TEST REPORT

Fire resistance load-bearing test of a 136mm thick Ozone Panels wall system tested in accordance with AS 1530.4 – 2005.

EWFA Report No:

2758400

Report Sponsor:

Ozone Panels
Level 31, 367 Collins Street
Melbourne, VIC 3000

Test Date:

22nd August 2012

Testing. Advising. Assuring.

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GENERAL CONDITIONS OF USE

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1 CONSTRUCTION DETAILS

TEST ASSEMBLY

The test assembly comprised a nominal 3000mm wide × 3000mm high × 136mm thick load-bearing wall system.

The wall was restrained at the top and was supported at the base on the loading jacks. The East and West vertical edges were free from lateral restraint.

TEST SPECIMENS

The test specimen consisted of 120mm thick Ozone Panels comprising of 16mm KRONOPLY OSB/3 wood based boards with 90mm PIR Foam core, with one layer of 16mm Boral Firestop plasterboard on the fire side only. The panel system incorporated timber framing around the perimeter of the wall system.

The full description of the specimen is provided in Figures A1.1 to A1.4 and the 'Schedule of Components' in Section 2.

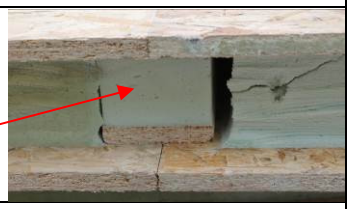
ASSEMBLY AND INSTALLATION METHODS

The wall system was constructed by representatives of Ozone Panels on 14th and 15th August 2012.

ORIENTATION

The wall system was asymmetrical with the fire grade plasterboard to the exposed side.

2 SCHEDULE OF COMPONENTS

Item	Description	
1	**Name**	**Ozone Panels**
	Specification	Panels comprised of 16mm thick (measured) KRONOPLY OSB/3 wood based boards with 90mm thick (measured) PIR Foam core.
	Density	KRONOPLY OSB/3 = 659kg/m^3 (measured). PIR Foam core = 43.89kg/m^3 (measured).
	Installation	Installed vertically with PIR foam at all edges cut-out to accommodate the timber framing around the perimeter and the Ozone panel studs on all internal vertical and horizontal joints Item 2 
2	**Name**	**Ozone Panel studs**
	Size	90 × 90mm
	Specification	Panels comprised of 16mm thick (measured) KRONOPLY OSB/3 wood based boards with 58mm thick (measured) PIR Foam core.
	Density	KRONOPLY OSB/3 = 659kg/m^3 (measured). PIR Foam core = 43.89kg/m^3 (measured).
	Installation	Fitted into grooves cut into the Ozone Panel (Item 1) joints. See figure A.1.1-A1.4 for details. 
3	**Name**	**Exposed Cladding**
	Product Name	Boral Firestop
	Size	16mm thick
	Density	794kg/m^3 (measured)
	Installation	Fixed to the exposed side of the Ozone Panels wall with Item 7 at 400mm centres
4	**Name**	**Timber Framing (MGP 10)**
	Size	90 × 45mm
	Installation	A single piece fitted into the grooves made along the 2 vertical edges and the bottom, with a double layer along the head.  
5	**Name**	**Plasterboard capping**
	Specification	16mm thick × 152mm wide Boral Firestop
	Installation	Used to cover the timber framing along the vertical edges and screw (Item 9) fixed to timber framing at 200mm centres. 

Item	Description	
6	**Name**	**Sealant**
	Product name	HB Fuller “Firesound”
	Installation	Applied to exposed side cladding joints and Ozone panel joints on fire side only.
7	**Name**	**Fixing**
	Size	6g × 41mm Bugle head Coarse thread screws
	Installation	Fixing the exposed cladding to the Ozone Panels at 400mm centres
8	**Name**	**Fixing**
	Size	3mm gauge × 55mm Ring shift nail
	Installation	Fixing the Ozone panels to Ozone Panel studs at 150mm centres and Ozone panels to timber framing at 100mm centres.
9	**Name**	**Fixing**
	Size	3.5g × 30mm PZ2 Timber screws
	Installation	Fixing the plasterboard capping to the timber framing at 200mm centres

3 TEST PROCEDURE

STATEMENT OF COMPLIANCE

The test was performed in accordance with the requirements of AS 1530.4-2005 Sections 2 & 3 as appropriate for a load bearing wall.

VARIATIONS TO TEST METHOD

None

PRE-TEST CONDITIONING

The construction of the wall was finished on the 15th August 2012 and was tested on 22nd August 2012. The specimen was subject to normal laboratory temperatures and conditions.

SAMPLING / SPECIMEN SELECTION

The laboratory was not involved in the sampling or selection of the test specimen for the fire resistance test.

AMBIENT TEMPERATURE

The ambient temperature at the start of the test was 20°C and varied between 20 - 22°C during the test.

LOADING

The specimen was subjected to a total axial load of 18.996kN for the duration of the test. The load was applied at 6-off single point load locations at 600mm centres to the bottom edge of the wall. The applied load at each hydraulic jack was 3.07kN, which also allowed 2.9kN for the weight of the wall and a 3% increase in load for accuracy.

TEST DURATION

The test duration was 85 minutes.

INSTRUMENTATION AND EQUIPMENT

The instrumentation was provided in accordance with AS 1530.4-2005 and as detailed below:

The furnace temperature was measured by 6-off mineral insulated metal sheathed Type K thermocouples with wire diameters not greater than 1mm and overall diameter of 3mm with the measuring junction insulated from the sheath. The thermocouples protruded a minimum of 25mm from steel supporting tubes.

The non-fire side specimen temperatures as well as some internal specimen temperatures were measured by Type K thermocouples with wire diameters less than 0.5mm diameter soldered to 12mm diameter × 0.2mm thick copper discs covered by 30mm × 30mm × 2.0 mm

inorganic insulating pads. The thermocouple positions are described in Table A4.1, and are shown on Figure A4.1 in Appendix 4.

A roving thermocouple was available to measure temperatures at positions that appeared hotter than the positions monitored by the fixed thermocouples.

The furnace pressure was measured at approximately 500mm above the floor of the furnace.

Gap gauges were available during the test to assess the performance under the criteria for integrity.

The load was applied at nominal 600mm centres directly below each stud with hydraulic jacks, via 100mm × 100mm steel pads with pin support conditions. The loading equipment was capable of measuring the load applied within an accuracy of ± 2.5% of the test load.

Deflection measurements were taken from calibrated tapes fixed to the specimen using a Telescope Levelling Instrument (Dumpy Level) Model 200B, at the positions shown on Figure A4.1 in Appendix 4.

4 TEST MEASUREMENTS

FURNACE TEMPERATURE AND PRESSURE MEASUREMENTS

Furnace temperature and pressure data are provided in Figure A5.1 and Table A5.2 in Appendix 5.

SPECIMEN TEMPERATURES

Specimen temperature data is provided in A5.3 and Table A5.1 in Appendix 5.

OBSERVATIONS

A table that includes observations of the significant behaviour of the specimen and details of the occurrence of the various performance criteria specified in AS 1530.4-2005 is provided in Appendix 2. Photographs of the specimen are included in Appendix 6.

5 TEST RESULTS

The specimen tested achieved the following performance with respect to the performance criteria listed in AS 1530.4-2005, Section 2 & 3.

Criteria	**Result**
Structural Adequacy	No Failure
Integrity	Failure at 81minutes
Insulation	Failure at 77 minutes
FRL	**60/60/60**

6 APPLICATION OF TEST RESULTS

TEST LIMITATIONS

The results of this fire test may be used to directly assess fire hazard, but it should be recognized that a single test method will not provide a full assessment of fire hazard under all fire conditions. The results only relate to the behaviour of the specimen of the element of the construction under the particular conditions of the test; they are not intended to be the sole criteria for assessing the potential fire performance of the element in use nor do they necessarily reflect the actual behaviour in fires.

VARIATIONS FROM THE TESTED SPECIMENS

This report details the methods of construction, the test conditions and the results obtained when the specific element of construction described herein was tested following the procedure outlined in AS1530.4. Any significant variation with respect to size, constructional details, loads, stresses, edge or end conditions, other than those allowed under the field of direct application in the relevant test method, is not addressed by this report. It is recommended that any proposed variation to the tested configuration other than as permitted under the field of direct application specified in Appendix 3 should be referred to the test sponsor in the first instance to obtain appropriate documentary evidence of compliance from Exova Warringtonfire Aus Pty Ltd or another Registered Testing Authority.

UNCERTAINTY OF MEASUREMENT

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.

APPENDIX 1 DRAWINGS OF TEST ASSEMBLY

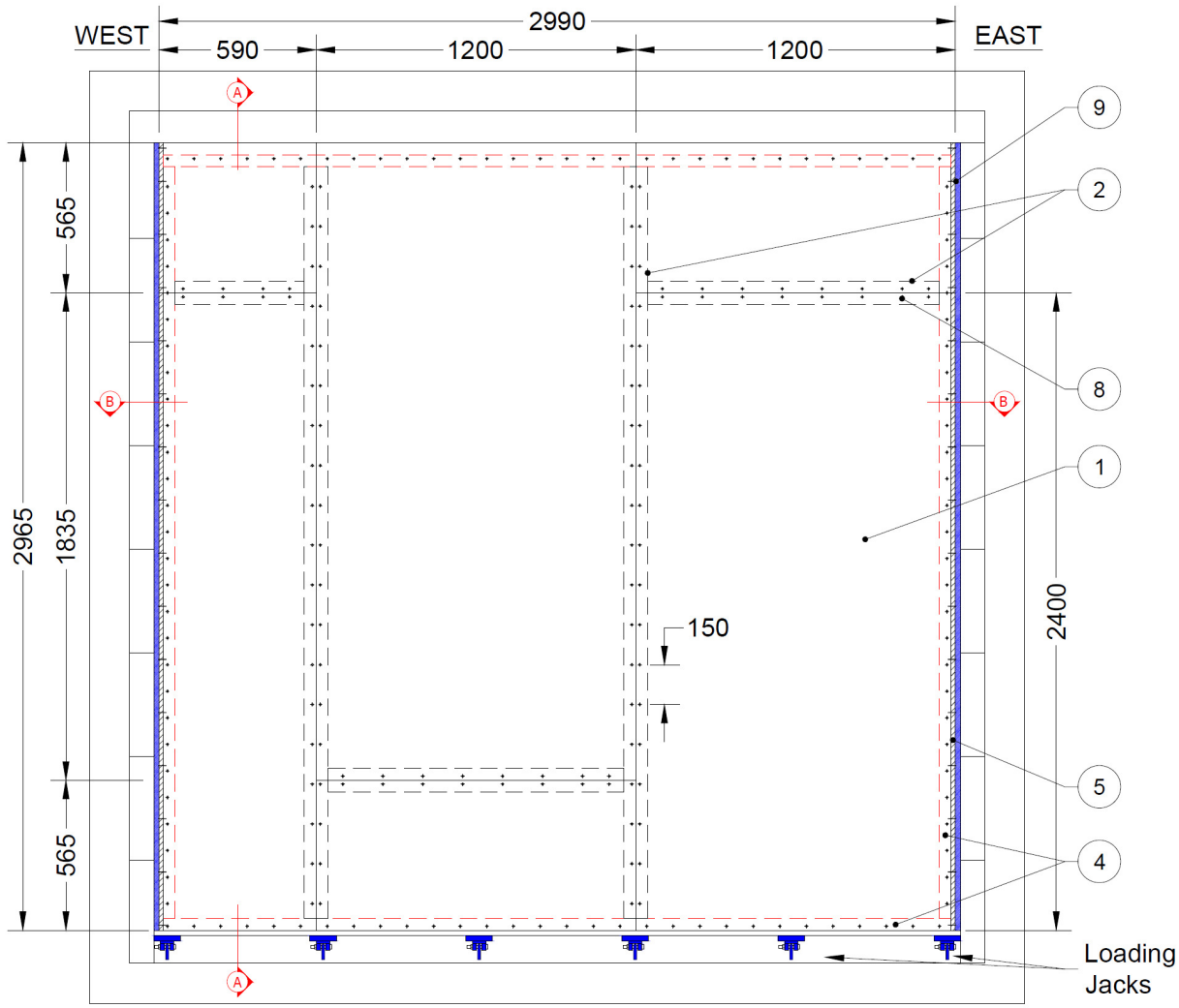


Figure A1.1: Elevation of Test Specimen (Unexposed side)

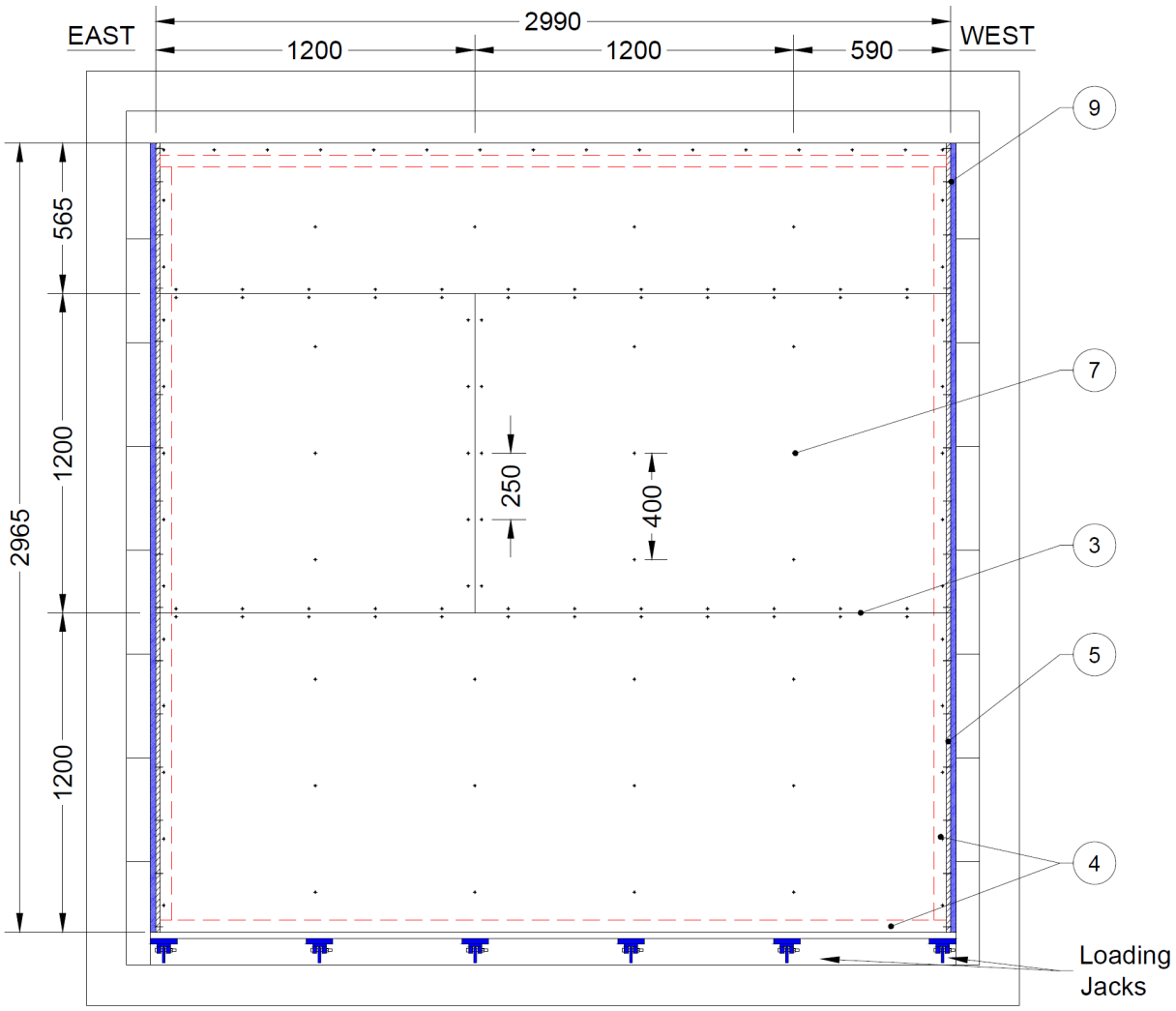


Figure A1.2: Elevation of Test Specimen (Exposed side)

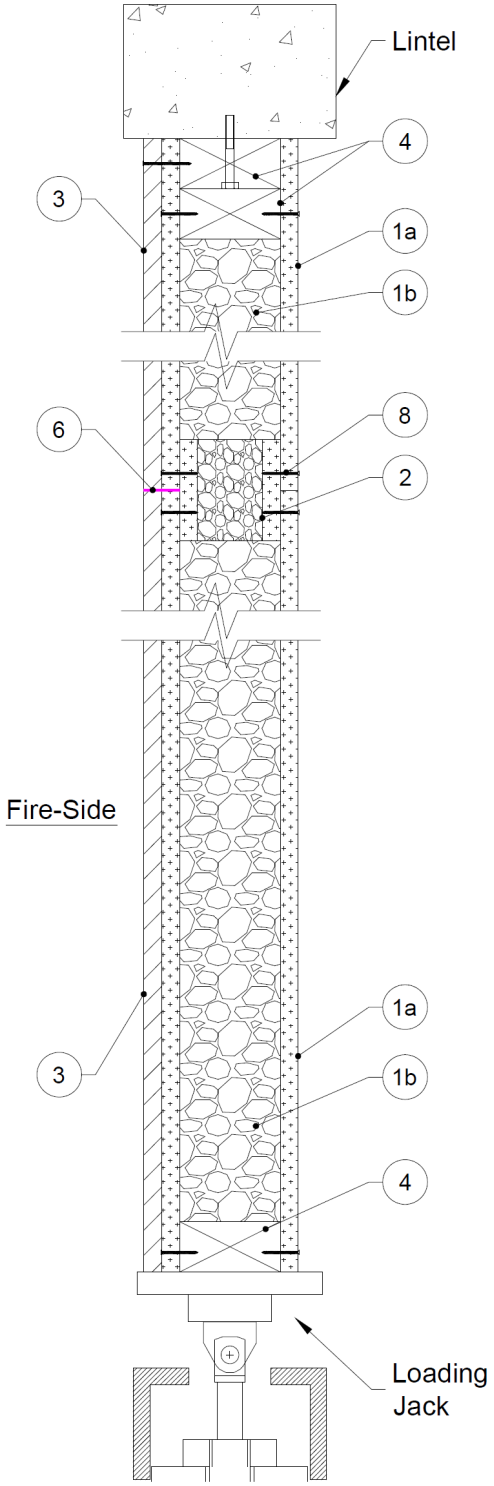


Figure A1.3: Vertical cross section A-A

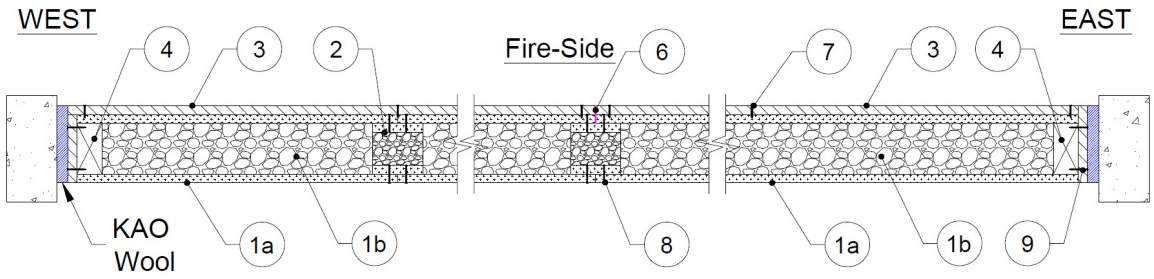


Figure A1.4: Horizontal cross section B-B

APPENDIX 2 TEST OBSERVATIONS

The following include observations of the significant behaviour of the specimen.

Note: All observations are from the unexposed face unless otherwise stated.

Time		Observation
Min	**Sec**	
-15	00	Test load applied.
0	00	Fire resistance test commence and ambient temperature was 20°C.
16	00	Smoke emissions had become evident at the bottom edge of the specimen.
16	30	Smoke emissions had become evident on the bottom horizontal joint on west side.
30	00	Specimen had continued to maintain integrity and insulation in accordance with AS 1530.4-2005.
37	00	Smoke emissions had become evident on the west vertical edge of the specimen. Increased smoke emissions on the bottom edge and bottom horizontal edge had become evident.
42	26	More smoke emissions had become evident from the top edge of the specimen at the centre.
45	00	Smoke emissions had become evident on the west horizontal joint on the specimen.
50	00	Reduction in volume of smoke from across the specimen had become evident.
60	00	Specimen had continued to maintain integrity and insulation in accordance with AS 1530.4-2005.
66	00	Slight discolouration on the specimen in the path of the smoke.
77	**00**	**A 90 second roving thermocouple test was carried out near the aperture that had become evident towards the centre of the specimen, resulting in a temperature of 250°C. Failure on insulation in accordance with AS 1530.4-2005, clause 2.12.3(b), where the temperature exceeded the initial temperature by more than 180°C**
80	00	Another aperture had become evident on the surface of the wall approximately 300mm below the first aperture.
81	**00**	**Flaming at the aperture towards the centre of the specimen had become evident. Failure on integrity in accordance with AS 1530.4-2005, clause 2.12.2.4, due to sustained flaming on the non-exposed side for greater than 10 seconds.**
83	00	Two more apertures had become evident on the surface of the wall.
85	00	Test terminated at the request of the sponsor.

APPENDIX 3 DIRECT FIELD OF APPLICATION

GENERAL

AS 1530.4-2005 states that the results of a fire resistance test on a wall are directly applicable without reference to the testing authority, to similar constructions where one or more of the following changes are made provided no individual component is removed or reduced:

SEPARATING ELEMENTS

a) An increase in thickness of the wall is permitted.

APPENDIX 4 INSTRUMENTATION POSITIONS

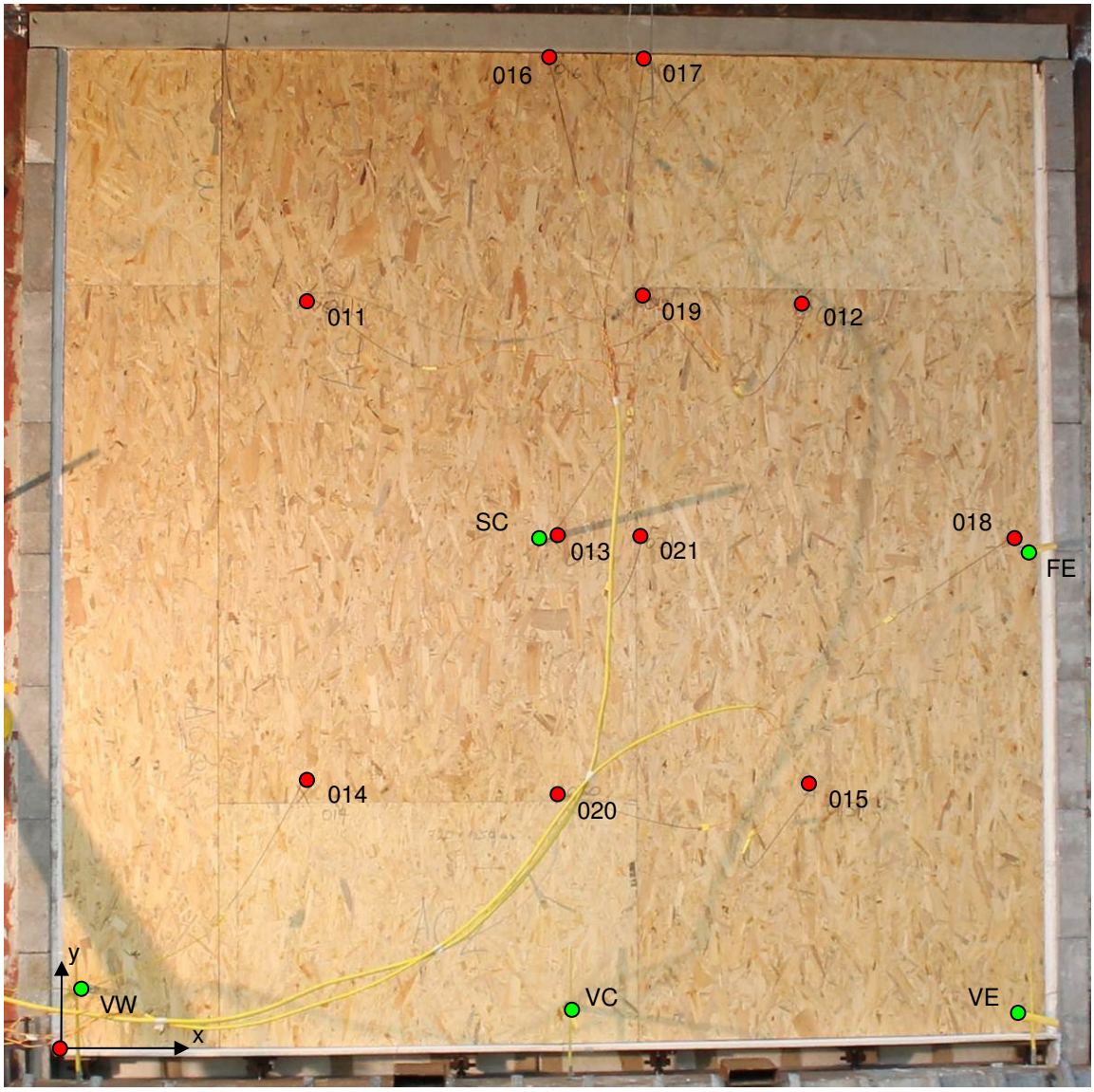


Figure A4.1: Unexposed surface thermocouple locations.
Note: The green dots indicate deflection locations

Table A 4.1 Thermocouple Locations

Location	T/C No.	x	y	Description
Qtr points	011	742	2250	Upper West quarter point
	012	2228	2250	Upper East quarter point
	013	1485	1500	Centre of specimen
	014	742	750	Lower West quarter point
	015	2228	750	Lower East quarter point
Other Surface	016	1485	2975	At the head of the specimen at mid-width
	017	1770	2975	Top of vertical stud
	018	2870	1500	Mid-height of the free edge, 100mm from the edge
	019	1770	2250	15mm from stud and nogging joint
	020	1485	740	15mm from a horizontal joint
	021	1770	1500	15mm from a vertical joint

Table A 4.2 Deflection Locations

Part of specimen	Ref.	x	y	Description
Horizontal	SC	1470	1500	Centre point of the specimen
	FE	2870	1485	Mid-height of the east free edge, 50mm from the edge.
Vertical	VE	2870	100	East base of the wall
	VC	1485	100	Centre base of the wall
	VW	50	100	West base of the wall

APPENDIX 5 TEST DATA

A 5.1 FURNACE TEMPERATURE

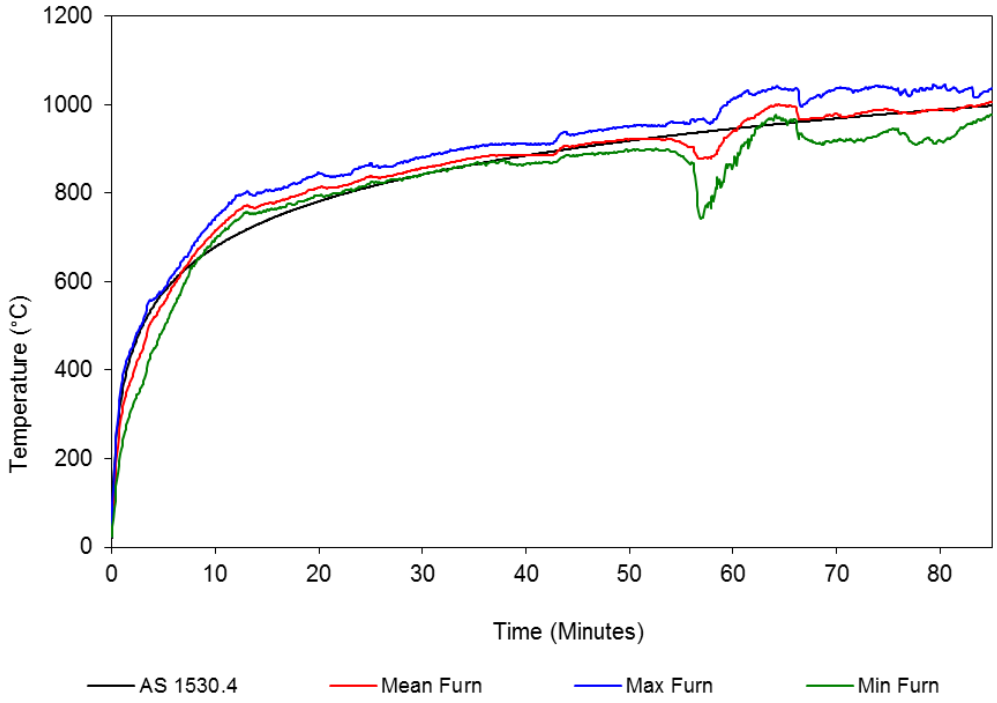


Figure A5.1: Furnace Temperatures vs. time

A 5.2 FURNACE PRESSURE

Time (minutes)	Pressure (Pa) Avg	Time (minutes)	Pressure (Pa) Avg
5-10	**2**	45-50	**1**
10-15	**1**	50-55	**2**
15-20	**-2**	55-60	**0**
20-25	**-1**	60-65	**0**
25-30	**-1**	65-70	**-1**
30-35	**-1**	70-75	**-2**
35-40	**1**	75-80	**0**
40-45	**2**	80-85	**0**

A 5.3 SPECIMEN TEMPERATURES

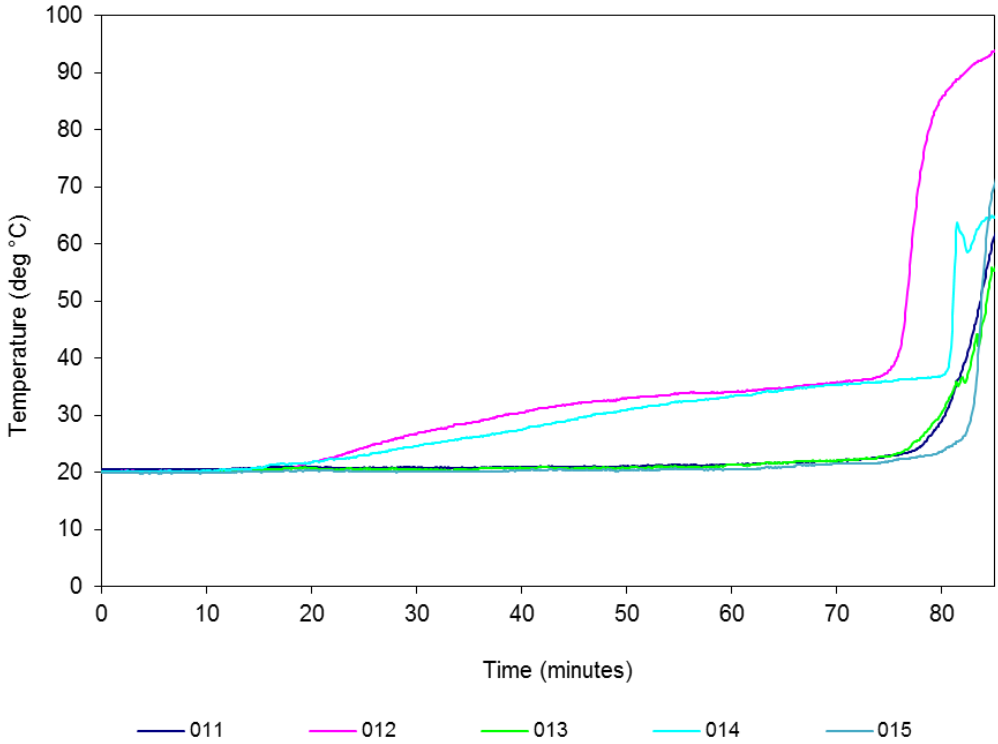


Figure A5.2: Quarter point and centre on unexposed face. Temperatures vs. time

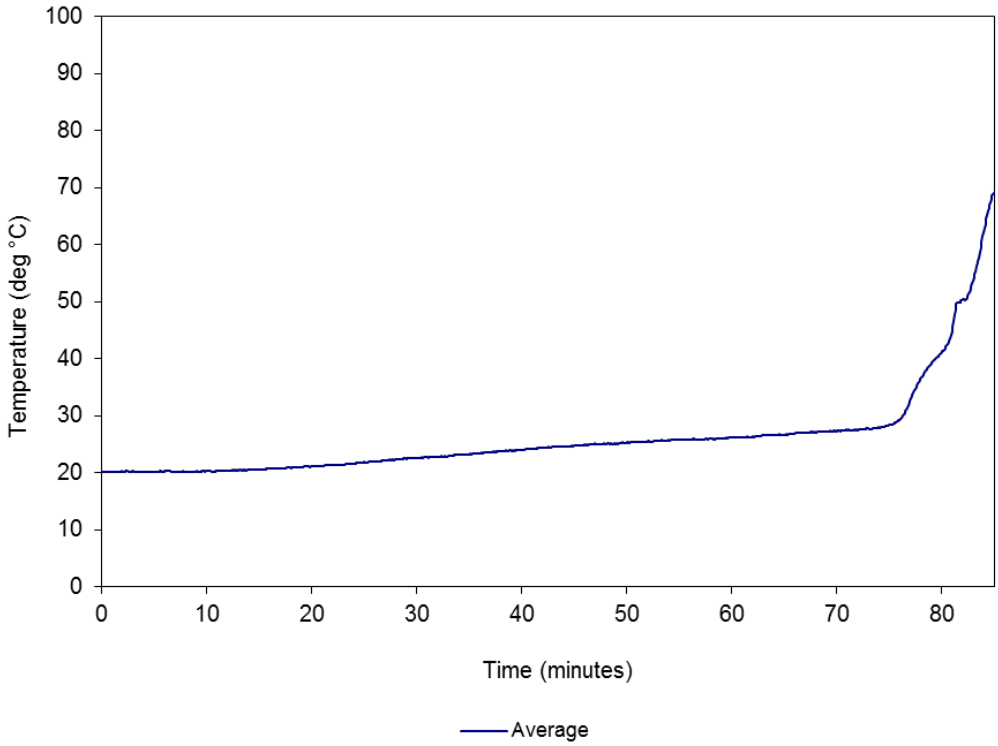


Figure A5.3: Average of Quarter point and centre on unexposed face. Temperatures vs. Time

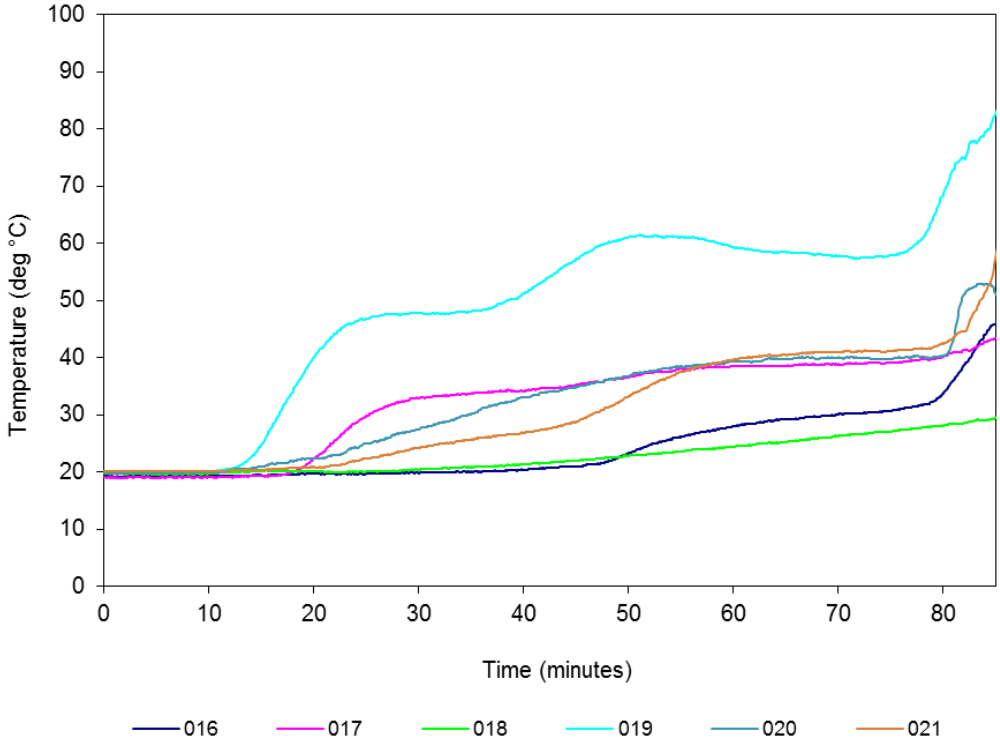


Figure A5.4: Other Surface - Head, Free-edge, horizontal and vertical joins. Temperatures vs. time

Table A5.1: Test Specimen Temperatures

Location	T/C No.	Description[2]	Temp (°C) at t (minutes)				Limit (Mins)[1]
			t=0	t=30	t=60	t=85	
Qtr points	011	Upper West quarter point	21	21	21	62	-
	012	Upper East quarter point	20	27	34	94	-
	013	Centre of specimen	20	21	21	56	-
	014	Lower West quarter point	20	25	33	65	-
	015	Lower East quarter point	20	20	21	71	-
Quarter point average			20	23	26	69	-
Other surface	016	At the head of the specimen at mid-width	19	20	28	46	-
	017	Top of vertical stud	19	33	38	43	-
	018	Mid-height of the free edge, 100mm from the edge	20	20	24	30	-
	019	15mm from stud and nogging joint	20	48	59	83	-
	020	15mm from a horizontal joint	20	27	39	51	-
	021	15mm from a vertical joint	20	24	40	58	-

Notes

[1] Limit time is the time to the nearest whole minute, rounded down to the nearest minute, at which the temperature recorded by the thermocouple does not rise by more than 180K above the initial temperature. Limit time is the time to the nearest whole minute, rounded down to the nearest minute, at which the average temperature recorded by the thermocouples does not rise by more than 140K above the initial temperature.

[2] Refer to Appendix 4 for locations of thermocouples as only a generic description is included in the table.

[3] No insulation failure prior to thermocouple failure.

'-' Under Limit column indicates the temperature limit was not exceeded during the test period or up until the time of integrity failure if a failure occurred.

NA Under Limit column indicates that the temperature limit criteria are Not Applicable for these thermocouple locations.

Thermocouple failure

A 5.4 DEFLECTIONS

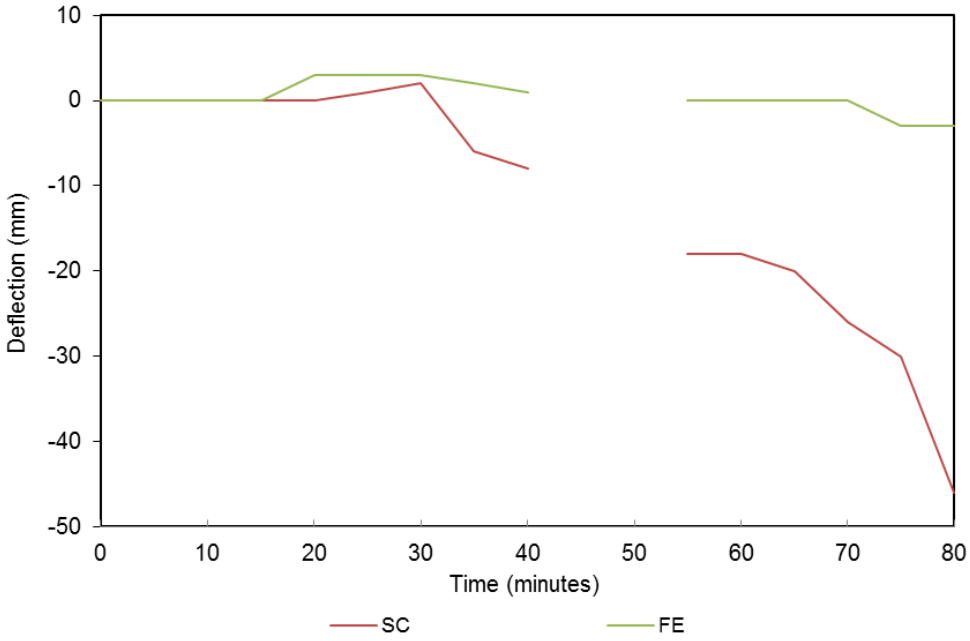


Figure A5.5: Specimen Deflection of the wall vs. Time. (Horizontal Deflection)
Positive measurements show movement of the wall towards the furnace
Note: Some data is not available because of excessive smoke emissions

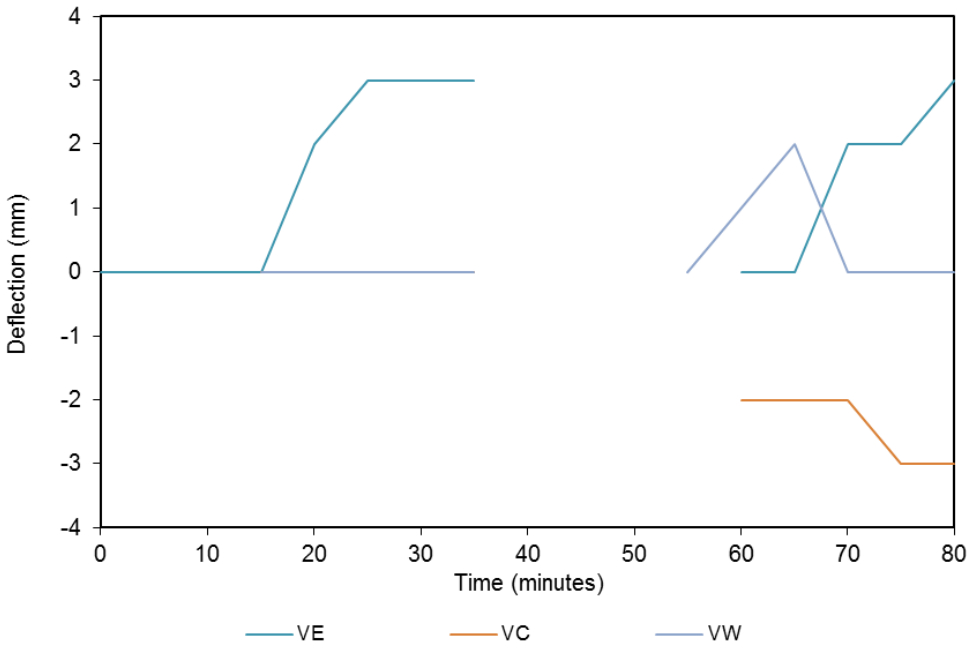


Figure A5.6 Specimen Deflection of the wall vs. Time (Vertical Deflection)
Positive measurements show movement of the base of the wall upwards
Note: Some data is not available because of excessive smoke emissions

APPENDIX 6 PHOTOGRAPHS

Figure A6.1. Unexposed face of specimen before commencement of the fire-resistance test.

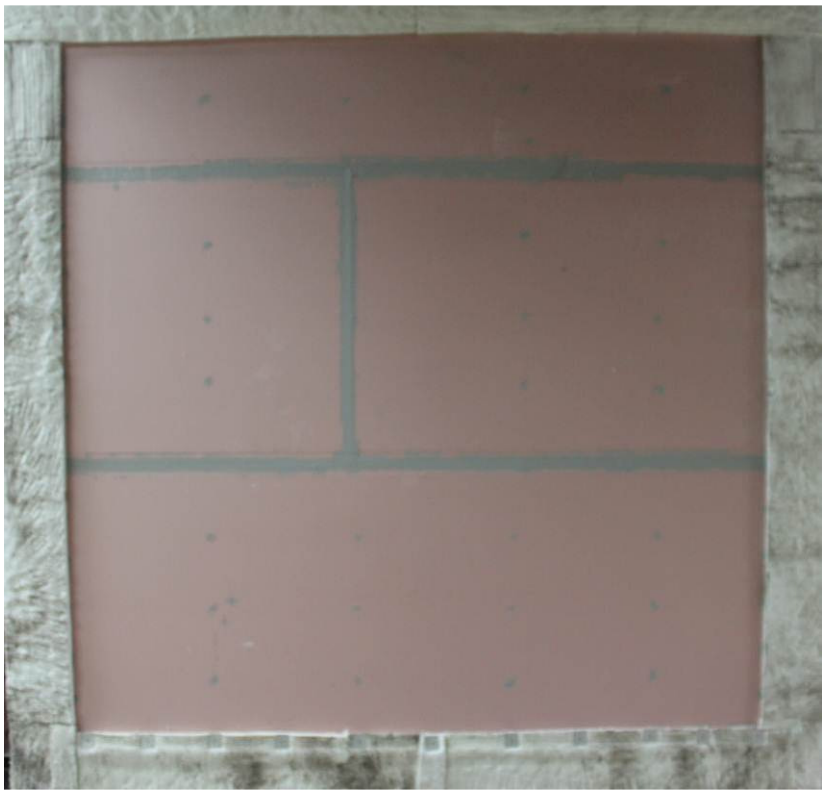


Figure A6.2. Exposed face of specimen before commencement of the fire-resistance test.

Figure A6.3. Unexposed face of specimen at the end of the test

Figure A6.4 Exposed face of specimen at the end of the test