



Sponsor:

FireCrunch Australasia Pty Ltd
Level 44, MLC Centre
19 Martin Place
Sydney NSW 2000

Test Report – Fire Resistance:

TESTING PERFORMED ON: A timber framed, stud wall with one layer of R2.5 x 90mm thk earthwool and sheeted with a single layer of 10mm thk SE FireCrunch board each side.

TEST DATE:	04/09/2018
REPORT WRITTEN BY:	M. Lewis
REPORT DATE:	12/09/2018
RTL REPORT NO:	TR-F025.01 (PR0057)
TEST ID:	FR33.S3/2018
SCOPE:	Measurement of fire resistance in general accordance with AS 1530.4-2014 Sections 1, 2 and 3

1. DOCUMENT HISTORY


Revision #	Date	Sent to	Additional Information
TR-F025.DR (PR0057)	13/09/2018	Client	Draft issue for comment
TR-F025.01 (PR0057)	18/09/2018	Client	Test Observation Table added. Final Issue

2. TESTING FACILITY NAME AND ADDRESS

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3. REPORT AUTHORISATION

Report Written by	Title	Date	Signature
M. Lewis	Technical Manager Fire & Smoke	18/09/2018	


Report Authorised by	Title	Date	Signature
M. Lewis	Technical Manager Fire & Smoke	18/09/2018	

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4. REPORT SUMMARY

Fire resistance test on a timber framed, stud wall with one layer of R2.5 x 90mm thk earthwool and sheeted with a single layer of 10mm thk SE FireCrunch board each side. The specimen under test achieved the following fire-resistance levels in general accordance with AS 1530.4-2014.

Test Results	
Structural adequacy	n/a
Integrity	62 minutes ¹
Insulation	62 minutes ¹
FRL	-/60/60

¹ No failure recorded

Post-Test Observation

At the request of the Client a subsequent cooldown and observation phase was carried out after the end of the 60-minute fire test. The Client nominated a modified AS 1530.8.2 Performance Criteria (ref: AS 1530.8.2-2007 C13.8), the modification namely being a 60-minute AS 1530.4 test followed by 60 minutes of observation.

With agreement of the Lab, 13.8 Performance Criteria (as modified above) (b), (c), (e) & (g) were monitored during the observation period.

The test was shutdown at 62 minutes and the sample was removed from the furnace without the thermocouples being disconnected from the logging equipment and was placed in a specimen frame cradle. The cradle and wall were positioned on an angle away from the furnace so as to not be affected by radiant heat from the furnace.

Over the subsequent observation period the following observations were made:

AS 1530.8.2 13.8 Performance Criteria (shortened to agreed scope)	Time to failure (min)	Position of failure
Sustained flaming for more than 10 s on the non-fire side for the duration of the 120 min test period	No failure	-
Flaming on the fire-exposed face more than 30 min after completion of heating	109	Centre of wall approx. 150mm down from top.
Mean and maximum temperature rises greater than 140 K and 180 K	67	TC11 exceeded max
	67	TC12 exceeded max
	68	Group3 exceeded ave
	112	TC16 NFS upper joint
Mean and maximum temperature of internal faces exceed 250°C and 300°C respectively more than 30 min after completion of heating phase	92	TC1 max and TC1& TC2 ave

5. INTRODUCTION

This report details a test carried out on a timber framed, stud wall with one layer of R2.5 x 90mm thk earthwool and sheeted with a single layer of 10mm thk SE FireCrunch board each side. The test was carried out in general accordance with AS 1530.4-2014 to measure the fire-resistance of the specimen. The specimen under test was installed into steel restraint frame suitable for mounting to the test apparatus.

6. STANDARDS

The measurements leading to the results presented in this report have been undertaken in accordance with standards which specify a method for measuring the fire resistance of building elements:

- AS 1530.4—2014 Methods for fire tests on building materials, components and structures – Part 4: Fire-resistance tests for elements of construction.
- AS 1530.8.2-2007 Part 8.2 Tests on elements of construction for bushfire attack - Large flaming sources
 - Specifically, only C13.8 (b), (c), (e) & (g), reported in accordance with 13.9 and Table 13.3.

The test facility and equipment were in accordance with:

- AS 1530.4—2014 Methods for fire tests on building materials, components and structures – Part 4: Fire-resistance tests for elements of construction.

7. DEVIATIONS FROM THE TEST STANDARD:

Only the general principals of the test Standard were followed as wall testing is required to be carried out at full scale.

Specific variations include edge and end conditions, fixing, and deflection measurements.

During the test the internal furnace pressure fluctuated outside of the control parameters intermittently.

Only the nominated Performance Criteria noted in Section 6 were considered during the cooldown observation phase. This report does not cover any other part of AS 1530.8.2-2007.

8. PERFORMANCE CRITERIA

Criteria of Failure

Under AS 1530.4-2014 the following conditions are set out to describe failure of the element under test with regards to:

Structural Adequacy (loadbearing capacity)

Structural adequacy not evaluated.

Integrity

Failure in relation to integrity shall be deemed to have occurred when evaluated in accordance with Clauses 2.13.2.2 to 2.13.2.4.

The measurement of the integrity of the test specimen shall be made by cotton pad, gap gauge or sustained flaming. For uninsulated assemblies, other than service penetrations, the cotton pad is deemed inappropriate and gap gauges shall be used. The cotton pad is also deemed inappropriate, except for penetration systems, where a fixed or roving thermocouple measures a temperature exceeding 300°C.

Insulation

The measurement of insulation performance is made by thermocouples on the unexposed face compared to the initial temperature.

The specimen shall be deemed to have failed when:

The average temperature on the unexposed face of the test specimen exceeds the initial temperature by more than 140 K; or

The temperature at any location on the unexposed face of the test specimen exceeds the initial temperature by more than 180 K.

Radiation

Radiation not evaluated.

9. CONSTRUCTION DETAILS

Manufacture Information

The test specimen wall was constructed offsite by the Clients contractor GHA Group. It was delivered to Resolute labs on the 14th August. Resolute attached internal thermocouples over the 16th and 17th August and the Client and GHA Group returned on the 20th August to fix off and seal the non-fire side boards.

Supporting Construction

No supporting construction was used in this test as the entire wall comprised of the test specimen.

Test Specimen(s) Description

(Client supplied)

1 X 90 X 45MM SINGLE TIMBER MPG10 STUD FRAME
 1 X 10MM FCA SHEET EACH SIDE
 INSULATION R2.5 "EARTHWOOL" GLASS WOOL BATT 90MM IN FRAME
 AS1530.4 FIRE SEALANT BOSTIK FIRE BAN TO JOINTS AND PERIMETERS
 SEALANT IN 3 X 3MM BEADS DOWN EACH (VERTICAL) JOINT 45MM STUD FACE
 4MM FIRE GAP BETWEEN VERTICALLY SET BOARDS FILLED WITH SAME FIRE SEALANT
 FIXED WITH NEEDLE POINT STAINLESS STEEL SCREWS AT MIN 200 CENTRES. 10 GAUGE x 35mm SELF
 EMBEDDING TYPE 17, COUNTERSUNK HEAD, GALV CLASS 3, PHILLIPS DRIVE

10. SUPPORT AND RESTRAINT CONDITIONS

The wall was installed within one of the vertical test specimen frames suitable for mounting to the test apparatus. The wall sat upon a refractory blanket and was compressed against the vertical faces of the test specimen frame, which was fitted with the same refractory blanket, by way of four off compression brackets acting on two vertical angles to spread the compression load evenly across the wall.

11. PRE-TEST CONDITIONING

The specimen was completed on 20/08/18 and left to cure in the indoor laboratory environment for 15 days.

12. DIRECTION OF EXPOSURE

The specimen was subjected to fire exposure from the inside. The wall was symmetrical.

13. SELECTION OF TEST SPECIMEN(S)

The laboratory was not involved in the selection of any specimen materials for this test. The Client supplied and installed all materials for their specimen.

14. TEST PROCEDURE

Furnace Heating Conditions – Temperature Curve

The temperature of the furnace shall be controlled to vary with time, as close as possible, in accordance with the following relationship:

$$T = 345 \log_{10}(8t + 1) + 20$$

Where

T = furnace temperature at time (t), in degrees centigrade

T = time into the test, measured from the ignition of the furnace, in minutes

Laboratory Ambient Temperature at Commencement of fire test

At 10:27 on the 04/09/18 at the commencement of the test, the indoor ambient temperature was 21°C. Over the 120-minute test duration the temperature increased to 22°C.

Furnace Pressure Differential

Furnace pressure was measured with a Dwyer Magnesense pressure transmitter (S:N 71640), with a probe located 100mm from the face of the test specimen.

Specimen Temperatures

Specimen temperatures measured with type K thermocouples of wire diameter not exceeding 0.5mm, with the measuring junction silver soldered to the face of a 12mm diameter by 0.2mm thick copper disc. Each thermocouple shall be covered with a 30±0.5mm x 30±0.5mm x 2.0±0.5mm thick millboard pad.

Deflection Measurement

Deflection measurement was not taken during this test.

Validation to Variation in Tolerances on the Time/Temperature Curve, Pressure Conditions and/or Ambient Laboratory Conditions

The pressure variations within the furnace chamber are not expected to have detrimentally affected the performance of the test.

15. TEST RESULTS

Performance (whole minutes and FRL)

Specimen : A timber framed, stud wall with one layer of R2.5 x 90mm thk earthwool and sheeted with a single layer of 10mm thk SE FireCrunch board each side

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	67	TC12 exceeded max
	68	Group3 exceeded ave
	112	TC16 NFS upper joint
Mean and maximum temperature of internal faces exceed 250°C and 300°C respectively more than 30 min after completion of heating phase	92	TC1 max and TC1& TC2 ave

STATEMENTS

THE RESULTS OF THESE FIRE TESTS MAY BE USED TO DIRECTLY ASSESS FIRE HAZZARD, BUT IT SHOULD BE RECOGNIZED THAT A SINGLE TEST METHOD WILL NOT PRODUCE A FULL ASSESSMENT OF FIRE HAZARD UNDER ALL FIRE CONDITIONS.

THIS REPORT DETAILS METHODS OF CONSTRUCTION, THE TEST CONDITIONS AND THE RESULTS OBTAINED WHEN THE SPECIFIC ELEMENT OF CONSTRUCTION DESCRIBED HERIN WAS TESTED FOLLOWING THE PROCEDURE OUTLINED IN AS 1530.4. ANY SIGNIFICANT VARIATION WITH RESPECT TO SIZE, CONSTRUCTION DETAILS, LOADS STRESSES, EDGE OR END CONDITIONS, OTHER THAN THAT ALLOWED UNDER THE FIELD OF DIRECT APPLICATION IN THE RELEVANT TEST METHOD, IS NOT COVERED BY THIS REPORT.

BECAUSE OF THE NATURE OF FIRE RESISTANCE TESTING AND THE CONSEQUENT DIFFICULTY IN QUANTIFYING UNCERTAINTY OF MEASUREMENT OF FIRE RESISTANCE TESTING, IT IS NOT POSSIBLE TO PROVIDE A STATED DEGREE OF ACCURACY OF THE RESULT.

Appendix A – FIGURES

Figure 1 – Furnace Temperature vs Time

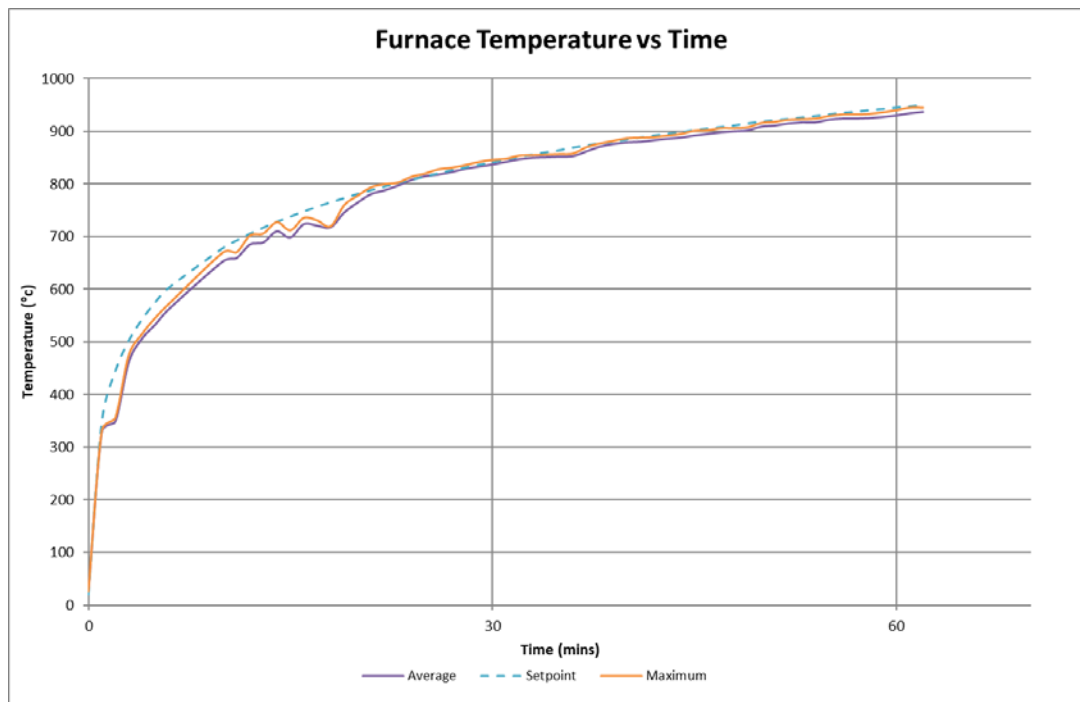


Figure 2 – Furnace Severity vs Time

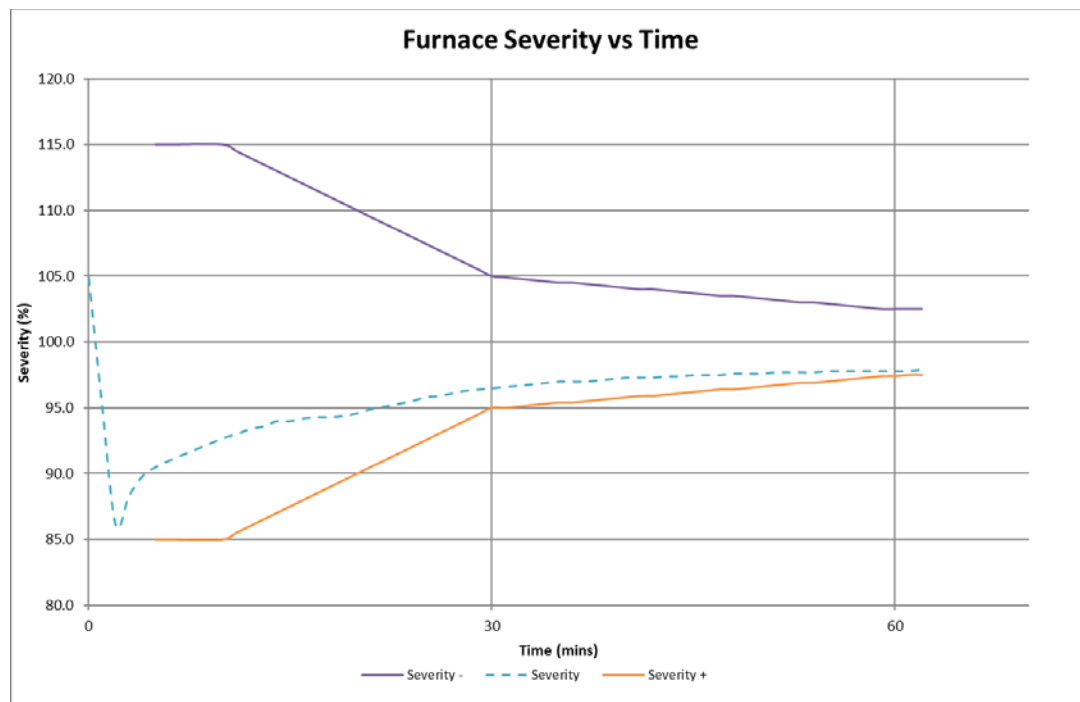


Figure 3 – Furnace Pressure vs Time

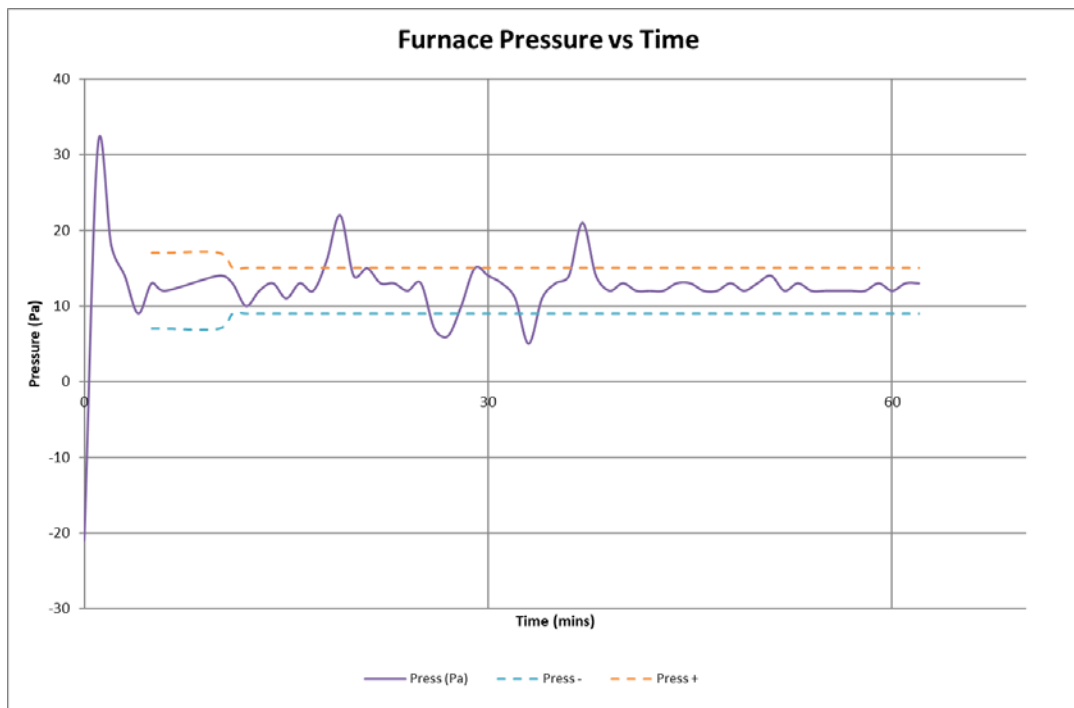


Table 1 – Specimen Thermocouple Locations

Group Location	T/C Location	T/C Designation
Specimen Group 1	Unexposed face of fire side board – NW	SP1
	Unexposed face of fire side board – SW	SP2
	Unexposed face of fire side board – NE	SP3
	Unexposed face of fire side board – SE	SP4
Specimen Group 2	Non-fire side of insulation - NW	SP7
	Non-fire side of insulation – SW	SP8
	Non-fire side of insulation – NE	SP9
	Non-fire side of insulation - SE	SP10
Specimen Group 3	Non-fire side board - NW	SP11
	Non-fire side board – NE	SP12
	Non-fire side board – Central	SP13
	Non-fire side board – SW	SP14
	Non-fire side board - SW	SP15
Specimen Group 4	RHS of vertical board joint	SP16
	LHS of vertical board joint	SP17

Figure 4 – Specimen Group 1 Temperatures vs Time

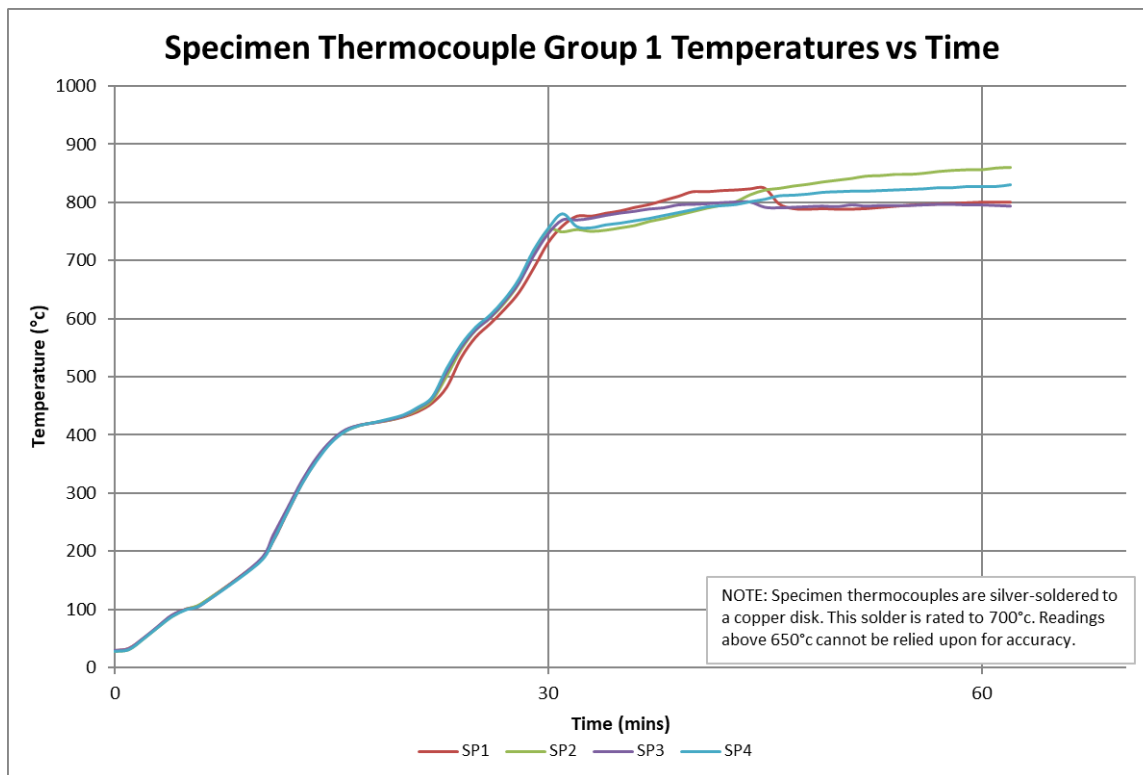


Figure 5 – Specimen Group 2 Temperatures vs Time

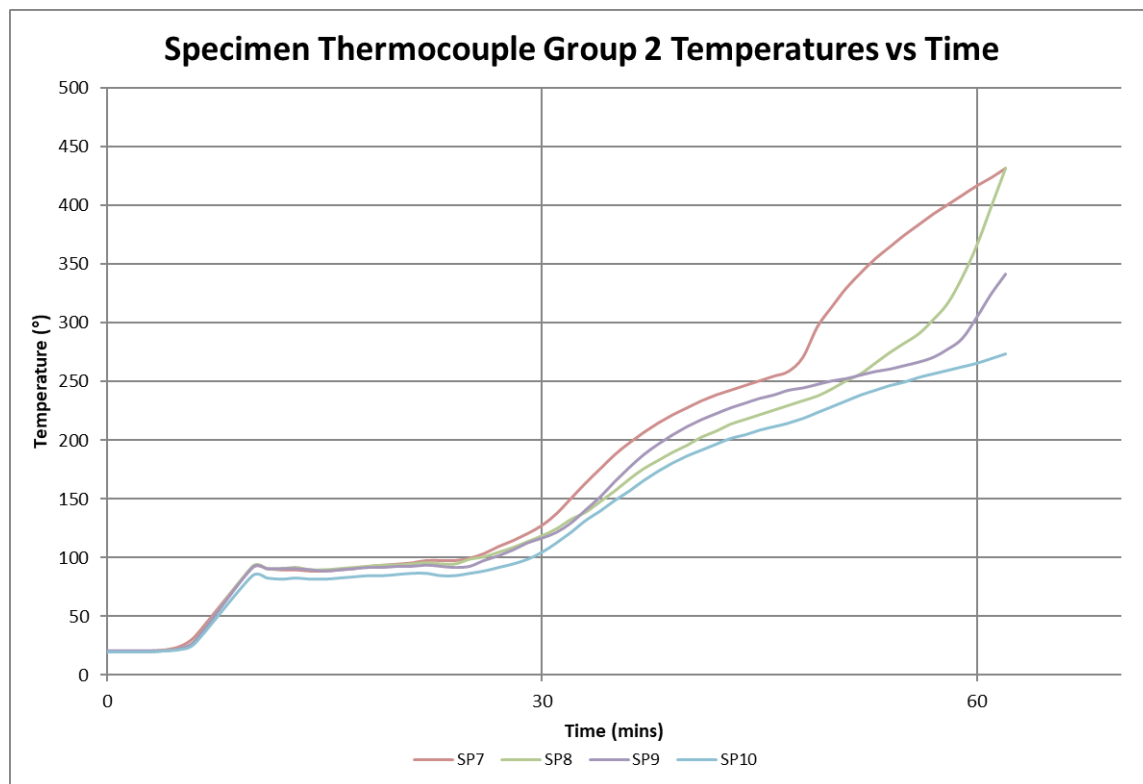


Figure 6 – Specimen Group 3 Temperatures vs Time

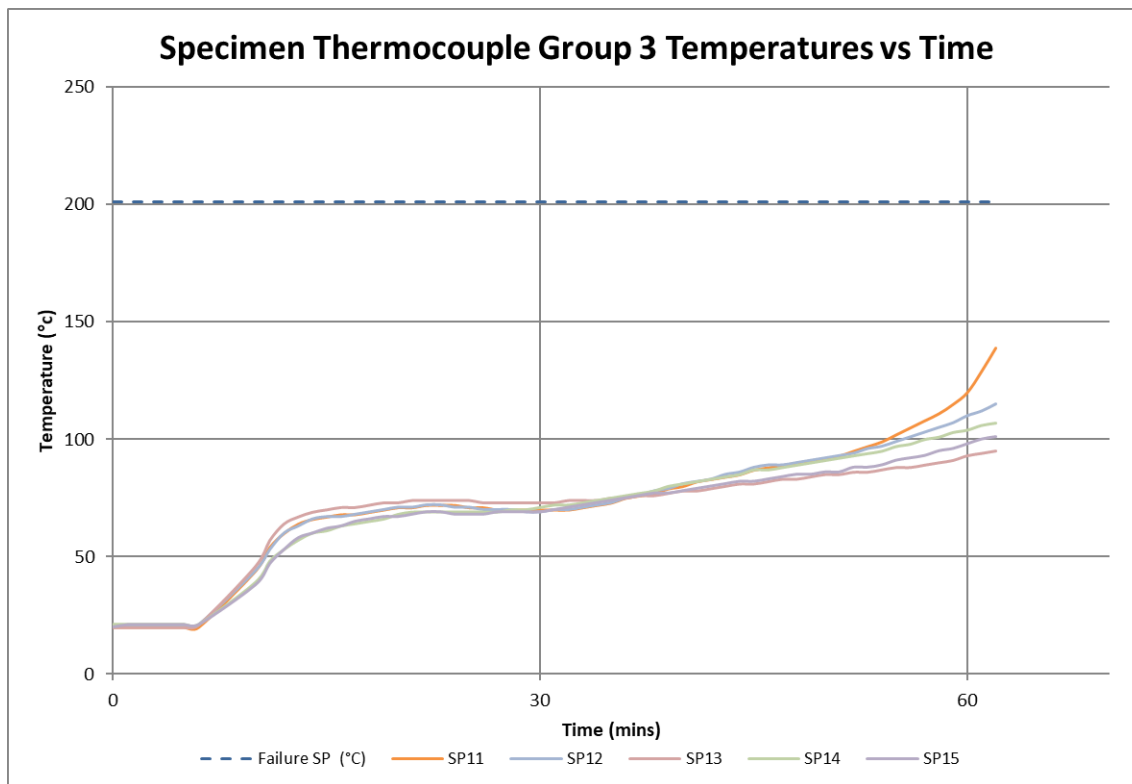


Figure 7 – Specimen Group 4 Temperatures vs Time

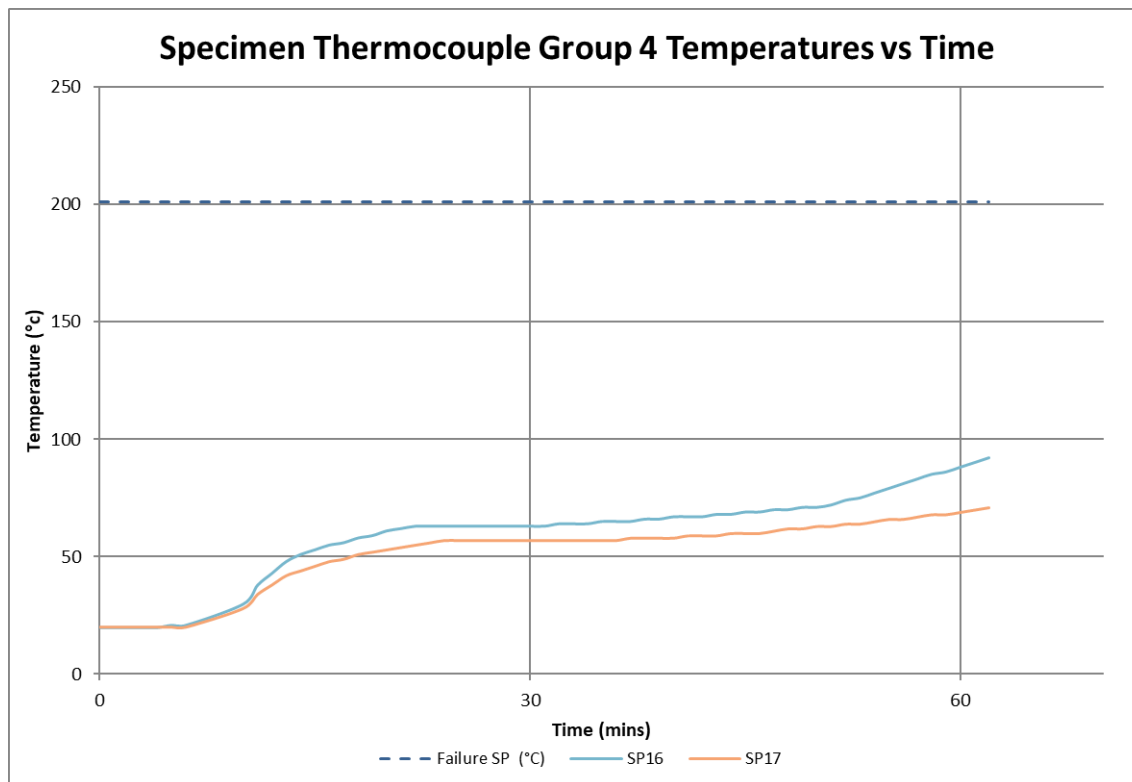


Figure 8 – Specimen Group 1 Cooldown Phase vs Time

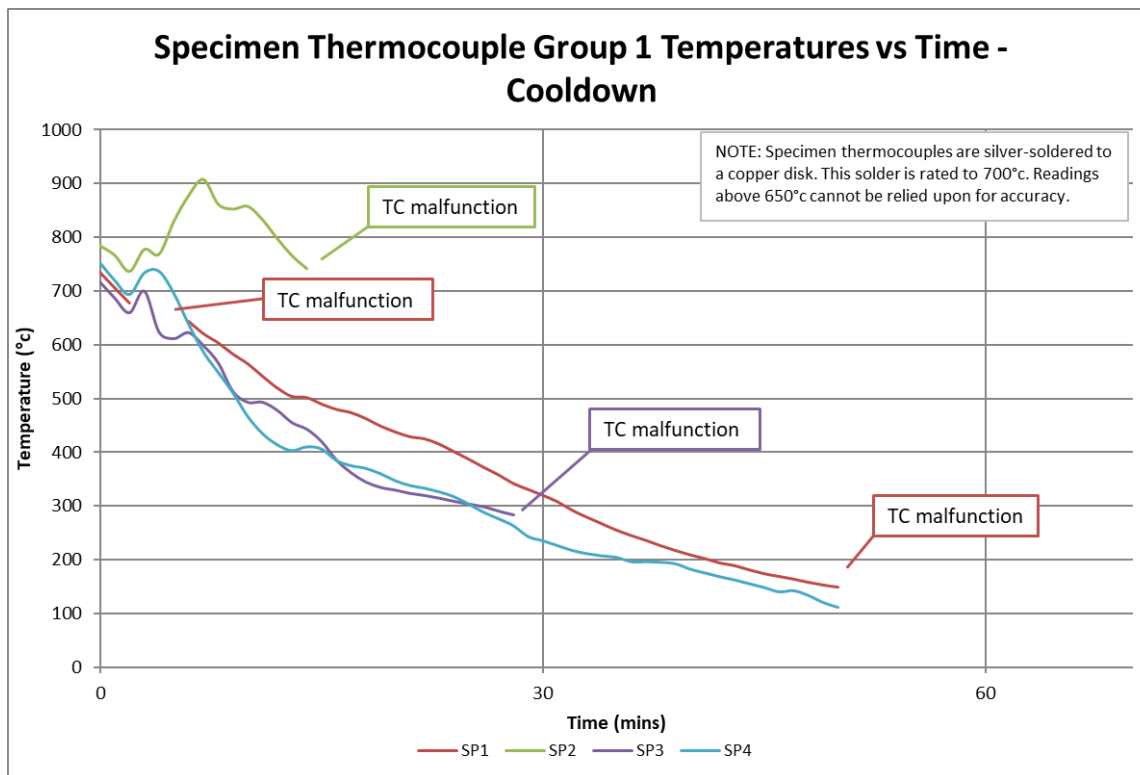


Figure 9 – Specimen Group 2 Cooldown Phase vs Time

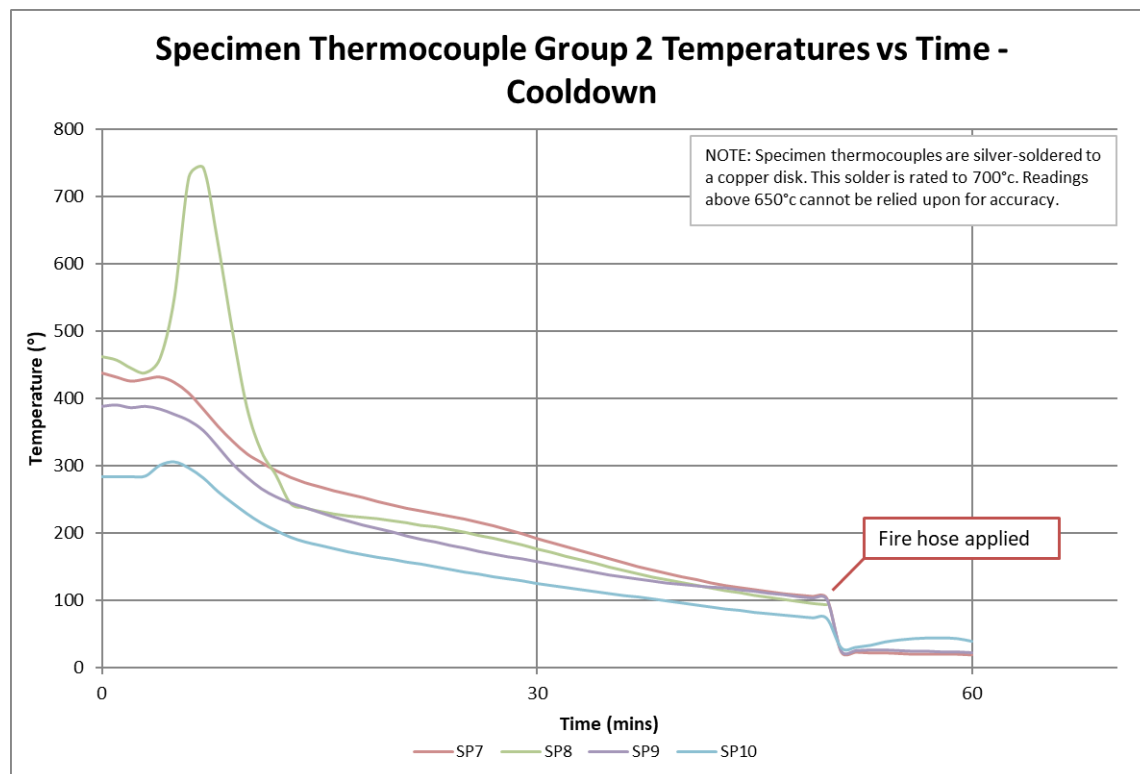


Figure 10 – Specimen Group 3 Cooldown Phase vs Time

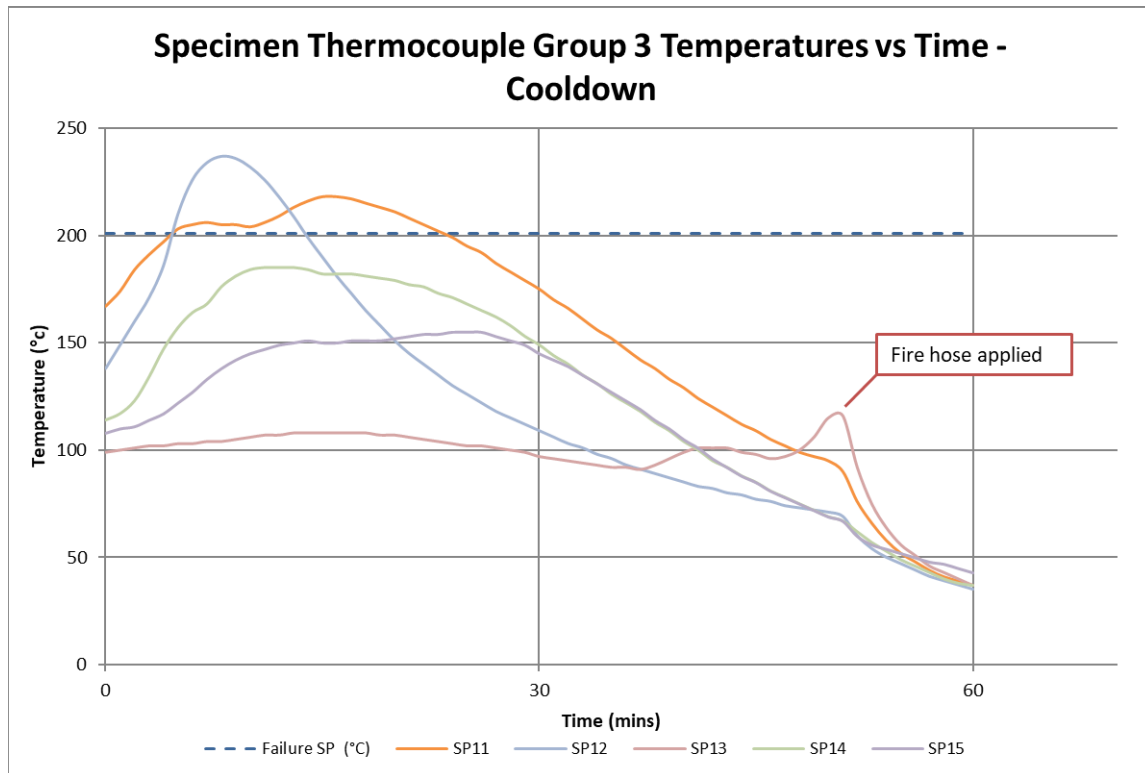
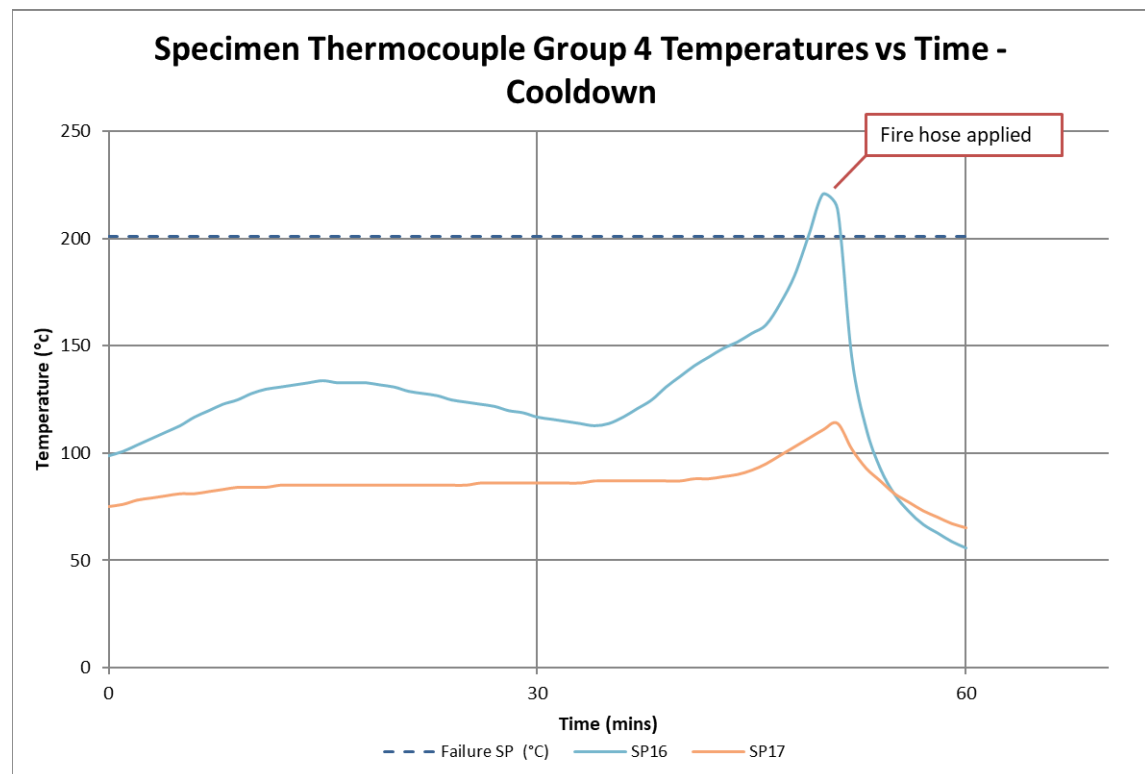


Figure 11 – Specimen Group 4 Cooldown Phase vs Time



Appendix B – TABLES

Table 2 – Specimen Group 1 Temperatures

Date / Time	Test Time (mins)	SP1	SP2	SP3	SP4
04-09-18 10:27	0	29	27	29	27
04-09-18 10:28	1	33	30	32	30
04-09-18 10:29	2	50	48	50	48
04-09-18 10:30	3	70	68	70	68
04-09-18 10:31	4	90	87	90	87
04-09-18 10:32	5	101	100	100	99
04-09-18 10:33	6	109	109	107	107
04-09-18 10:37	10	182	180	183	179
04-09-18 10:38	11	218	221	228	218
04-09-18 10:39	12	268	270	275	268
04-09-18 10:40	13	317	319	322	316
04-09-18 10:41	14	357	358	361	355
04-09-18 10:42	15	388	388	390	386
04-09-18 10:43	16	408	406	409	406
04-09-18 10:44	17	417	416	417	416
04-09-18 10:45	18	421	421	421	421
04-09-18 10:46	19	425	425	426	427
04-09-18 10:47	20	431	432	433	434
04-09-18 10:48	21	440	443	446	447
04-09-18 10:49	22	455	460	464	465
04-09-18 10:50	23	482	501	509	514
04-09-18 10:51	24	533	547	551	555
04-09-18 10:52	25	568	580	581	585
04-09-18 10:53	26	591	601	602	606
04-09-18 10:54	27	616	627	630	633
04-09-18 10:55	28	645	661	662	668
04-09-18 10:56	29	686	712	708	717
04-09-18 10:57	30	730	752	746	754
04-09-18 10:58	31	759	749	770	780
04-09-18 10:59	32	776	753	770	758
04-09-18 11:00	33	776	750	773	756
04-09-18 11:01	34	781	752	778	761
04-09-18 11:02	35	785	756	782	764
04-09-18 11:03	36	791	760	785	768
04-09-18 11:04	37	796	767	789	772
04-09-18 11:05	38	803	772	791	777
04-09-18 11:06	39	810	778	796	782
04-09-18 11:07	40	818	784	797	787

Date / Time	Test Time (mins)	SP1	SP2	SP3	SP4
04-09-18 11:08	41	818	790	798	792
04-09-18 11:09	42	820	795	800	794
04-09-18 11:10	43	821	801	801	796
04-09-18 11:11	44	823	813	801	801
04-09-18 11:12	45	824	821	792	805
04-09-18 11:13	46	797	824	791	811
04-09-18 11:14	47	789	828	792	812
04-09-18 11:15	48	788	831	793	814
04-09-18 11:16	49	789	835	794	817
04-09-18 11:17	50	788	838	793	818
04-09-18 11:18	51	788	841	796	819
04-09-18 11:19	52	789	845	794	819
04-09-18 11:20	53	791	846	795	820
04-09-18 11:21	54	793	848	795	821
04-09-18 11:22	55	795	848	795	822
04-09-18 11:23	56	796	850	796	823
04-09-18 11:24	57	797	853	797	825
04-09-18 11:25	58	798	855	797	825
04-09-18 11:26	59	799	856	796	827
04-09-18 11:27	60	800	856	796	827
04-09-18 11:28	61	800	859	795	827
04-09-18 11:29	62	800	860	794	830

Table 3 – Specimen Group 2 Temperatures

Date / Time	Test Time (mins)	SP7	SP8	SP9	SP10
04-09-18 10:27	0	21	20	21	20
04-09-18 10:28	1	21	20	21	20
04-09-18 10:29	2	21	20	21	20
04-09-18 10:30	3	21	20	21	20
04-09-18 10:31	4	22	21	21	21
04-09-18 10:32	5	25	23	23	22
04-09-18 10:33	6	33	29	29	27
04-09-18 10:37	10	92	93	92	85
04-09-18 10:38	11	91	91	91	83
04-09-18 10:39	12	90	91	91	82
04-09-18 10:40	13	90	92	91	83
04-09-18 10:41	14	89	90	90	82
04-09-18 10:42	15	89	90	89	82
04-09-18 10:43	16	90	91	90	83
04-09-18 10:44	17	91	92	91	84

Date / Time	Test Time (mins)	SP7	SP8	SP9	SP10
04-09-18 10:45	18	93	93	92	85
04-09-18 10:46	19	94	94	92	85
04-09-18 10:47	20	95	94	93	86
04-09-18 10:48	21	96	95	93	87
04-09-18 10:49	22	98	96	94	87
04-09-18 10:50	23	98	95	93	85
04-09-18 10:51	24	98	95	92	85
04-09-18 10:52	25	100	99	93	87
04-09-18 10:53	26	104	101	98	89
04-09-18 10:54	27	110	105	102	92
04-09-18 10:55	28	115	109	107	95
04-09-18 10:56	29	121	114	113	99
04-09-18 10:57	30	128	119	117	105
04-09-18 10:58	31	138	125	122	113
04-09-18 10:59	32	151	133	130	122
04-09-18 11:00	33	164	139	141	132
04-09-18 11:01	34	176	148	152	140
04-09-18 11:02	35	188	157	165	149
04-09-18 11:03	36	198	167	177	157
04-09-18 11:04	37	207	176	188	166
04-09-18 11:05	38	215	183	197	174
04-09-18 11:06	39	222	190	205	181
04-09-18 11:07	40	228	196	212	187
04-09-18 11:08	41	234	203	218	192
04-09-18 11:09	42	239	208	223	197
04-09-18 11:10	43	243	214	228	202
04-09-18 11:11	44	247	218	232	205
04-09-18 11:12	45	251	222	236	209
04-09-18 11:13	46	255	226	239	212
04-09-18 11:14	47	259	230	243	215
04-09-18 11:15	48	271	234	245	219
04-09-18 11:16	49	297	238	248	224
04-09-18 11:17	50	314	244	251	229
04-09-18 11:18	51	330	251	253	234
04-09-18 11:19	52	343	257	256	239
04-09-18 11:20	53	355	266	259	243
04-09-18 11:21	54	365	275	261	247
04-09-18 11:22	55	375	283	264	250
04-09-18 11:23	56	384	291	267	254
04-09-18 11:24	57	393	303	271	257
04-09-18 11:25	58	401	317	278	260

Date / Time	Test Time (mins)	SP7	SP8	SP9	SP10
04-09-18 11:26	59	409	339	287	263
04-09-18 11:27	60	417	366	305	266
04-09-18 11:28	61	424	399	325	270
04-09-18 11:29	62	432	432	342	274

Table 4 – Specimen Group 3 Temperatures

Date / Time	Test Time (mins)	Failure SP (°C)	SP11	SP12	SP13	SP14	SP15	AVE
04-09-18 10:27	0	201	20	20	20	21	20	20.2
04-09-18 10:28	1	201	20	20	20	21	21	20.4
04-09-18 10:29	2	201	20	20	20	21	21	20.4
04-09-18 10:30	3	201	20	20	20	21	21	20.4
04-09-18 10:31	4	201	20	20	20	21	21	20.4
04-09-18 10:32	5	201	20	20	20	21	21	20.4
04-09-18 10:33	6	201	20	21	21	21	21	20.8
04-09-18 10:37	10	201	44	44	46	39	38	42.2
04-09-18 10:38	11	201	54	53	57	48	47	51.8
04-09-18 10:39	12	201	60	60	64	53	53	58
04-09-18 10:40	13	201	64	63	67	57	58	61.8
04-09-18 10:41	14	201	66	66	69	60	60	64.2
04-09-18 10:42	15	201	67	67	70	61	62	65.4
04-09-18 10:43	16	201	68	67	71	63	63	66.4
04-09-18 10:44	17	201	68	68	71	64	65	67.2
04-09-18 10:45	18	201	69	69	72	65	66	68.2
04-09-18 10:46	19	201	70	70	73	66	67	69.2
04-09-18 10:47	20	201	71	71	73	68	67	70
04-09-18 10:48	21	201	71	71	74	69	68	70.6
04-09-18 10:49	22	201	72	72	74	69	69	71.2
04-09-18 10:50	23	201	72	72	74	69	69	71.2
04-09-18 10:51	24	201	72	71	74	69	68	70.8
04-09-18 10:52	25	201	71	71	74	69	68	70.6
04-09-18 10:53	26	201	71	70	73	69	68	70.2
04-09-18 10:54	27	201	70	70	73	69	69	70.2
04-09-18 10:55	28	201	70	70	73	70	69	70.4
04-09-18 10:56	29	201	70	69	73	70	69	70.2
04-09-18 10:57	30	201	70	69	73	71	69	70.4
04-09-18 10:58	31	201	70	70	73	72	70	71
04-09-18 10:59	32	201	70	70	74	72	71	71.4
04-09-18 11:00	33	201	71	71	74	73	72	72.2
04-09-18 11:01	34	201	72	72	74	74	73	73
04-09-18 11:02	35	201	73	73	75	75	74	74
04-09-18 11:03	36	201	75	75	75	76	75	75.2

Date / Time	Test Time (mins)	Failure SP (°C)	SP11	SP12	SP13	SP14	SP15	AVE
04-09-18 11:04	37	201	76	76	76	77	76	76.2
04-09-18 11:05	38	201	77	78	76	78	77	77.2
04-09-18 11:06	39	201	79	79	77	80	77	78.4
04-09-18 11:07	40	201	80	81	78	81	78	79.6
04-09-18 11:08	41	201	82	82	78	82	79	80.6
04-09-18 11:09	42	201	83	83	79	83	80	81.6
04-09-18 11:10	43	201	84	85	80	84	81	82.8
04-09-18 11:11	44	201	85	86	81	85	82	83.8
04-09-18 11:12	45	201	87	88	81	87	82	85
04-09-18 11:13	46	201	88	89	82	87	83	85.8
04-09-18 11:14	47	201	89	89	83	88	84	86.6
04-09-18 11:15	48	201	90	90	83	89	85	87.4
04-09-18 11:16	49	201	91	91	84	90	85	88.2
04-09-18 11:17	50	201	92	92	85	91	86	89.2
04-09-18 11:18	51	201	93	93	85	92	86	89.8
04-09-18 11:19	52	201	95	94	86	93	88	91.2
04-09-18 11:20	53	201	97	96	86	94	88	92.2
04-09-18 11:21	54	201	99	97	87	95	89	93.4
04-09-18 11:22	55	201	102	99	88	97	91	95.4
04-09-18 11:23	56	201	105	101	88	98	92	96.8
04-09-18 11:24	57	201	108	103	89	100	93	98.6
04-09-18 11:25	58	201	111	105	90	101	95	100.4
04-09-18 11:26	59	201	115	107	91	103	96	102.4
04-09-18 11:27	60	201	120	110	93	104	98	105
04-09-18 11:28	61	201	129	112	94	106	100	108.2
04-09-18 11:29	62	201	139	115	95	107	101	111.4

Table 5 – Specimen Group 4 Temperatures

Date / Time	Test Time (mins)	Failure SP (°C)	SP16	SP17
04-09-18 10:27	0	201	20	20
04-09-18 10:28	1	201	20	20
04-09-18 10:29	2	201	20	20
04-09-18 10:30	3	201	20	20
04-09-18 10:31	4	201	20	20
04-09-18 10:32	5	201	21	20
04-09-18 10:33	6	201	21	20
04-09-18 10:37	10	201	30	28
04-09-18 10:38	11	201	38	34
04-09-18 10:39	12	201	43	38
04-09-18 10:40	13	201	48	42

04-09-18 10:41	14	201	51	44
04-09-18 10:42	15	201	53	46
04-09-18 10:43	16	201	55	48
04-09-18 10:44	17	201	56	49
04-09-18 10:45	18	201	58	51
04-09-18 10:46	19	201	59	52
04-09-18 10:47	20	201	61	53
04-09-18 10:48	21	201	62	54
04-09-18 10:49	22	201	63	55
04-09-18 10:50	23	201	63	56
04-09-18 10:51	24	201	63	57
04-09-18 10:52	25	201	63	57
04-09-18 10:53	26	201	63	57
04-09-18 10:54	27	201	63	57
04-09-18 10:55	28	201	63	57
04-09-18 10:56	29	201	63	57
04-09-18 10:57	30	201	63	57
04-09-18 10:58	31	201	63	57
04-09-18 10:59	32	201	64	57
04-09-18 11:00	33	201	64	57
04-09-18 11:01	34	201	64	57
04-09-18 11:02	35	201	65	57
04-09-18 11:03	36	201	65	57
04-09-18 11:04	37	201	65	58
04-09-18 11:05	38	201	66	58
04-09-18 11:06	39	201	66	58
04-09-18 11:07	40	201	67	58
04-09-18 11:08	41	201	67	59
04-09-18 11:09	42	201	67	59
04-09-18 11:10	43	201	68	59
04-09-18 11:11	44	201	68	60
04-09-18 11:12	45	201	69	60
04-09-18 11:13	46	201	69	60
04-09-18 11:14	47	201	70	61
04-09-18 11:15	48	201	70	62
04-09-18 11:16	49	201	71	62
04-09-18 11:17	50	201	71	63
04-09-18 11:18	51	201	72	63
04-09-18 11:19	52	201	74	64
04-09-18 11:20	53	201	75	64
04-09-18 11:21	54	201	77	65
04-09-18 11:22	55	201	79	66

04-09-18 11:23	56	201	81	66
04-09-18 11:24	57	201	83	67
04-09-18 11:25	58	201	85	68
04-09-18 11:26	59	201	86	68
04-09-18 11:27	60	201	88	69
04-09-18 11:28	61	201	90	70
04-09-18 11:29	62	201	92	71

Table 6 – Specimen Group 1 Temperatures – Cooldown Phase

Date / Time	Test Time (mins)	SP1	SP2	SP3	SP4
04-09-18 11:32	0	735	784	716	753
04-09-18 11:33	1	706	766	686	720
04-09-18 11:34	2	678	736	659	694
04-09-18 11:35	3		777	699	734
04-09-18 11:36	4		768	623	737
04-09-18 11:37	5		829	611	696
04-09-18 11:38	6	644	877	622	639
04-09-18 11:39	7	621	907	598	587
04-09-18 11:40	8	604	861	566	549
04-09-18 11:41	9	583	852	513	511
04-09-18 11:42	10	565	857	493	467
04-09-18 11:43	11	542	832	493	435
04-09-18 11:44	12	520	797	478	414
04-09-18 11:45	13	504	765	455	403
04-09-18 11:46	14	502	741	443	410
04-09-18 11:47	15	490		420	406
04-09-18 11:48	16	480		386	385
04-09-18 11:49	17	474		362	375
04-09-18 11:50	18	463		345	370
04-09-18 11:51	19	449		335	360
04-09-18 11:52	20	438		330	347
04-09-18 11:53	21	429		324	338
04-09-18 11:54	22	425		320	333
04-09-18 11:55	23	415		315	326
04-09-18 11:56	24	401		309	317
04-09-18 11:57	25	387		304	303
04-09-18 11:58	26	372		299	288
04-09-18 11:59	27	358		291	276
04-09-18 12:00	28	342		284	263
04-09-18 12:01	29	331			243

Date / Time	Test Time (mins)	SP1	SP2	SP3	SP4
04-09-18 12:02	30	320			235
04-09-18 12:03	31	308			226
04-09-18 12:04	32	292			217
04-09-18 12:05	33	279			211
04-09-18 12:06	34	267			207
04-09-18 12:07	35	255			204
04-09-18 12:08	36	245			196
04-09-18 12:09	37	236			196
04-09-18 12:10	38	226			195
04-09-18 12:11	39	217			192
04-09-18 12:12	40	209			182
04-09-18 12:13	41	202			175
04-09-18 12:14	42	194			168
04-09-18 12:15	43	189			162
04-09-18 12:16	44	181			155
04-09-18 12:17	45	174			148
04-09-18 12:18	46	169			140
04-09-18 12:19	47	164			142
04-09-18 12:20	48	158			133
04-09-18 12:21	49	153			120
04-09-18 12:22	50	149			111
04-09-18 12:23	51				
04-09-18 12:24	52				
04-09-18 12:25	53				
04-09-18 12:26	54				
04-09-18 12:27	55				
04-09-18 12:28	56				
04-09-18 12:29	57				
04-09-18 12:30	58				
04-09-18 12:31	59				
04-09-18 12:32	60				

Table 7 – Specimen Group 2 Temperatures – Cooldown Phase

Date / Time	Test Time (mins)	SP7	SP8	SP9	SP10
04-09-18 11:32	0	438	462	388	284
04-09-18 11:33	1	432	457	390	284
04-09-18 11:34	2	426	445	386	284
04-09-18 11:35	3	429	438	388	285
04-09-18 11:36	4	432	459	384	301

Date / Time	Test Time (mins)	SP7	SP8	SP9	SP10
04-09-18 11:37	5	424	550	376	306
04-09-18 11:38	6	408	729	367	297
04-09-18 11:39	7	384	743	352	282
04-09-18 11:40	8	359	631	328	262
04-09-18 11:41	9	337	501	303	245
04-09-18 11:42	10	318	387	283	229
04-09-18 11:43	11	305	321	266	215
04-09-18 11:44	12	293	286	254	204
04-09-18 11:45	13	283	244	245	194
04-09-18 11:46	14	275	237	238	187
04-09-18 11:47	15	269	232	231	182
04-09-18 11:48	16	263	228	224	177
04-09-18 11:49	17	258	225	218	172
04-09-18 11:50	18	253	223	212	168
04-09-18 11:51	19	247	221	207	164
04-09-18 11:52	20	242	218	202	161
04-09-18 11:53	21	237	215	196	157
04-09-18 11:54	22	233	211	191	154
04-09-18 11:55	23	229	209	187	150
04-09-18 11:56	24	225	205	182	146
04-09-18 11:57	25	221	201	178	142
04-09-18 11:58	26	216	196	173	139
04-09-18 11:59	27	211	192	169	135
04-09-18 12:00	28	205	187	165	132
04-09-18 12:01	29	199	182	162	129
04-09-18 12:02	30	192	176	158	125
04-09-18 12:03	31	186	171	154	122
04-09-18 12:04	32	180	165	150	119
04-09-18 12:05	33	174	160	146	116
04-09-18 12:06	34	168	155	142	113
04-09-18 12:07	35	162	149	138	110
04-09-18 12:08	36	156	144	135	107
04-09-18 12:09	37	150	139	132	105
04-09-18 12:10	38	145	134	129	102
04-09-18 12:11	39	140	130	126	99
04-09-18 12:12	40	135	126	124	96
04-09-18 12:13	41	131	122	122	93
04-09-18 12:14	42	126	118	120	90
04-09-18 12:15	43	122	114	119	87
04-09-18 12:16	44	119	111	116	85

Date / Time	Test Time (mins)	SP7	SP8	SP9	SP10
04-09-18 12:17	45	116	107	114	82
04-09-18 12:18	46	113	104	111	80
04-09-18 12:19	47	110	101	109	78
04-09-18 12:20	48	108	98	106	76
04-09-18 12:21	49	106	95	104	74
04-09-18 12:22	50	103	93	102	73
04-09-18 12:23	51	23		25	29
04-09-18 12:24	52	23		26	30
04-09-18 12:25	53	22		27	33
04-09-18 12:26	54	22		27	38
04-09-18 12:27	55	21		26	41
04-09-18 12:28	56	20		25	43
04-09-18 12:29	57	20		25	44
04-09-18 12:30	58	20		24	44
04-09-18 12:31	59	20		24	43
04-09-18 12:32	60	19		23	39

Table 8 – Specimen Group 3 Temperatures – Cooldown Phase

Date / Time	Test Time (mins)	Failure SP (°C)	SP11	SP12	SP13	SP14	SP15	AVE
04-09-18 11:32	0	201	167	138	99	114	108	125.2
04-09-18 11:33	1	201	174	149	100	117	110	130
04-09-18 11:34	2	201	184	160	101	123	111	135.8
04-09-18 11:35	3	201	191	171	102	134	114	142.4
04-09-18 11:36	4	201	197	186	102	147	117	149.8
04-09-18 11:37	5	201	203	210	103	157	122	159
04-09-18 11:38	6	201	205	226	103	164	127	165
04-09-18 11:39	7	201	206	234	104	168	133	169
04-09-18 11:40	8	201	205	237	104	176	138	172
04-09-18 11:41	9	201	205	236	105	181	142	173.8
04-09-18 11:42	10	201	204	232	106	184	145	174.2
04-09-18 11:43	11	201	206	226	107	185	147	174.2
04-09-18 11:44	12	201	209	218	107	185	149	173.6
04-09-18 11:45	13	201	213	209	108	185	150	173
04-09-18 11:46	14	201	216	199	108	184	151	171.6
04-09-18 11:47	15	201	218	190	108	182	150	169.6
04-09-18 11:48	16	201	218	181	108	182	150	167.8
04-09-18 11:49	17	201	217	173	108	182	151	166.2
04-09-18 11:50	18	201	215	165	108	181	151	164
04-09-18 11:51	19	201	213	158	107	180	151	161.8

Date / Time	Test Time (mins)	Failure SP (°C)	SP11	SP12	SP13	SP14	SP15	AVE
04-09-18 11:52	20	201	211	151	107	179	152	160
04-09-18 11:53	21	201	208	145	106	177	153	157.8
04-09-18 11:54	22	201	205	140	105	176	154	156
04-09-18 11:55	23	201	202	135	104	173	154	153.6
04-09-18 11:56	24	201	199	130	103	171	155	151.6
04-09-18 11:57	25	201	195	126	102	168	155	149.2
04-09-18 11:58	26	201	192	122	102	165	155	147.2
04-09-18 11:59	27	201	187	118	101	162	153	144.2
04-09-18 12:00	28	201	183	115	100	158	151	141.4
04-09-18 12:01	29	201	179	112	99	153	149	138.4
04-09-18 12:02	30	201	175	109	97	149	145	135
04-09-18 12:03	31	201	170	106	96	144	142	131.6
04-09-18 12:04	32	201	166	103	95	140	139	128.6
04-09-18 12:05	33	201	161	101	94	135	135	125.2
04-09-18 12:06	34	201	156	98	93	131	131	121.8
04-09-18 12:07	35	201	152	96	92	126	127	118.6
04-09-18 12:08	36	201	147	93	92	122	123	115.4
04-09-18 12:09	37	201	142	91	91	118	119	112.2
04-09-18 12:10	38	201	138	89	93	113	114	109.4
04-09-18 12:11	39	201	133	87	96	109	110	107
04-09-18 12:12	40	201	129	85	99	104	105	104.4
04-09-18 12:13	41	201	124	83	101	100	101	101.8
04-09-18 12:14	42	201	120	82	101	95	96	98.8
04-09-18 12:15	43	201	116	80	101	92	92	96.2
04-09-18 12:16	44	201	112	79	99	88	88	93.2
04-09-18 12:17	45	201	109	77	98	85	85	90.8
04-09-18 12:18	46	201	105	76	96	81	81	87.8
04-09-18 12:19	47	201	102	74	97	78	78	85.8
04-09-18 12:20	48	201	99	73	100	75	75	84.4
04-09-18 12:21	49	201	97	72	106	72	72	83.8
04-09-18 12:22	50	201	95	71	115	69	69	83.8
04-09-18 12:23	51	201	90	69	116	67	67	81.8
04-09-18 12:24	52	201	76	60	92	62	60	70
04-09-18 12:25	53	201	66	54	75	57	56	61.6
04-09-18 12:26	54	201	58	50	64	53	54	55.8
04-09-18 12:27	55	201	52	47	56	49	52	51.2
04-09-18 12:28	56	201	48	44	51	46	50	47.8
04-09-18 12:29	57	201	44	41	46	43	48	44.4
04-09-18 12:30	58	201	41	39	43	40	47	42
04-09-18 12:31	59	201	39	37	40	38	45	39.8

Date / Time	Test Time (mins)	Failure SP (°C)	SP11	SP12	SP13	SP14	SP15	AVE
04-09-18 12:32	60	201	37	35	37	37	43	37.8

Table 9 – Specimen Group 4 Temperatures – Cooldown Phase

Date / Time	Test Time (mins)	Failure SP (°C)	SP16	SP17
04-09-18 11:32	0	201	99	75
04-09-18 11:33	1	201	101	76
04-09-18 11:34	2	201	104	78
04-09-18 11:35	3	201	107	79
04-09-18 11:36	4	201	110	80
04-09-18 11:37	5	201	113	81
04-09-18 11:38	6	201	117	81
04-09-18 11:39	7	201	120	82
04-09-18 11:40	8	201	123	83
04-09-18 11:41	9	201	125	84
04-09-18 11:42	10	201	128	84
04-09-18 11:43	11	201	130	84
04-09-18 11:44	12	201	131	85
04-09-18 11:45	13	201	132	85
04-09-18 11:46	14	201	133	85
04-09-18 11:47	15	201	134	85
04-09-18 11:48	16	201	133	85
04-09-18 11:49	17	201	133	85
04-09-18 11:50	18	201	133	85
04-09-18 11:51	19	201	132	85
04-09-18 11:52	20	201	131	85
04-09-18 11:53	21	201	129	85
04-09-18 11:54	22	201	128	85
04-09-18 11:55	23	201	127	85
04-09-18 11:56	24	201	125	85
04-09-18 11:57	25	201	124	85
04-09-18 11:58	26	201	123	86
04-09-18 11:59	27	201	122	86
04-09-18 12:00	28	201	120	86
04-09-18 12:01	29	201	119	86
04-09-18 12:02	30	201	117	86
04-09-18 12:03	31	201	116	86
04-09-18 12:04	32	201	115	86
04-09-18 12:05	33	201	114	86
04-09-18 12:06	34	201	113	87

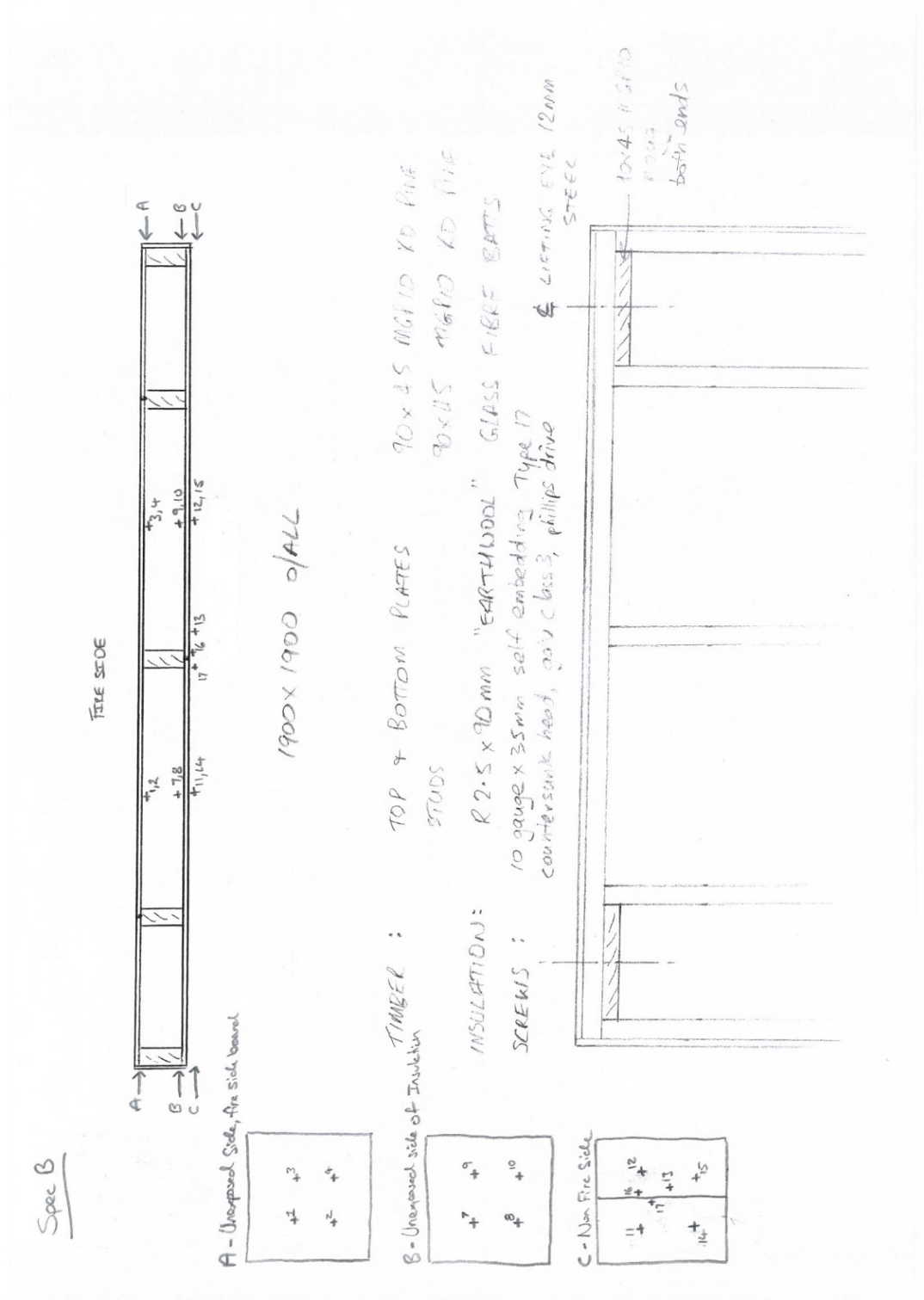
Date / Time	Test Time (mins)	Failure SP (°C)	SP16	SP17
04-09-18 12:07	35	201	114	87
04-09-18 12:08	36	201	117	87
04-09-18 12:09	37	201	121	87
04-09-18 12:10	38	201	125	87
04-09-18 12:11	39	201	131	87
04-09-18 12:12	40	201	136	87
04-09-18 12:13	41	201	141	88
04-09-18 12:14	42	201	145	88
04-09-18 12:15	43	201	149	89
04-09-18 12:16	44	201	152	90
04-09-18 12:17	45	201	156	92
04-09-18 12:18	46	201	160	95
04-09-18 12:19	47	201	170	99
04-09-18 12:20	48	201	183	103
04-09-18 12:21	49	201	202	107
04-09-18 12:22	50	201	221	111
04-09-18 12:23	51	201	214	114
04-09-18 12:24	52	201	145	102
04-09-18 12:25	53	201	112	93
04-09-18 12:26	54	201	93	87
04-09-18 12:27	55	201	81	81
04-09-18 12:28	56	201	73	77
04-09-18 12:29	57	201	67	73
04-09-18 12:30	58	201	63	70
04-09-18 12:31	59	201	59	67
04-09-18 12:32	60	201	56	65

Table 10 – Test Observations

TIME		Observations
Min	Sec	
10	0	Slight smoke from edge
15	0	NFS no change
17	0	Cracking heard from sample
20	0	NFS no change
30	0	NFS no change
33	0	No major deflection noticed. Cracking sound continuing intermittently
45	0	NFS no change
50	0	Cracking sounds. NFS no change
55	0	Cracking sounds. NFS no change
60	0	NFS no change
62	0	Furnace burners off. Specimen removed
		Following specimen removal, the specimen was monitored for a further 60 minutes. Observations against failure criteria noted in Section 15 – Post Test Observations.

Appendix C – DRAWINGS

Drawing 1 – Client supplied drawing. Lab added TC locations



Appendix D – PHOTOGRAPHS

Photo 1 – Specimen at start of test



Photo 2 – Specimen at end of 60-minute fire test

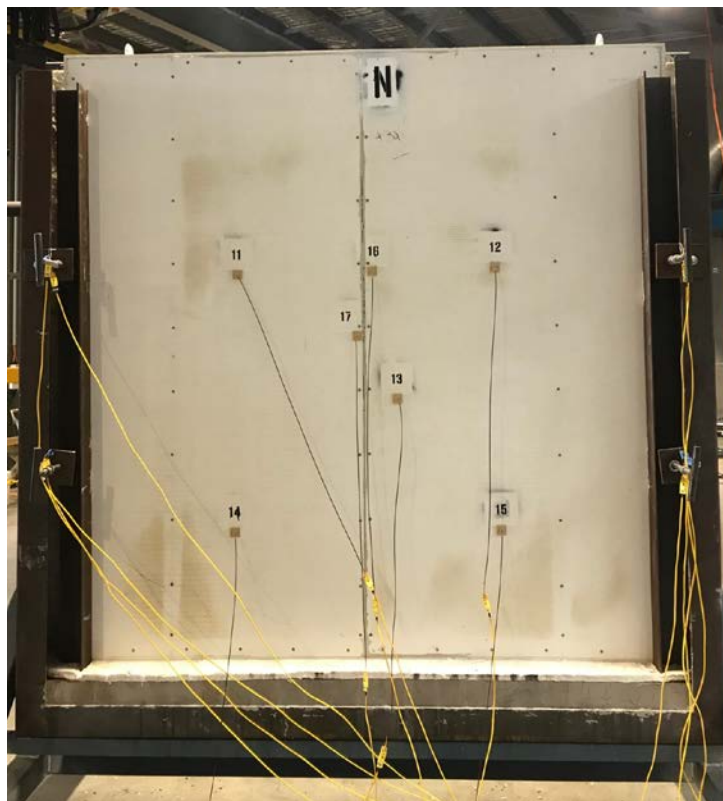


Photo 3 – Specimen at end of 60-minute fire test



Photo 4 – Very start of visible flaming from top gap



Photo 5 – Flaming prior to extinguishment



Photo 6 – Specimen at end of test



-----END OF REPORT-----