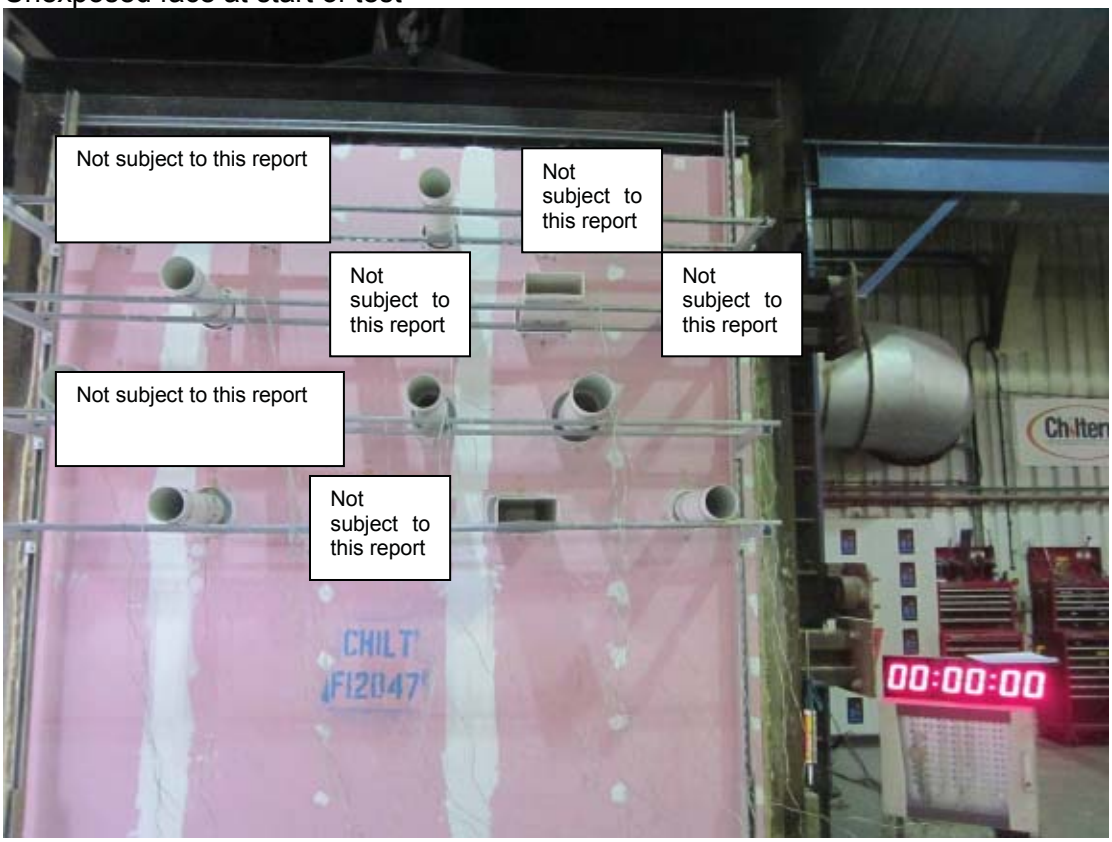
The results only relate to the behaviour of the element of construction under the particular conditions of test; they are not intended to be the sole criteria for assessing the potential fire performance of the element in use nor do they reflect the actual behaviour in fires.

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. 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.

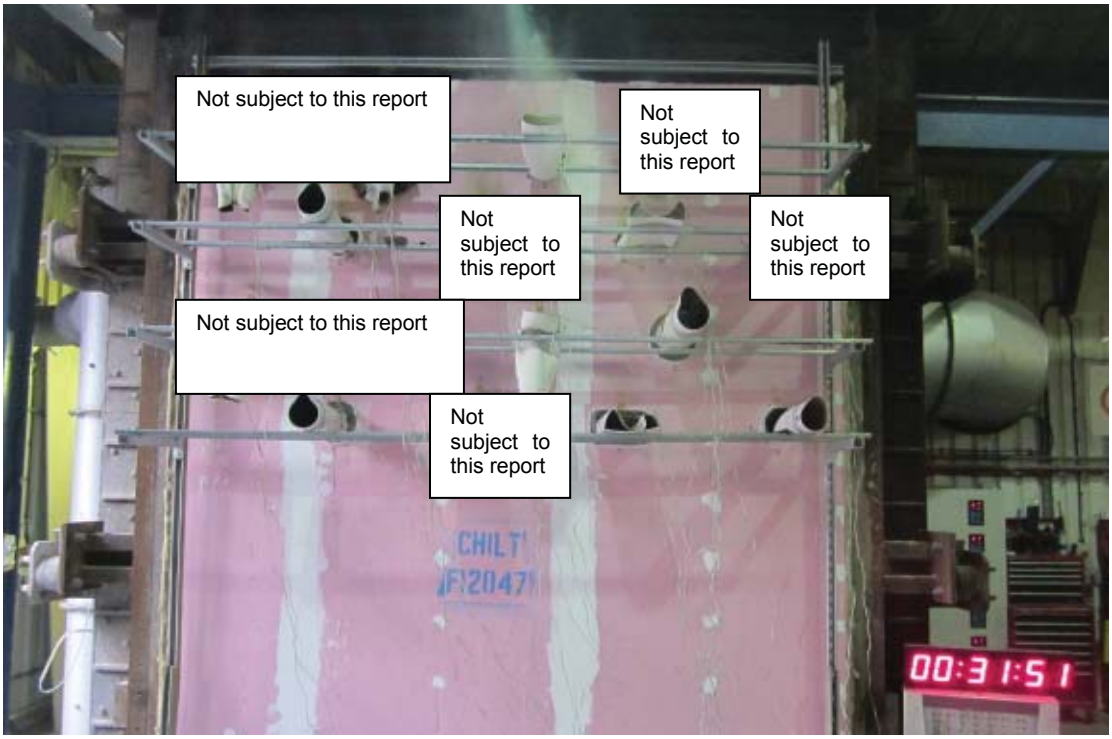
Signature:		
Name:	Robert Axe	Vincent Kerrigan
Title:	Deputy Section Leader – Fire Resistance	Technical Manager
Date of issue:	19-07-2012	19-07-2012

9 Photographs

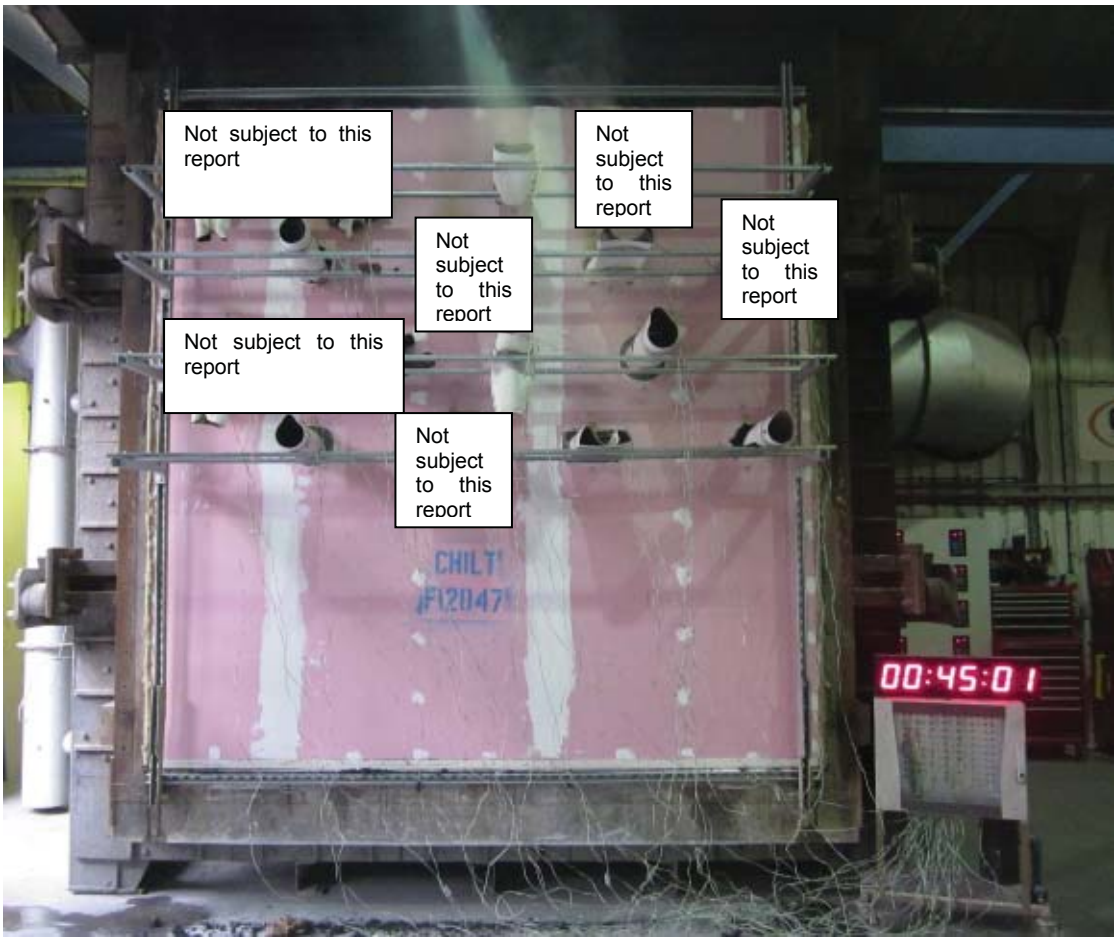
Unexposed face at start of test



After 31 minutes



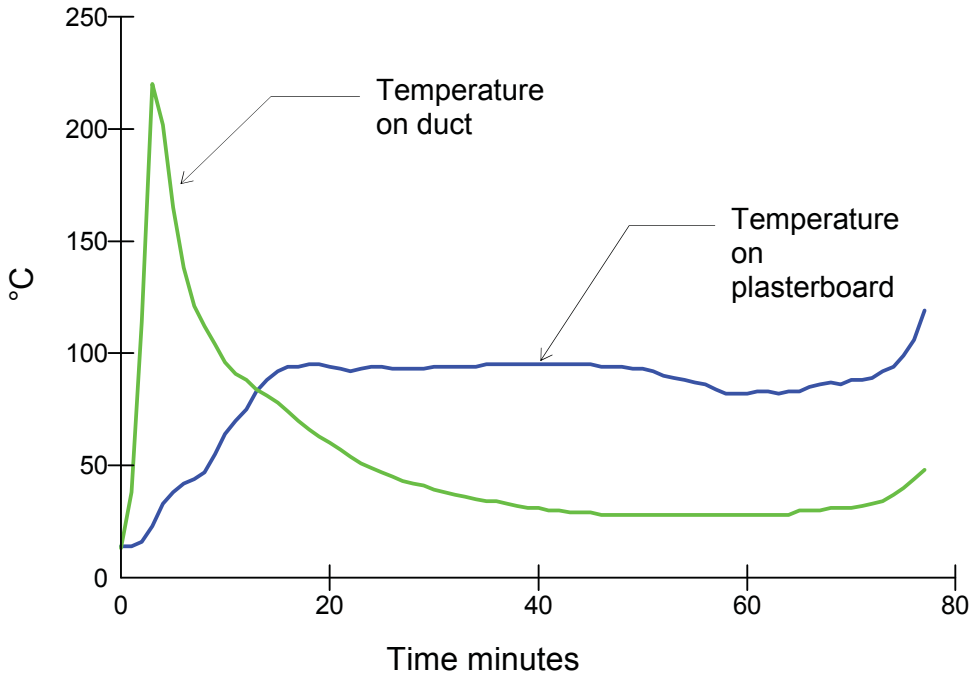
After 45 minutes



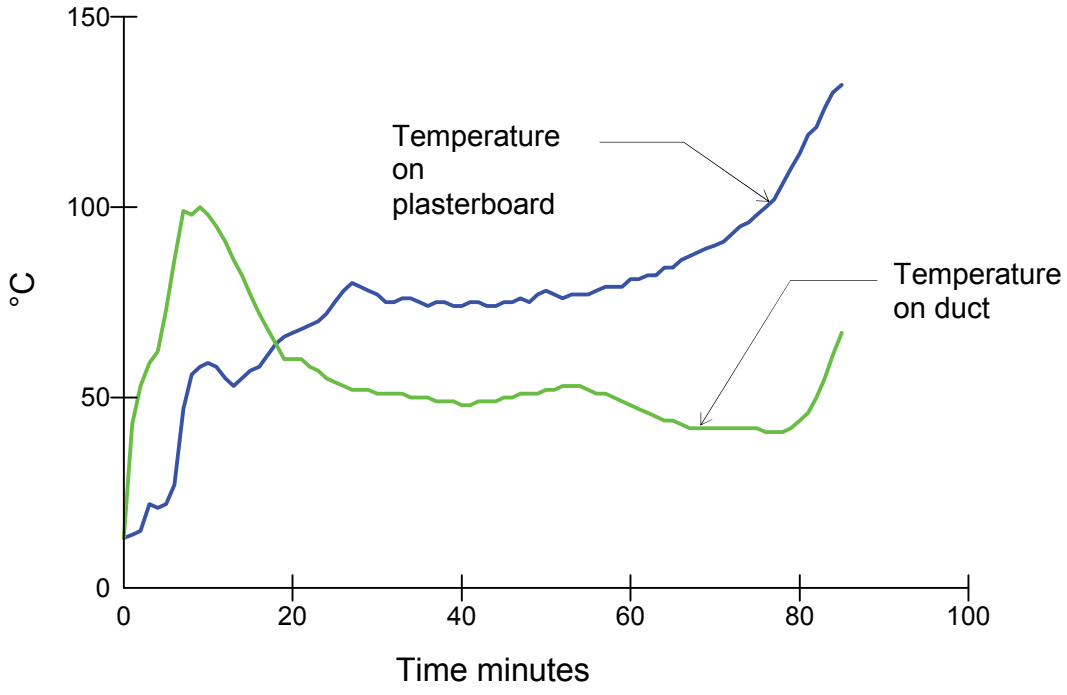
10 Graphs

Unexposed face temperature curves

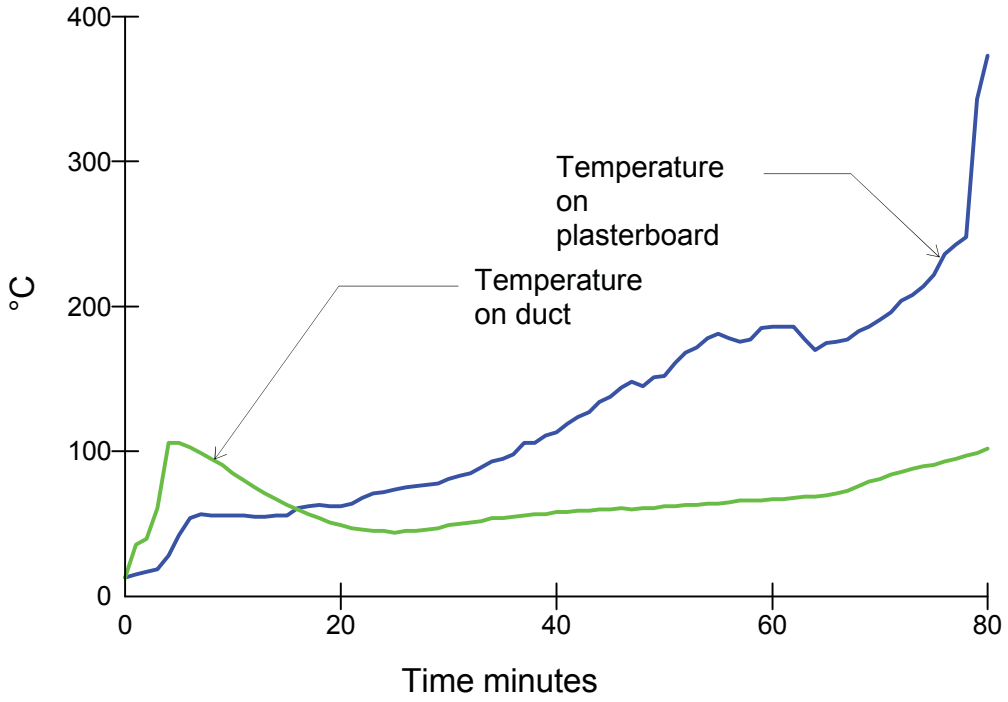
Duct 3



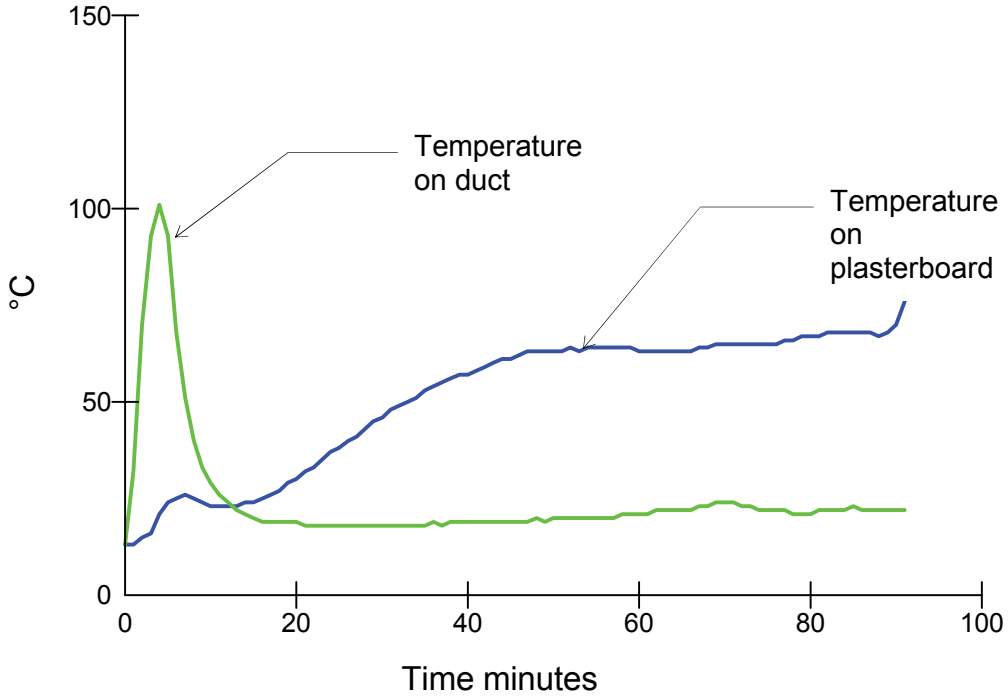
Duct 5



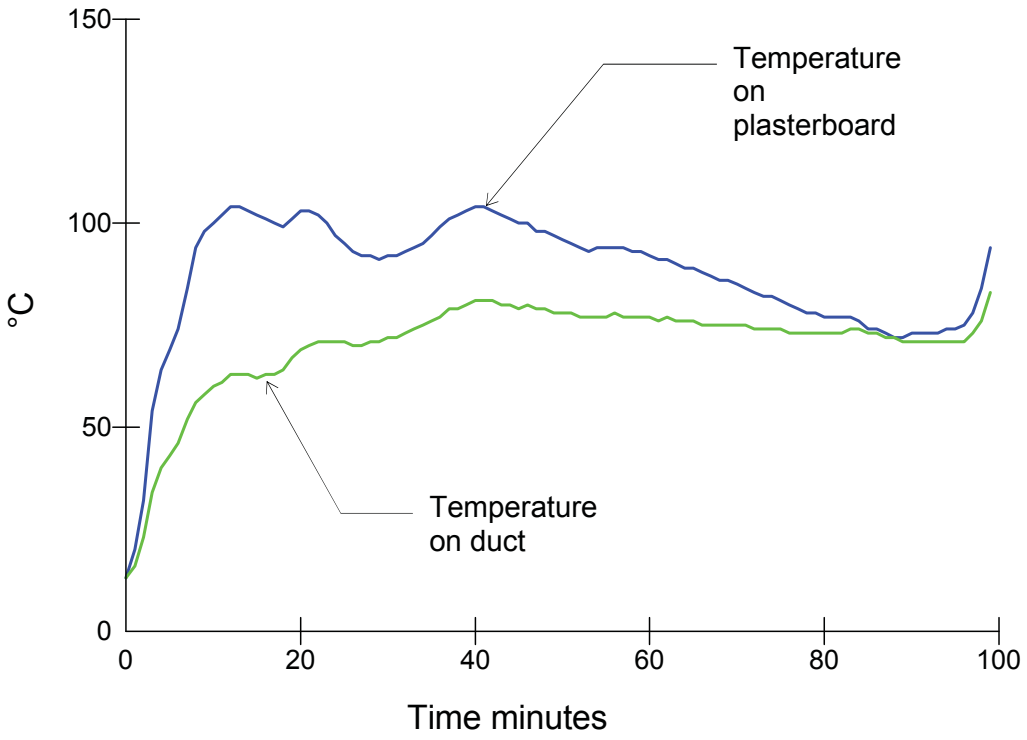
Duct 7



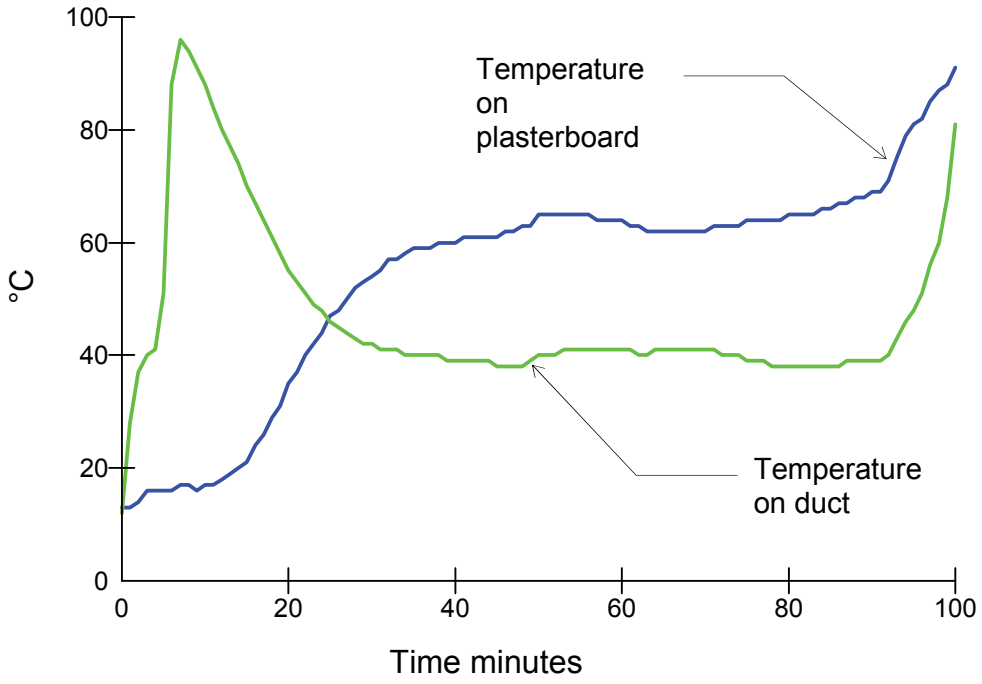
Duct 11



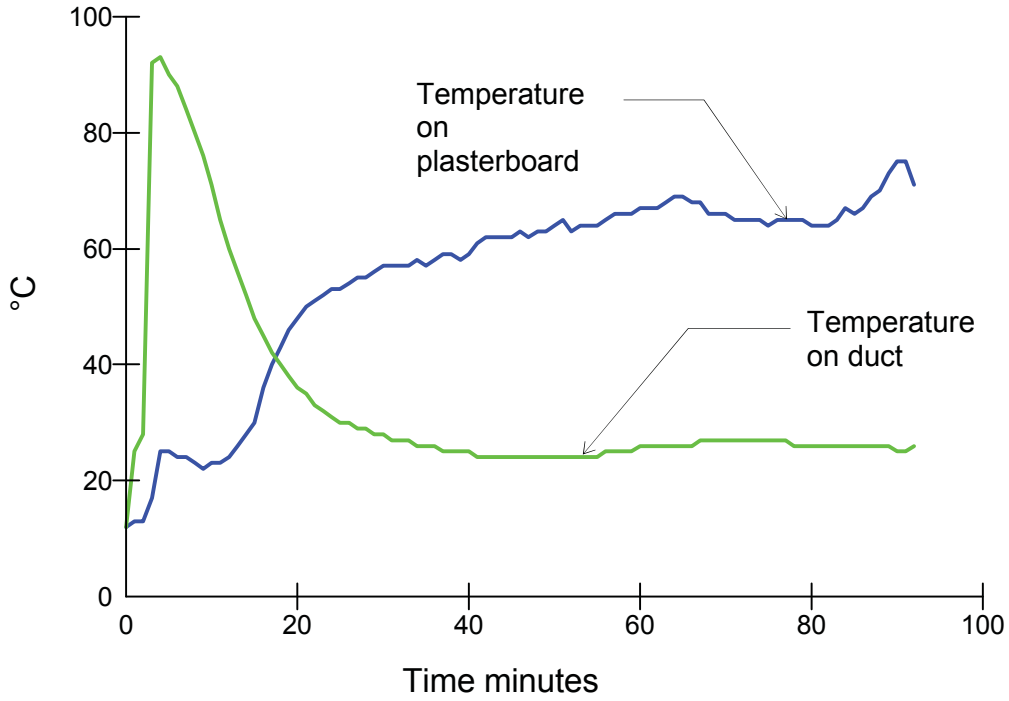
Duct 12


150
100
50
0
°C
Temperature on plasterboard
Temperature on duct
0
20
40
60
80
100
Time minutes

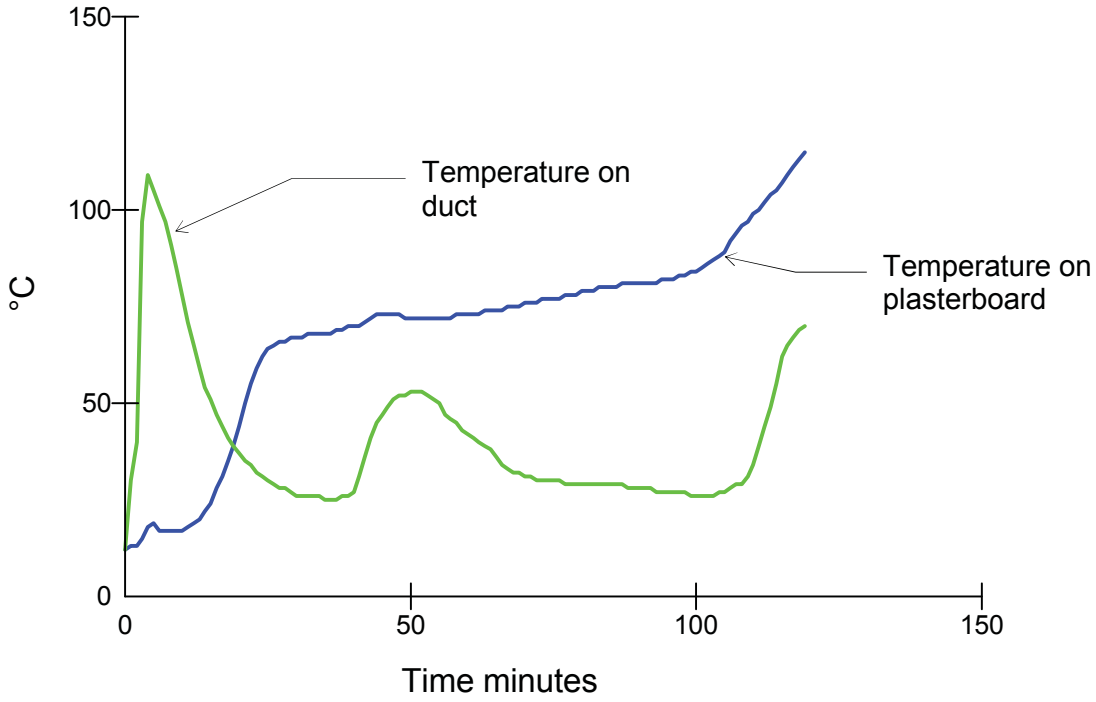
Duct 13



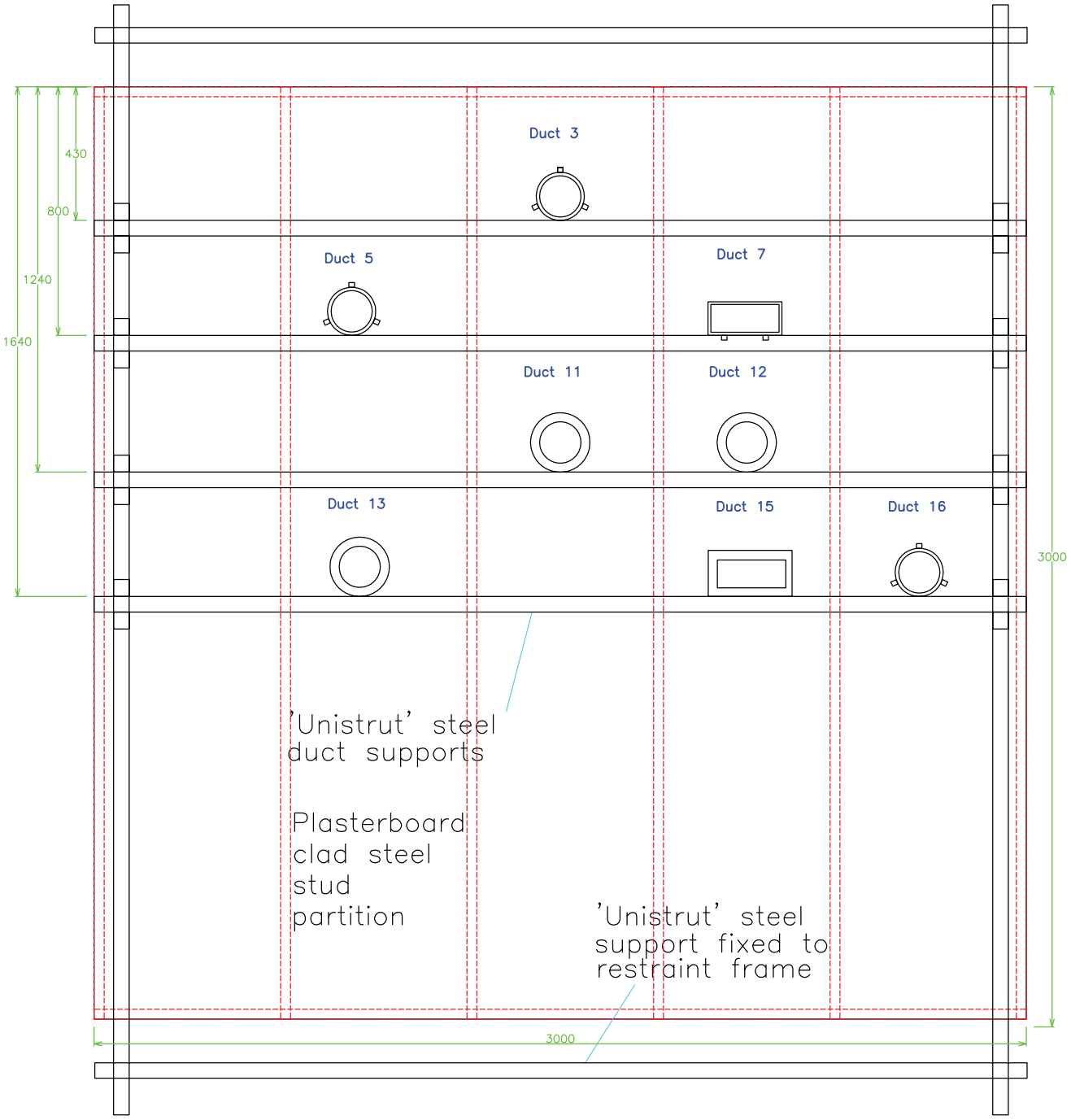
Duct 15



Duct 16


150
100
50
0
°C
Temperature on duct
Temperature on plasterboard
0
50
100
150
Time minutes

Appendix 1 – figures 1 – 4



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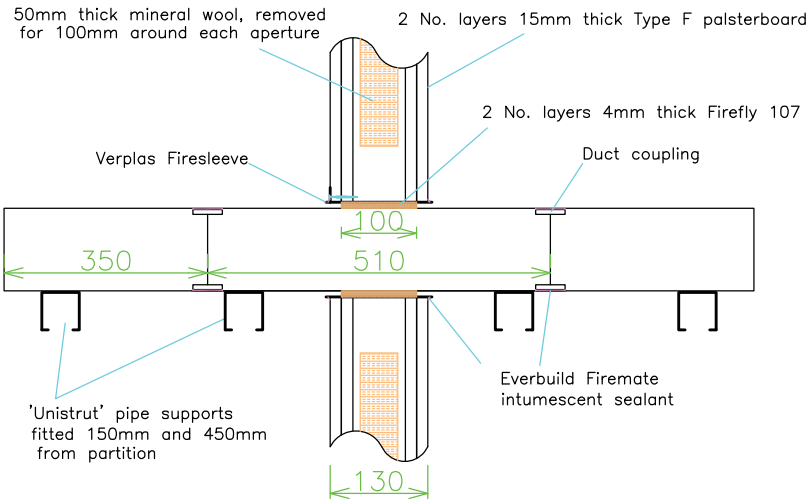
Title: Unexposed face elevation showing support positions (All dimensions in mm)

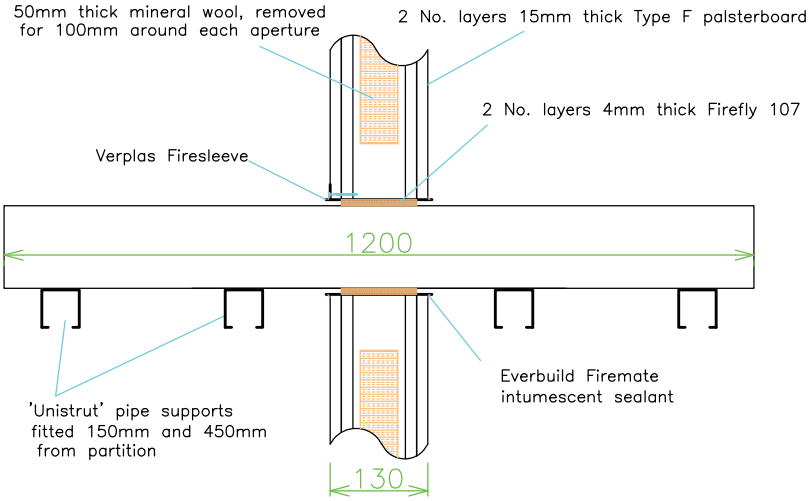
Date Drawn	Drawn By	Scale
11/05/12	ARD	NTS

Project No.	
Chilt/RF12047	Appendix 1

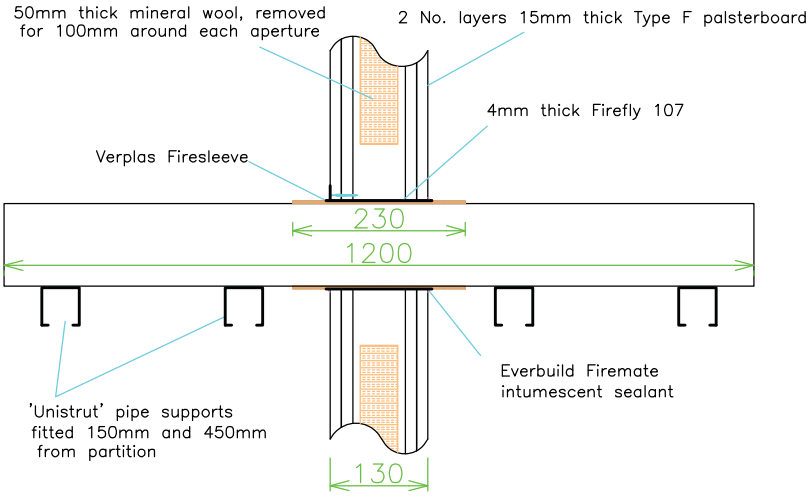
Duct 3



Ducts 5 and 7



Duct 16



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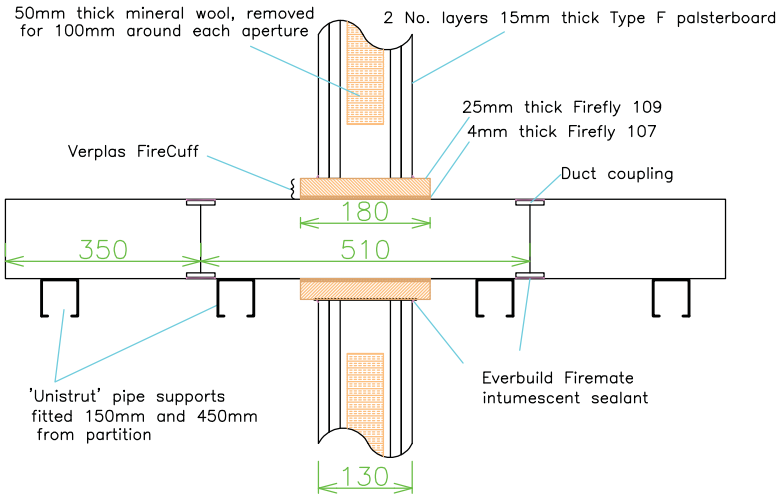
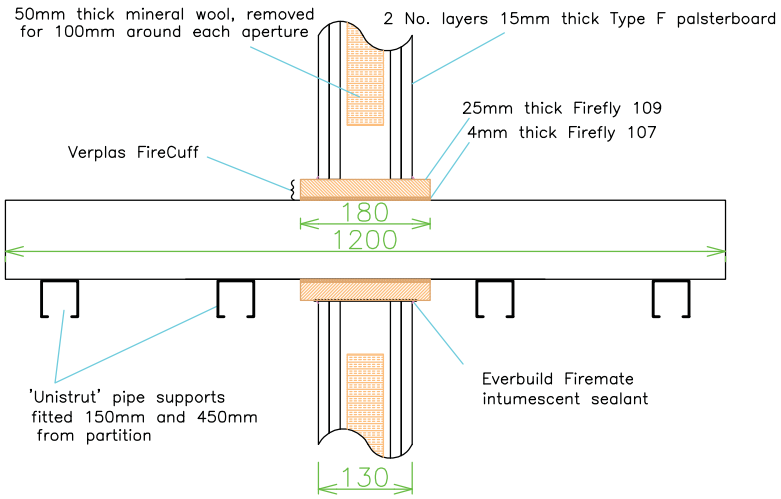
Title: Cross–section through ducts 3, 5, 7 and 16 with Firesleeves (All dimensions in mm)		
Date Drawn: 11/05/12	Drawn By: ARD	Scale: NTS
Project No.: Chilt/RF12047		Appendix 1

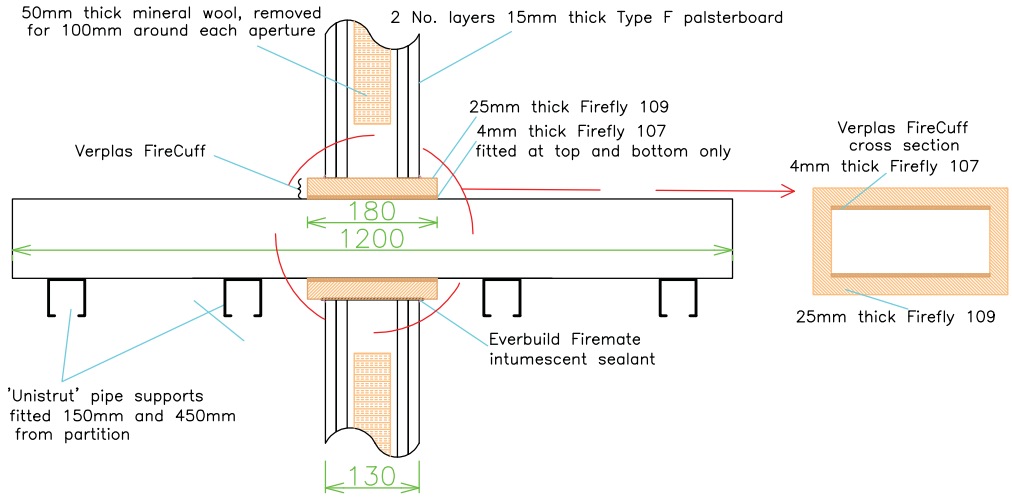
Duct 11 And 12



Duct 13



Duct 15



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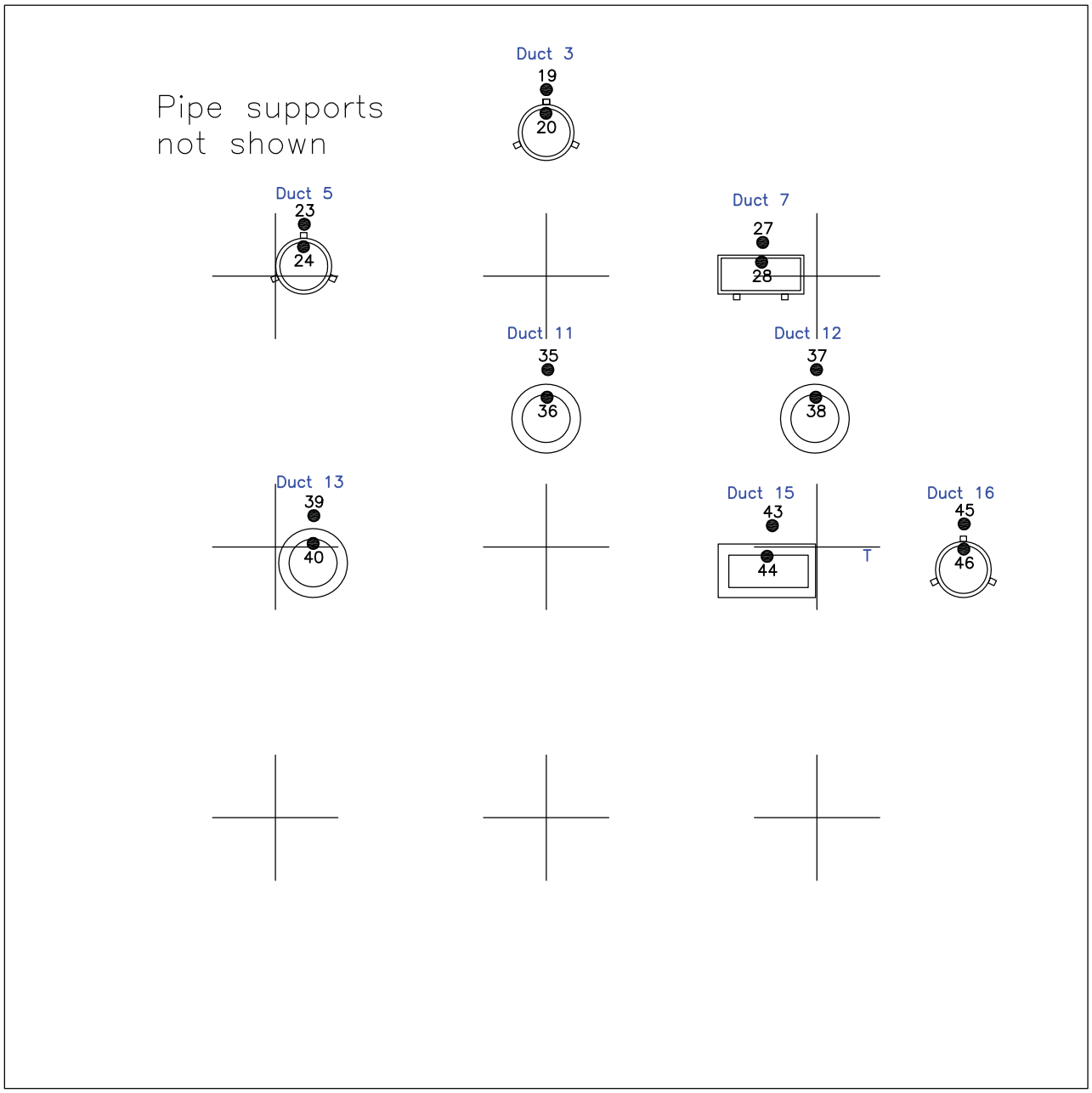
Title: Cross-section through ducts 11, 13 and 15 with FireCuffs (All dimensions in mm)

Date Drawn	Drawn By	Scale
11/05/12	ARD	NTS

Project No.	
Chilt/RF12047	Appendix 1



: Furnace Thermocouples

: Unexposed Face Thermocouples

Viewed From Unexposed Face

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Title: Thermocouple positions

(All dimensions in mm)

Date Drawn	Drawn By	Scale
11/05/12	ARD	NTS

Project No.	
Chilt/RF12047	Appendix 1

Appendix 2 - raw test data (8 pages) Furnace thermocouple Failure time and corresponding thermocouple

(see figure 4 of appendix 1 for channel locations)

Time	Chan 0	Chan 1	Chan 2	Chan 3	Chan 4	Chan 5	Chan 6	Chan 7	Chan 8	Chan 9	Chan 11	Chan 19	Chan 20	Chan 23	Chan 24	Chan 27	Chan 28	Chan 35	Chan 36
min	Pa	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
0	0	12	13	12	13	12	12	12	14	14	11	14	13	13	13	13	13	13	13
1	-1.3	234	312	228	234	329	241	267	375	352	11	14	38	14	43	15	36	13	32
2	5.7	358	418	305	403	395	392	322	511	474	11	16	114	15	53	17	40	15	70
3	0.4	475	542	369	521	504	526	363	613	577	11	23	220	22	59	19	61	16	93
4	2.7	542	602	403	581	581	591	427	658	633	11	33	202	21	62	28	106	21	101
5	2.3	579	635	443	619	651	626	514	693	667	11	38	165	22	73	42	106	24	93
6	0.2	591	638	505	642	673	636	595	703	674	11	42	138	27	86	54	103	25	68
7	0.6	601	640	557	649	678	642	645	703	679	11	44	121	47	99	57	99	26	51
8	1.2	613	646	595	644	686	650	664	705	681	11	47	112	56	98	56	95	25	40
9	1.6	626	656	613	376	697	658	679	717	687	11	55	104	58	100	56	91	24	33
10	2.3	634	669	630	135	710	670	690	728	696	11	64	96	59	98	56	85	23	29
11	1.1	660	702	660	655	737	698	711	753	718	11	70	91	58	95	56	80	23	26
12	0.2	685	728	693	701	755	724	731	771	736	11	75	88	55	91	55	75	23	24
13	1.6	693	731	697	708	755	727	733	768	736	11	83	84	53	86	55	71	23	22
14	1.2	698	732	708	709	752	730	737	766	734	11	88	81	55	82	56	67	24	21
15	1.5	702	738	710	716	755	731	739	768	741	11	92	78	57	77	56	63	24	20
16	2.4	712	744	721	730	760	741	743	771	744	11	94	74	58	72	61	60	25	19
17	2.7	720	752	726	740	765	744	749	777	750	11	94	70	61	68	62	57	26	19
18	4.2	730	760	739	749	772	754	761	787	757	11	95	66	64	64	63	54	27	19
19	3.4	738	772	747	760	785	768	769	797	767	11	95	63	66	60	62	51	29	19

Time	Chan 0	Chan 1	Chan 2	Chan 3	Chan 4	Chan 5	Chan 6	Chan 7	Chan 8	Chan 9	Chan 11	Chan 19	Chan 20	Chan 23	Chan 24	Chan 27	Chan 28	Chan 35	Chan 36
min	Pa	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
20	3.4	748	778	760	772	790	780	781	806	774	11	94	60	67	60	62	49	30	19
21	3.2	755	786	769	786	799	786	787	812	782	11	93	57	68	60	64	47	32	18
22	2.8	765	794	778	785	806	792	794	820	790	11	92	54	69	58	68	46	33	18
23	2.9	774	802	788	795	813	797	802	826	795	11	93	51	70	57	71	45	35	18
24	3	781	811	797	813	819	808	810	833	804	11	94	49	72	55	72	45	37	18
25	3.1	791	817	803	823	828	812	817	840	812	11	94	47	75	54	74	44	38	18
26	2.9	800	825	812	814	835	819	826	846	817	11	93	45	78	53	75	45	40	18
27	3.4	807	835	821	836	841	828	832	854	827	11	93	43	80	52	76	45	41	18
28	3.3	815	842	825	843	848	832	840	860	830	11	93	42	79	52	77	46	43	18
29	3.1	823	847	836	849	856	841	847	866	838	11	93	41	78	52	78	47	45	18
30	3.3	832	855	841	857	862	846	854	874	843	11	94	39	77	51	81	49	46	18
31	3.2	841	861	848	863	868	852	862	878	847	11	94	38	75	51	83	50	48	18
32	2.2	846	868	855	865	871	855	866	883	859	11	94	37	75	51	85	51	49	18
33	2	852	869	860	858	872	858	871	884	857	11	94	36	76	51	89	52	50	18
34	2.1	857	873	865	864	875	862	877	887	860	11	94	35	76	50	93	54	51	18
35	2.2	861	876	871	868	879	868	881	891	863	11	95	34	75	50	95	54	53	18
36	2.3	866	882	874	872	883	871	888	895	869	11	95	34	74	50	98	55	54	19
37	2.5	870	885	879	888	888	874	889	900	872	11	95	33	75	49	106	56	55	18
38	1.8	875	888	885	895	893	879	898	904	876	11	95	32	75	49	106	57	56	19
39	2.1	879	892	885	896	894	880	901	906	882	11	95	31	74	49	111	57	57	19
40	2.1	883	894	889	900	898	884	905	909	882	11	95	31	74	48	113	58	57	19
41	2.2	886	897	891	903	899	886	912	912	886	11	95	30	75	48	119	58	58	19
42	2.4	889	901	895	904	904	889	914	914	890	11	95	30	75	49	124	59	59	19
43	2.2	893	905	897	908	907	893	920	917	892	11	95	29	74	49	127	59	60	19

Time	Chan 0	Chan 1	Chan 2	Chan 3	Chan 4	Chan 5	Chan 6	Chan 7	Chan 8	Chan 9	Chan 11	Chan 19	Chan 20	Chan 23	Chan 24	Chan 27	Chan 28	Chan 35	Chan 36
min	Pa	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
44	2.2	896	909	902	914	911	897	920	922	895	11	95	29	74	49	134	60	61	19
45	2.3	898	912	906	913	913	900	927	924	896	11	95	29	75	50	138	60	61	19
46	2.4	902	915	909	918	917	903	929	927	901	11	94	28	75	50	144	61	62	19
47	2.4	907	920	911	921	920	905	932	931	904	11	94	28	76	51	148	60	63	19
48	2.6	910	922	915	920	924	910	934	934	906	11	94	28	75	51	145	61	63	20
49	2.3	914	925	918	920	927	913	934	938	913	11	93	28	77	51	151	61	63	19
50	2.7	917	929	920	922	930	916	938	941	915	11	93	28	78	52	152	62	63	20
51	2.5	919	930	925	927	933	919	941	943	917	11	92	28	77	52	161	62	63	20
52	2.4	921	934	928	931	937	923	945	946	920	11	90	28	76	53	168	63	64	20
53	2.5	926	937	930	937	940	924	947	950	922	11	89	28	77	53	172	63	63	20
54	2.4	929	941	935	941	944	927	948	952	926	11	88	28	77	53	178	64	64	20
55	2.7	933	945	939	941	946	931	953	956	928	11	87	28	77	52	181	64	64	20
56	2	937	949	946	945	950	937	955	960	932	11	86	28	78	51	178	65	64	20
57	2.3	939	950	943	947	951	936	952	961	934	11	84	28	79	51	176	66	64	20
58	2.5	941	953	946	948	953	938	955	964	936	11	82	28	79	50	177	66	64	21
59	2.3	943	954	948	952	955	941	960	967	938	11	82	28	79	49	185	66	64	21
60	2.2	948	957	950	955	959	945	960	969	941	11	82	28	81	48	186	67	63	21
61	2.3	949	959	952	957	961	947	962	972	943	11	83	28	81	47	186	67	63	21
62	2.4	952	962	954	960	965	951	965	976	947	11	83	28	82	46	186	68	63	22
63	2.2	955	965	959	962	967	954	966	977	951	11	82	28	82	45	177	69	63	22
64	1.9	957	969	962	966	971	957	968	980	954	11	83	28	84	44	170	69	63	22
65	2.7	960	972	963	967	973	961	970	982	957	11	83	30	84	44	175	70	63	22
66	3.3	963	973	964	960	974	961	970	982	958	11	85	30	86	43	176	71	63	22
67	3.1	965	975	968	969	976	963	972	984	959	11	86	30	87	42	177	73	64	23

Time	Chan 0	Chan 1	Chan 2	Chan 3	Chan 4	Chan 5	Chan 6	Chan 7	Chan 8	Chan 9	Chan 11	Chan 19	Chan 20	Chan 23	Chan 24	Chan 27	Chan 28	Chan 35	Chan 36
min	Pa	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
68	3.4	967	978	970	969	978	967	973	986	962	11	87	31	88	42	183	76	64	23
69	3.2	969	980	972	971	980	970	976	989	965	11	86	31	89	42	186	79	65	24
70	3.4	972	983	975	974	983	971	977	991	967	11	88	31	90	42	191	81	65	24
71	3.4	975	985	977	976	985	975	981	993	970	11	88	32	91	42	196	84	65	24
72	3.4	978	990	978	979	987	976	981	996	978	11	89	33	93	42	204	86	65	23
73	1.9	981	993	982	983	990	978	984	997	979	11	92	34	95	42	208	88	65	23
74	4	981	992	983	985	990	978	985	998	976	11	94	37	96	42	214	90	65	22
75	4	982	994	984	986	991	980	986	999	980	11	99	40	98	42	222	91	65	22
76	3.9	983	996	985	987	992	981	986	1001	980	11	106	44	100	41	236	93	65	22
77	4	987	998	988	990	995	984	988	1002	984	11	119	48	102	41	243	95	66	22
78	3.7	989	1000	990	981	996	986	991	1004	986	11	24	36	106	41	248	97	66	21
79	4.2	991	1002	992	992	999	988	993	1007	987	11	13	25	110	42	343	99	67	21
80	3.9	992	1003	993	993	1000	990	993	1008	990	11	12	19	114	44	373	102	67	21
81	4.1	995	1005	995	996	1002	993	995	1009	991	11	11	16	119	46	292	106	67	22
82	3.7	995	1006	998	996	1003	994	997	1011	992	10	11	14	121	50	378	111	68	22
83	3.7	995	1008	999	999	1006	995	999	1014	994	10	11	14	126	55	106	123	68	22
84	3.6	997	1009	1000	1001	1007	997	1000	1015	996	10	11	13	130	61	31	135	68	22
85	3.6	999	1010	1002	1003	1009	999	1002	1016	999	11	11	13	132	67	17	140	68	23
86	3.3	999	1010	1003	1003	1009	1001	1004	1017	998	10	12	13	131	72	13	142	68	22
87	3.4	1001	1013	1005	1004	1010	1003	1004	1018	998	11	12	13	119	77	13	143	68	22
88	3.1	1004	1013	1002	997	1008	1001	1005	1018	998	11	12	13	111	79	12	144	67	22
89	2.9	1007	1015	1006	998	1010	1001	1006	1019	998	10	12	13	109	80	13	144	68	22
90	2.9	1008	1019	1009	1002	1012	1005	1006	1020	999	10	12	13	108	80	13	144	70	22
91	2.3	1011	1022	1012	1005	1014	1006	1008	1022	1002	11	12	13	107	79	13	145	76	22

Time	Chan 0	Chan 1	Chan 2	Chan 3	Chan 4	Chan 5	Chan 6	Chan 7	Chan 8	Chan 9	Chan 11	Chan 19	Chan 20	Chan 23	Chan 24	Chan 27	Chan 28	Chan 35	Chan 36
min	Pa	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
92	3.2	998	1013	1006	999	1010	1007	1003	1021	1001	10	12	13	108	80	13	147	83	23
93	2.9	1002	1018	1005	1002	1012	1008	1003	1019	1001	10	12	13	110	79	13	149	94	28
94	3.1	1009	1020	1006	1003	1012	1011	1003	1019	1002	10	12	13	111	79	13	151	21	34
95	3.7	1013	1025	1012	1012	1015	1011	1008	1024	1005	11	12	13	112	77	13	155	13	30
96	3.3	1012	1024	1013	1011	1015	1009	1010	1023	1002	10	12	13	115	76	13	158	12	27
97	2.8	1015	1018	1004	1007	1011	1004	1004	1020	1002	11	13	14	115	76	14	155	13	29
98	3.1	1013	1019	999	1002	1008	1000	1003	1019	1001	11	12	15	118	76	14	155	13	35
99	2.1	1038	1021	1007	1008	1014	1007	1008	1026	1005	11	12	15	120	77	13	157	12	36
100	2.2	1028	1028	1014	1012	1019	1011	1013	1030	1009	11	12	14	123	79	12	185	11	33
101	2.5	1036	1033	1019	1016	1024	1015	1017	1034	1011	11	12	15	129	80	12	278	11	33
102	2.8	1034	1037	1020	1020	1028	1019	1019	1036	1014	11	12	14	137	81	13	408	12	36
103	2.9	1042	1039	1022	1028	1031	1022	1020	1037	1019	11	12	15	146	79	14	447	11	36
104	1.8	1043	1041	1026	1032	1033	1024	1021	1038	1020	11	12	15	185	78	14	383	12	38
105	3.5	1048	1046	1032	1034	1037	1027	1025	1042	1023	11	12	15	224	66	14	354	12	39
106	3.1	1060	1059	1040	1041	1044	1032	1027	1045	1025	11	13	16	242	48	15	499	12	40
107	2.9	1043	1054	1038	1037	1039	1029	1028	1042	1023	11	13	16	250	42	15	453	13	46
108	1.8	1055	1055	1039	1038	1039	1030	1028	1043	1021	11	13	16	289	37	15	382	13	60
109	3.8	1059	1052	1040	1036	1037	1027	1026	1040	1020	11	12	16	326	38	15	313	12	44
110	2.8	1058	1052	1037	1035	1037	1027	1025	1039	1017	11	14	17	348	35	18	216	13	41
111	1.8	1055	1052	1035	1036	1038	1025	1026	1039	1018	11	13	16	377	33	17	177	12	38
112	2.8	1056	1053	1038	1038	1039	1028	1028	1041	1019	11	14	16	376	33	16	321	12	37
113	3.1	1059	1053	1039	1041	1042	1028	1030	1044	1023	11	13	16	820	32	16	355	12	40
114	4.2	1056	1054	1037	1040	1042	1029	1030	1043	1024	11	16	16	826	37	18	200	17	40
115	1.3	1059	1055	1039	1042	1043	1032	1031	1046	1024	11	17	16	757	31	21	177	17	41

Time	Chan 0	Chan 1	Chan 2	Chan 3	Chan 4	Chan 5	Chan 6	Chan 7	Chan 8	Chan 9	Chan 11	Chan 19	Chan 20	Chan 23	Chan 24	Chan 27	Chan 28	Chan 35	Chan 36
min	Pa	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C	°C
116	1.7	1059	1058	1040	1045	1045	1033	1033	1047	1026	11	17	16	749	28	24	175	18	44
117	2.4	1063	1058	1042	1047	1047	1036	1037	1049	1029	11	15	16	744	31	23	172	17	43
118	1.8	1061	1060	1044	1049	1049	1038	1037	1051	1031	11	16	16	758	31	22	172	17	44
119	3.1	1066	1062	1047	1050	1051	1041	1039	1054	1033	11	14	16	791	29	20	181	15	40
120	2.6	1065	1064	1048	1049	1053	1044	1040	1056	1036	11	12	13	886	28	15	312	13	40

Time	Chan 39	Chan 40	Chan 43	Chan 44
min	°C	°C	°C	°C
0	13	12	12	12
1	13	28	13	25
2	14	37	13	28
3	16	40	17	92
4	16	41	25	93
5	16	51	25	90
6	16	88	24	88
7	17	96	24	84
8	17	94	23	80
9	16	91	22	76
10	17	88	23	71
11	17	84	23	65
12	18	80	24	60
13	19	77	26	56
14	20	74	28	52
15	21	70	30	48

Time	Chan 39	Chan 40	Chan 43	Chan 44
min	°C	°C	°C	°C
16	24	67	36	45
17	26	64	40	42
18	29	61	43	40
19	31	58	46	38
20	35	55	48	36
21	37	53	50	35
22	40	51	51	33
23	42	49	52	32
24	44	48	53	31
25	47	46	53	30
26	48	45	54	30
27	50	44	55	29
28	52	43	55	29
29	53	42	56	28
30	54	42	57	28
31	55	41	57	27

Time	Chan 39	Chan 40	Chan 43	Chan 44
min	°C	°C	°C	°C
32	57	41	57	27
33	57	41	57	27
34	58	40	58	26
35	59	40	57	26
36	59	40	58	26
37	59	40	59	25
38	60	40	59	25
39	60	39	58	25
40	60	39	59	25
41	61	39	61	24
42	61	39	62	24
43	61	39	62	24
44	61	39	62	24
45	61	38	62	24
46	62	38	63	24
47	62	38	62	24
48	63	38	63	24
49	63	39	63	24
50	65	40	64	24
51	65	40	65	24
52	65	40	63	24
53	65	41	64	24
54	65	41	64	24
55	65	41	64	24

Time	Chan 39	Chan 40	Chan 43	Chan 44
min	°C	°C	°C	°C
56	65	41	65	25
57	64	41	66	25
58	64	41	66	25
59	64	41	66	25
60	64	41	67	26
61	63	41	67	26
62	63	40	67	26
63	62	40	68	26
64	62	41	69	26
65	62	41	69	26
66	62	41	68	26
67	62	41	68	27
68	62	41	66	27
69	62	41	66	27
70	62	41	66	27
71	63	41	65	27
72	63	40	65	27
73	63	40	65	27
74	63	40	65	27
75	64	39	64	27
76	64	39	65	27
77	64	39	65	27
78	64	38	65	26
79	64	38	65	26

Time	Chan 39	Chan 40	Chan 43	Chan 44
min	°C	°C	°C	°C
80	65	38	64	26
81	65	38	64	26
82	65	38	64	26
83	65	38	65	26
84	66	38	67	26
85	66	38	66	26
86	67	38	67	26
87	67	39	69	26
88	68	39	70	26
89	68	39	73	26
90	69	39	75	25
91	69	39	75	25
92	71	40	71	26
93	75	43	74	26
94	79	46	238	33
95	81	48	379	59
96	82	51	840	79
97	85	56	775	96
98	87	60	549	111
99	88	68	142	116
100	91	81	85	108

Time	Chan 39	Chan 40	Chan 43	Chan 44
min	°C	°C	°C	°C
101	101	142	108	103
102	55	131	157	104
103	31	64	137	100
104	21	39	133	103
105	17	24	112	107
106	15	19	283	106
107	16	17	657	110
108	16	16	719	139
109	14	15	764	210
110	14	14	191	277
111	13	13	186	306
112	13	13	216	348
113	13	13	216	370
114	13	16	199	220
115	14	17	200	245
116	14	17	201	267
117	14	16	199	296
118	13	16	859	324
119	13	16	692	276
120	13	14	174	180