



TEST REPORT

Full scale bushfire external wall test of a framed wall system in accordance with AS1530.8.1-2007.

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2581501.1

Report Sponsor:

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1 CONSTRUCTION DETAILS

TEST ASSEMBLY

The test assembly comprised a nominal 3000 mm wide × 300 mm long × 211 mm thick wall system.

TEST SPECIMENS

The wall system consisted of two 90×45 timber stud frames, the central frame offset 250mm back incorporating a 800mm × 800mm timber reveal window. The unexposed side was faced with 10mm Gyprock plasterboard while the exposed side had a 10mm Rockcote PM100 QRender over 73mm Greenboard™ foam cladding. Further details are provided in Figures A1.1 to A1.4 and the Schedule of Components.

ASSEMBLY AND INSTALLATION METHODS

The timber framing was constructed by a contractor at EWFA Melbourne from the 23rd to the 25th of May 2011, under the supervision of EWFA representatives. The test applicant applied the cladding and render on the 25th of May 2011 and the texture on the 27th of May 2011. The test applicant supplied the exposed cladding, render and texture. The unexposed cladding and framing materials were sourced EWFA.

ORIENTATION

The specimen was asymmetrical with the exposed side of the wall coated with render and plasterboard on the unexposed side.

It was confirmed that the system was exposed from the side that would normally face the outside of the building.

2 SCHEDULE OF COMPONENTS

ITEM NO.	ITEM	DESCRIPTION
Exposed Cladding		
1	Product	75mm NRG Greenboard™ Expandable Polystyrene Fire Retardant
	Size	2500mm high x 1200mm wide x 75mm thick (nominal uncut, measured)
	Density	20.63 kg/m ³ (measured)
	Location/ Fixing	One layer across both exposed face levels and up east and west return walls. 10g 120mm long bugle head needle point screws with 40mm diameter Polypropylene impact Copolymer washers at nominal 300mm centres along batons (2).
2	Product	EPS Batons
	Size	30mm wide x 26mm deep (measured)
	Density	12.99 kg/m ³ (measured)
	Location	Running vertically at nominal 450mm centres with one at each end of a Greenboard™ section for smaller widths.
3	Product	Sisalation® TuffStuff™ Extra Heavy duty Wall Wrap (Breather)
	Location	Single layer with nominal 50mm overlap on exposed side of timber framing.
	Fixing	Staples at nominal 200mm centres.
4	Product	ROCKCOTE PM100 QRender Pre-Blended Cement Render and Mesh
	Size	Nominally 10mm thick (measured 8mm – 11mm)
	Density	1,540 kg/m ³ (measured)
	Location	Two lengths at both open ends of the furring channels. Wider face was facing downwards.
5	Product	ROCKCOTE Sandcote Pre-coloured Acrylic Coating
	Size	1mm thick (measured)
	Density	1,429 kg/m ³ (measured)
	Location	Across entire exposed surface of specimen.
6	Product	ROCKCOTE Armor Flex Paint
	Location	Single coat applied via roller across entire exposed surface of specimen.
7	Product	NRG PVC 6mm External Corner Bead
	Material	Impact Modified Extrusion Grade Rigid UVPVC
	Size	30mm x 30mm angle, nominally 1.5mm thick
	Linear Mass	0.1 kg/m (measured)
	Location	Around outer perimeter edge of wall specimen, around perimeter of window and two vertical pieces at the wing wall/return wall edges.
8	Product	Bostik™ No More Nails
	Location	Single bead between Greenboard™ (1) pieces and on full length of render beads (6).

ITEM NO.	ITEM	DESCRIPTION
Unexposed Cladding		
9	Product	Gyprock 10mm Plasterboard
	Size	1200mm wide x 3000mm long sheets cut to suit.
	Density	1.6075 kg/m ³ (measured)
	Location	Clad horizontally on the unexposed side of the timber framing.
	Fixings	32mm x 6g Bugle Head Drill Point Fine Thread ZY Plasterboard Screws @ nominal 300mm centres.
Insulation		
10	Product name	Fletcher Insulation R1.5 Glasswool Wall Batts
	Size	1160mm long x 430mm wide x 70mm thick (measured)
	Density	9.4 kg/m ³ (measured)
	Location	Cut to size and located between the timber studs in the cavity between the wall wrap (3) and the plasterboard (6).
Window		
11	Frame	Merbau timber reveal
	Moisture	Average of 10.3% (measured)
	Glazing	Vidirian 5TF Grade A Safety Glass
	Size	OD: Nominal 800mm wide x 800mm high x 141mm deep. ID: Front - 744mm wide x 751mm high x 54mm deep (to glazing). ID: Back - 724mm wide x 724mm high x 80mm deep (to glazing).
Framing		
12	Product	90x45 MGP10 Radiata Pine
	Density	435 kg/m ³ (measured)
	Moisture	Average of 9.7% (measured)
	Location and spacing	Refer to figures A1.1 and A1.2 for frame details.
Eave/Sill		
13	Eave Cladding	6mm Gyprock Fibre-cement sheet
14	Sill Cladding	13mm Gyprock Fyrcheck Plasterboard
15	Sill Cladding	6mm Gyprock Fibre-cement sheet

3 TEST PROCEDURE

STATEMENT OF COMPLIANCE

The test was performed in accordance with the requirements of AS 1530.8.1: 2007 Section 15 as appropriate for walls.

VARIATION TO TEST METHOD

The specimen was conditioned for 4 day prior to testing.

PRE-TEST CONDITIONING

The construction of the system was finished on the 27th May 2011 and was given a drying time of 4 days prior to the test. During this period the test 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 24°C and varied between 23°C and 35°C during the test.

TEST DURATION

The test was terminated after 60 minutes in accordance with the procedures of AS1530.8.1-2007.

INSTRUMENTATION AND EQUIPMENT

The instrumentation was provided in accordance with AS1530.8.1: 2007 and as detailed below:

A 3 mm gap gauge was available during the test to assess the performance of the test specimen under the criteria of integrity.

Radiant heat flux measurements to determine the irradiance transmitted from the exposed face of the specimen were made using a Medtherm Heat Flux Gauges.

During calibration, a radiometer was centrally located with respect to the specimen at a distance equal to the leading surface of the specimen.

A second radiometer was located in the vertical centre of the specimen, at the leading edge, in the west wall section.

During the test, the radiometer in the west wall section remained in place, using values found during an ancillary pre-test calibration to determine the heat flux at the centre of the leading edge of wall.

4 TEST MEASUREMENTS

MOISTURE CONTENT

The average moisture content of the timber stud frame was 9.7% which is below the $11\pm 1\%$ specified limit within in AS 1530.8.1-2007, Clause 12.2.

The average moisture content of the window reveal was 10.3% which is within the $11\pm 1\%$ specified limit within in AS 1530.8.1-2007, Clause 12.2.

SPECIMEN TEMPERATURES

Specimen temperature data is provided in A4.3 and Table A4.3 in Appendix 4.

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 5.

5 TEST RESULTS

The test specimen achieved the following performance when tested in accordance with AS 1530.8.1-2007 Clause 14 and 15 as appropriate for walls.

Table 1: Results for Radiant Exposure and Class A Crib

Performance Criteria		Time to Failure (min)	Position of Failure
Formation of through-gaps greater than 3 mm		No failure	-
Sustained flaming for 10 s on the non-fire side		No failure	-
Flaming on the fire-exposed side at the end of the 60 minute test period.		No failure	-
Radiant heat flux 365mm from the non-fire side exceeding 15 kW m^{-2}		Not applicable	NA
Mean and maximum temperature rises greater than 140K and 180K		No failure	-
Radiant heat flux 250 mm from the specimen, greater than 3 kW m^{-2} between 20 min and 60 min		No failure	-
Mean and maximum temperature of internal faces exceeding $250 \text{ }^\circ\text{C}$ and 300°C respectively between 20 min and 60 min after commencement of test		No failure	-
Crib class	A	Peak heat flux	29 kW m^{-2}
Test Result		BAL: A-29	

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 AS1530.8.1. 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

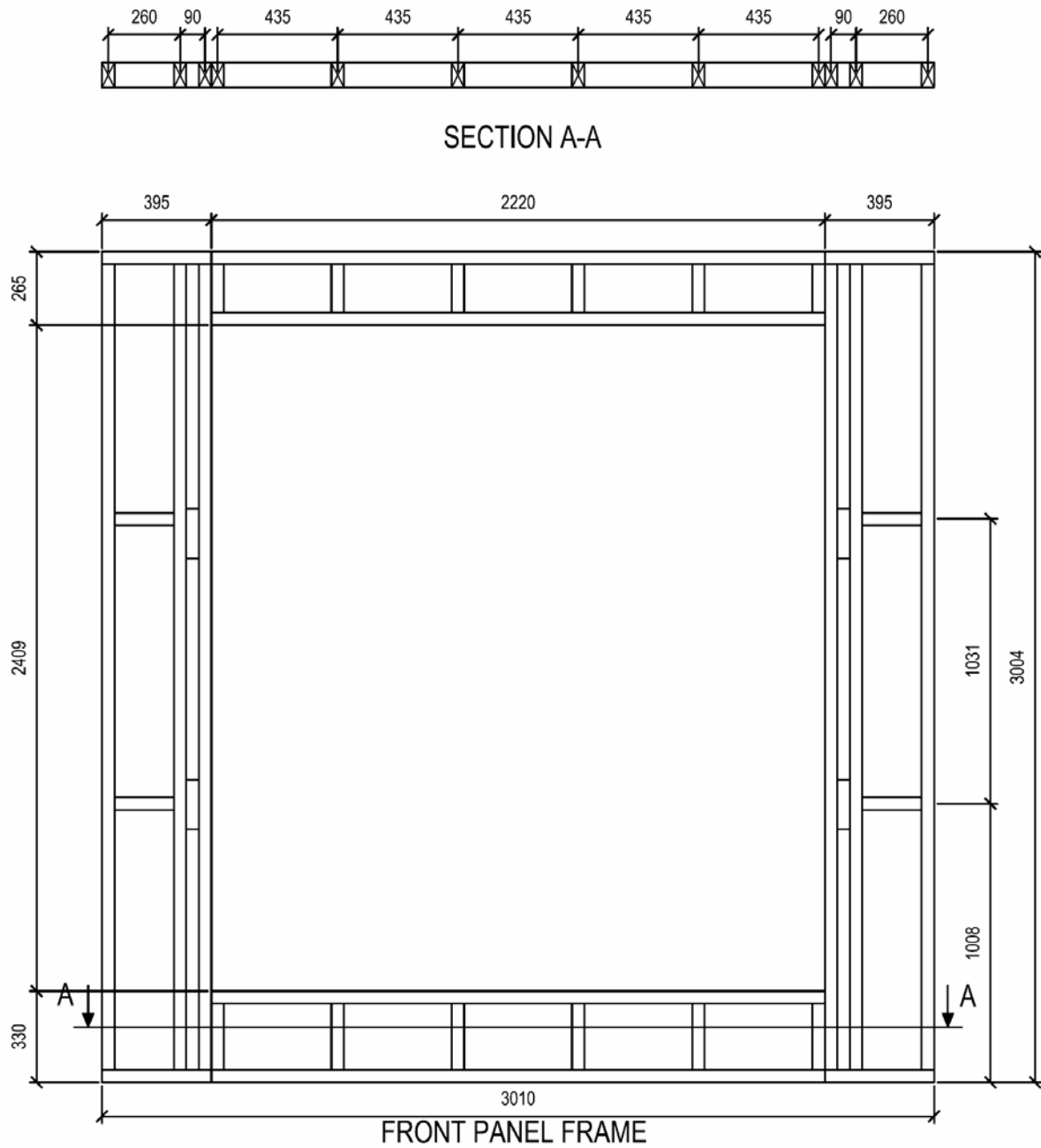


Figure A1.1: Front frame elevation.

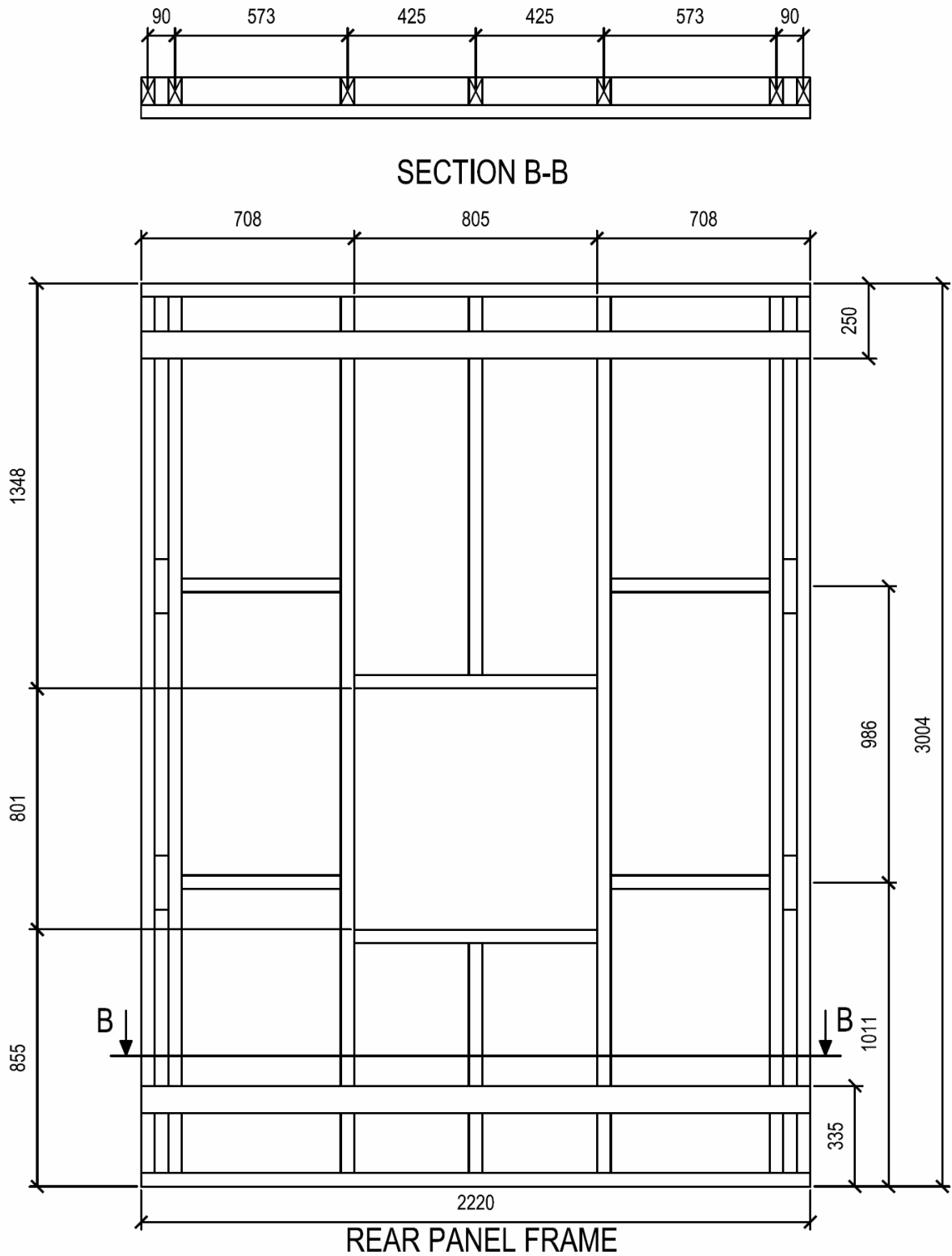


Figure A1.2: Rear frame elevation

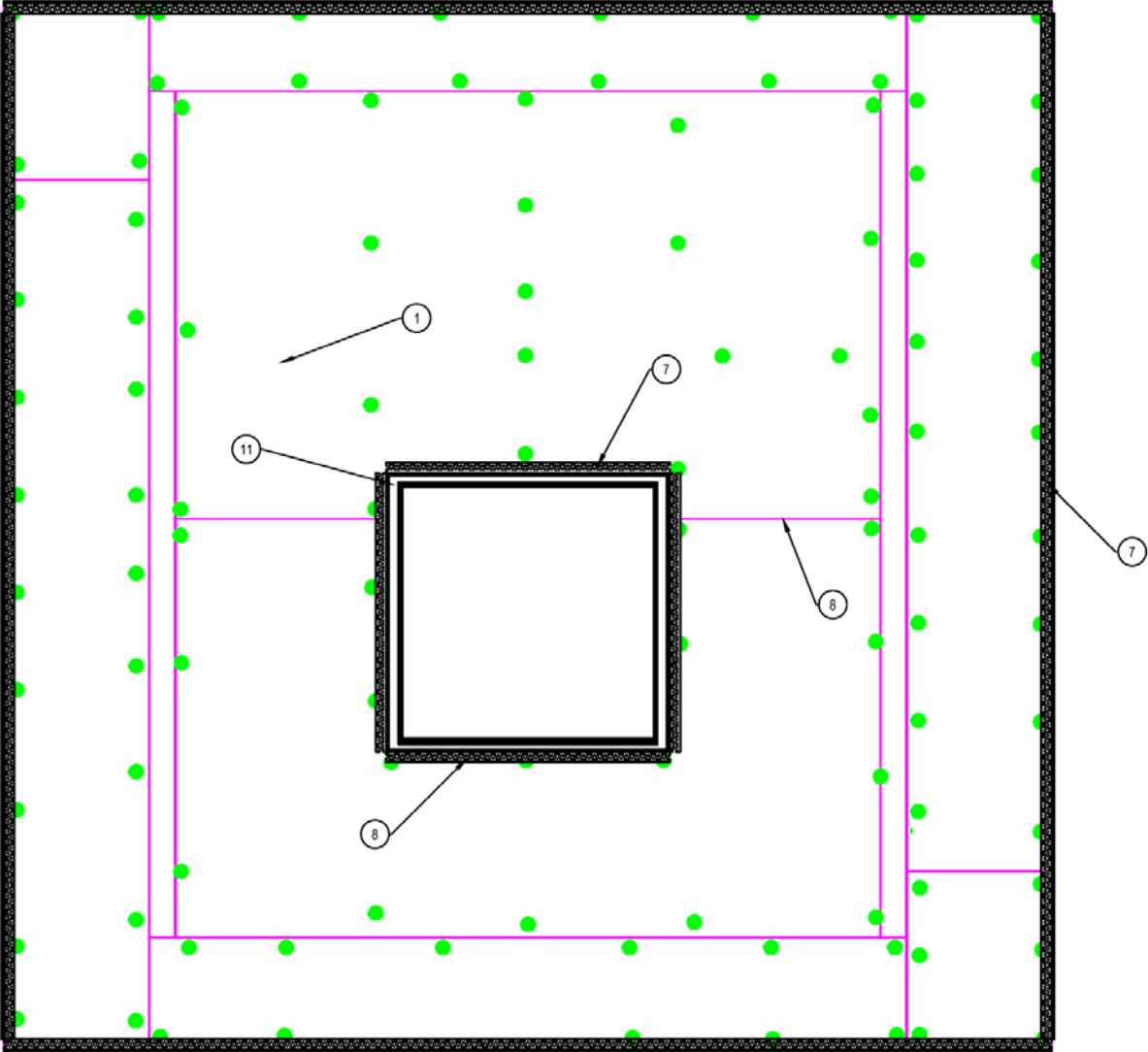


Figure A1.3: Exposed face elevation prior to render application.

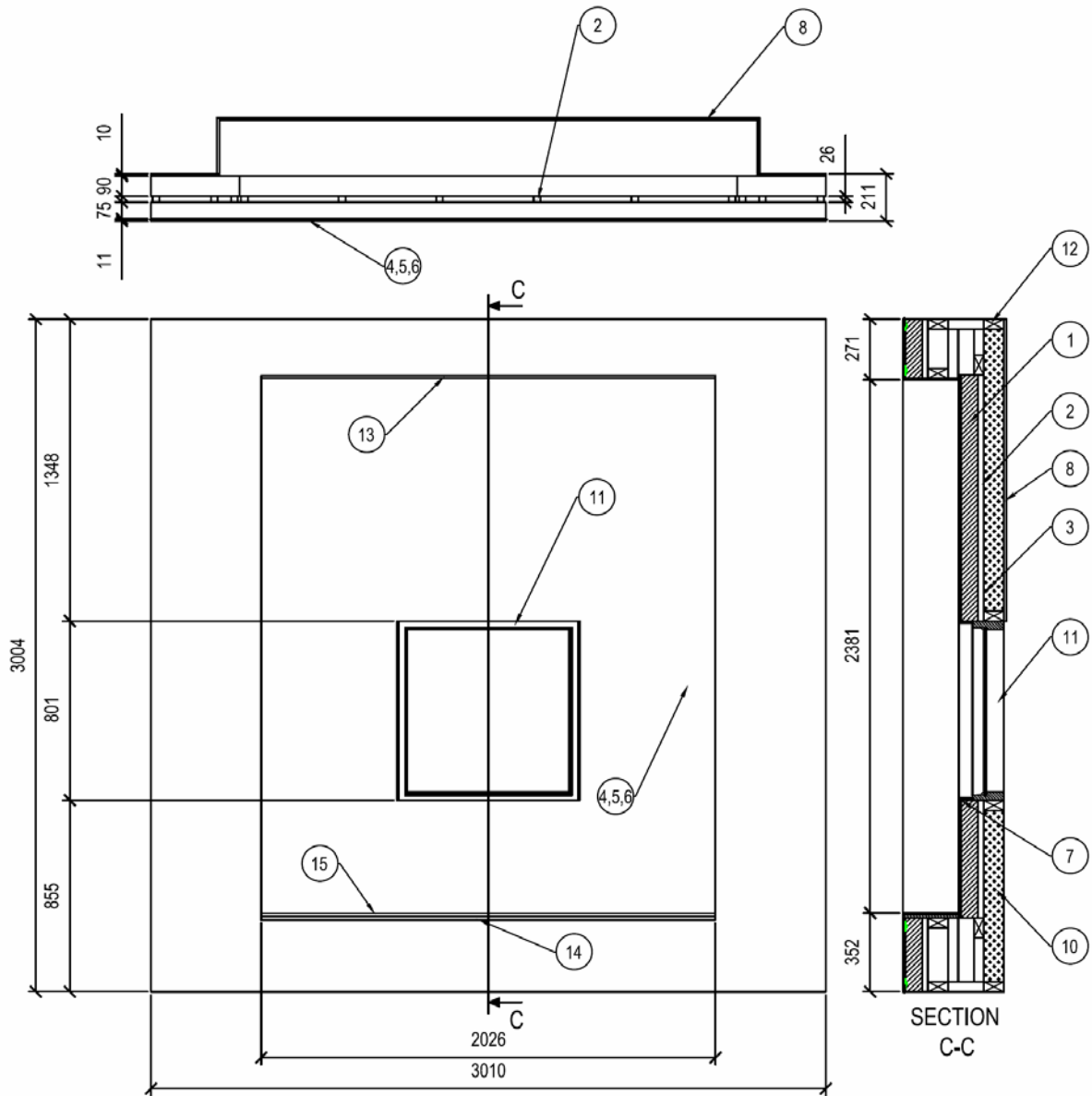


Figure A1.4: Exposed face elevation and section.

APPENDIX 2 TEST OBSERVATIONS

The following observations include observations of the significant behaviour of the specimen. All observations are from the unexposed side unless otherwise stated.

Time Min Sec		Observation
0	00	The bushfire test was commenced and ambient air temperature was approximately 24°C. The ignited crib has been placed in its defined location.
0	30	Smoke emissions from across the exposed surface of the specimen had become evident.
0	57	An increase in the volume of emitted smoke had become evident.
1	40	Discolouration of leading edge of specimen at junction of front and wing walls evident.
2	00	A further increase in the volume of emitted smoke had become evident.
3	18	The volume of emitted smoke had reduced.
10	00	Screen in place. Slight deformation of eave. Heavy discolouration around crib. Discolouration of the edges of the leading and recessed wall panels. Discolouration of window reveal.
18	07	Crib no longer flaming.
18	56	Thermocouple B11 has been reconnected.
26	00	Smoke emissions from specimen no longer evident.
33	00	Glowing of embers in crib no longer evident.
60	00	The bushfire test was stopped in accordance with the procedures of AS1530.8.1-2007.
Post Test Observation		
Upon removing the unexposed cladding and sarking it was noted that the majority of the EPS had melted away from the render, leaving a cavity. There was no smoking or smouldering behind the render in the wall cavity.		

APPENDIX 3 DIRECT FIELD OF APPLICATION

A 3.1 GENERAL

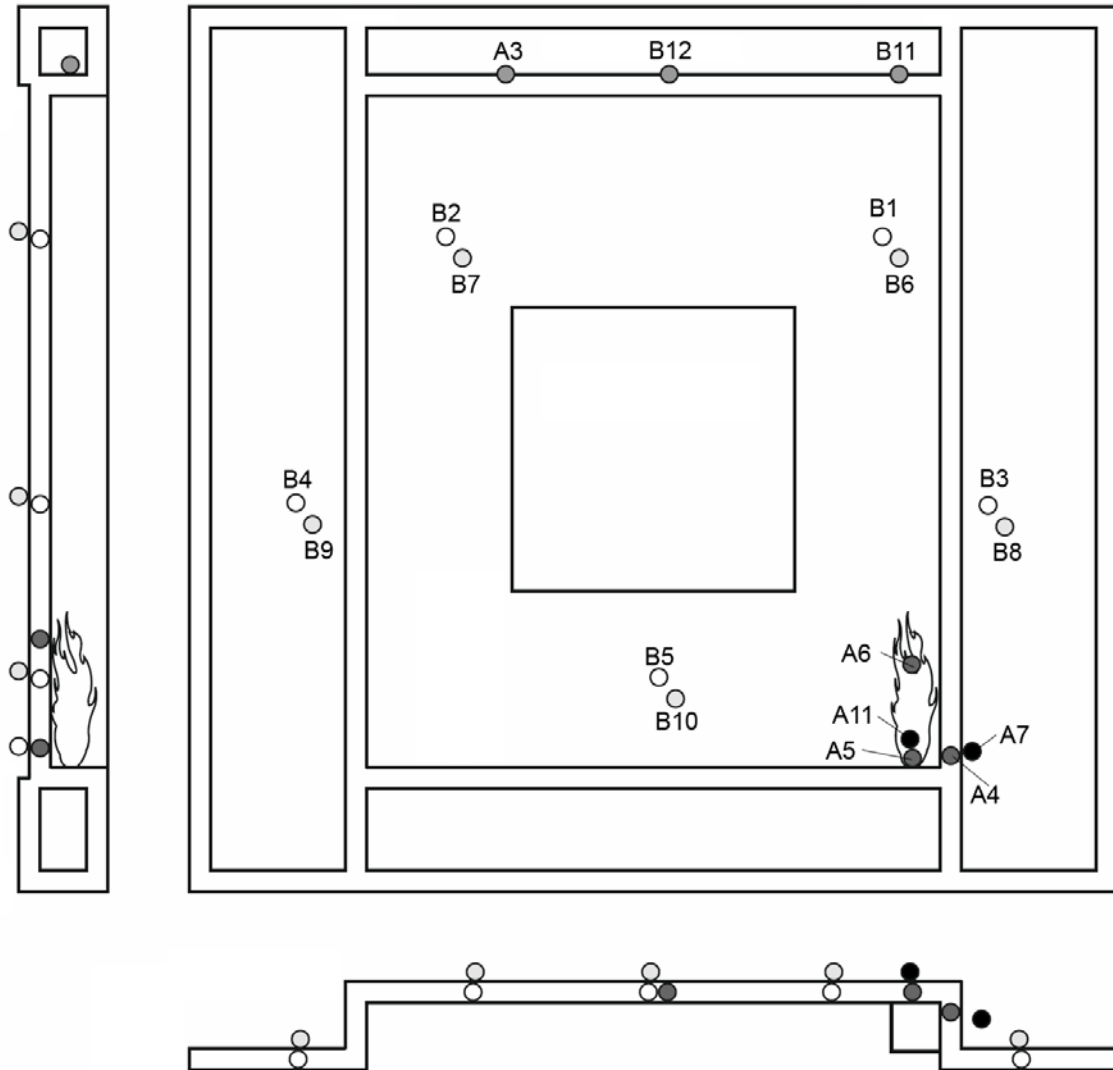
AS 1530.8.1-2007 Section 15.7 states:

The results of a fire test contained in the test report are directly applicable, without reference to the testing authority for a technical opinion, to similar constructions where one or more of the following changes have been made, provided no individual component is removed or reduced:

- a) *Increase in the length of a wall of identical construction if the specimen*
- b) *Increase in thickness of the wall.*
- c) *For framed walls –*
 - (i) *increase in timber density;*
 - (ii) *increase in cross-sectional dimensions of the framing element(s);*
 - (iii) *increase in the steel thickness, up to a maximum of 2 mm;*
 - (iv) *decrease in sheet or panel sizes;*
 - (v) *decrease in stud spacing; or*
 - (vi) *decrease in fixing centres of wall sheet materials.*

APPENDIX 4 INSTRUMENTATION

The instrumentation was positioned in accordance with the requirements of AS1530.8.1-2007, Clause 16.3 as summarised below.



LEGEND:

- = Incipient fire spread thermocouple positions—Mean temperature rise
- = Incipient fire spread thermocouple positions—Maximum temperature rise
- ◐ = Incipient fire spread thermocouple positions—Eaves mean and maximum
- = Non fire side thermocouple positions—Mean temperature rise
- = Non fire side thermocouple positions—Maximum temperature rise

Figure A4.1: Thermocouple locations on wall system

TABLE A3.1: THERMOCOUPLE LOCATIONS

Position	T/C	Location			Description
		x	y	z	
Internal Quarter Points	B1	2250	2250	360	Internal cavity surfaces - Mean temperature rise
	B2	750	2250	360	
	B3	2750	1500	110	
	B4	250	1500	110	
	B5	1500	600	360	
External Quarter Points	B6	2250	2250	460	Unexposed face - Mean temperature rise
	B7	750	2250	460	
	B8	2750	1500	210	
	B9	250	1500	210	
	B10	1500	600	460	
Eave	B11	550	2750	125	Internal surface of eaves - Max and mean temperature rise
	B12	1500	2750	125	
	A3	1900	2750	125	
West Crib	A4	2610	380	200	Internal cavity surfaces - Max temperature rise adjacent to West crib
	A5	2450	380	360	
	A6	2450	480	360	Internal cavity surface - Max temperature rise above West crib
	A7	2710	380	200	Unexposed face - Max temperature rise adjacent to West crib
	A11	2450	380	460	
Radiometer Positions	R1	2750	1500	0	Embedded in surface of exposed face.
	R2	1500	1500	0	250mm from exposed side from 20 min to 60 min of test.

APPENDIX 5 TEST DATA

A 5.1 MEASURED HEAT FLUX RECEIVED

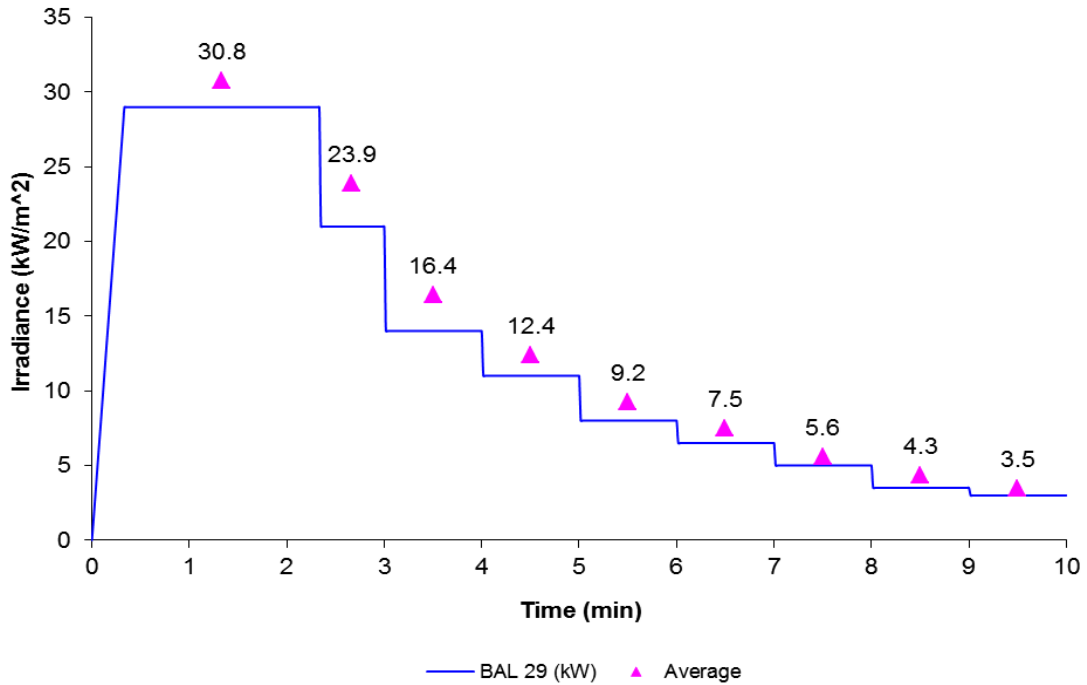


Figure A5.1: Incident heat flux during exposure period.

A 5.2 SPECIMEN TEMPERATURES

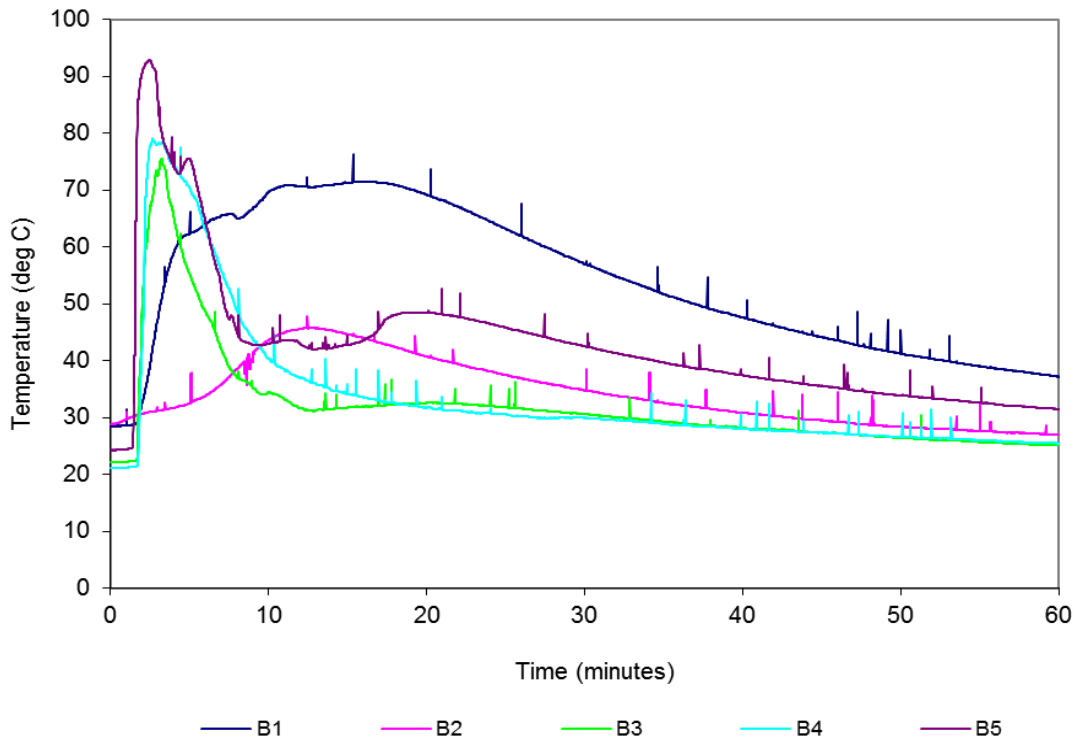


Figure A5.2: Specimen temperatures. Temperatures vs time
Internal quarter points

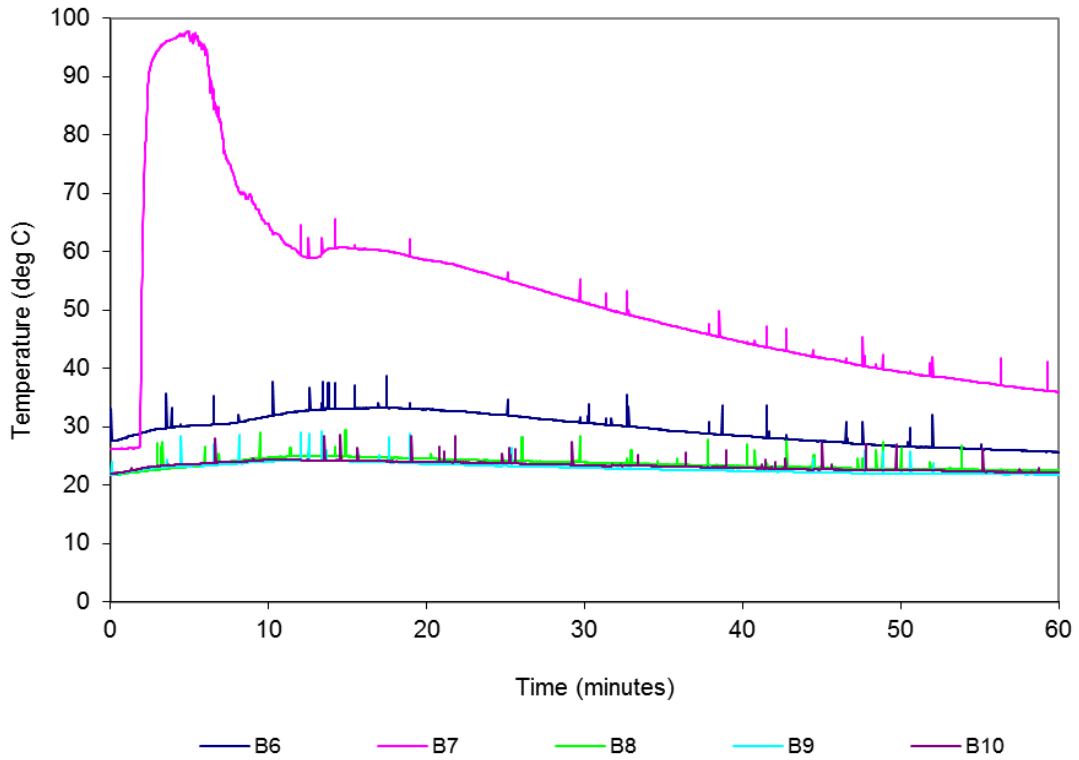


Figure A5.3: Specimen temperatures. Temperatures vs time
Unexposed quarter points

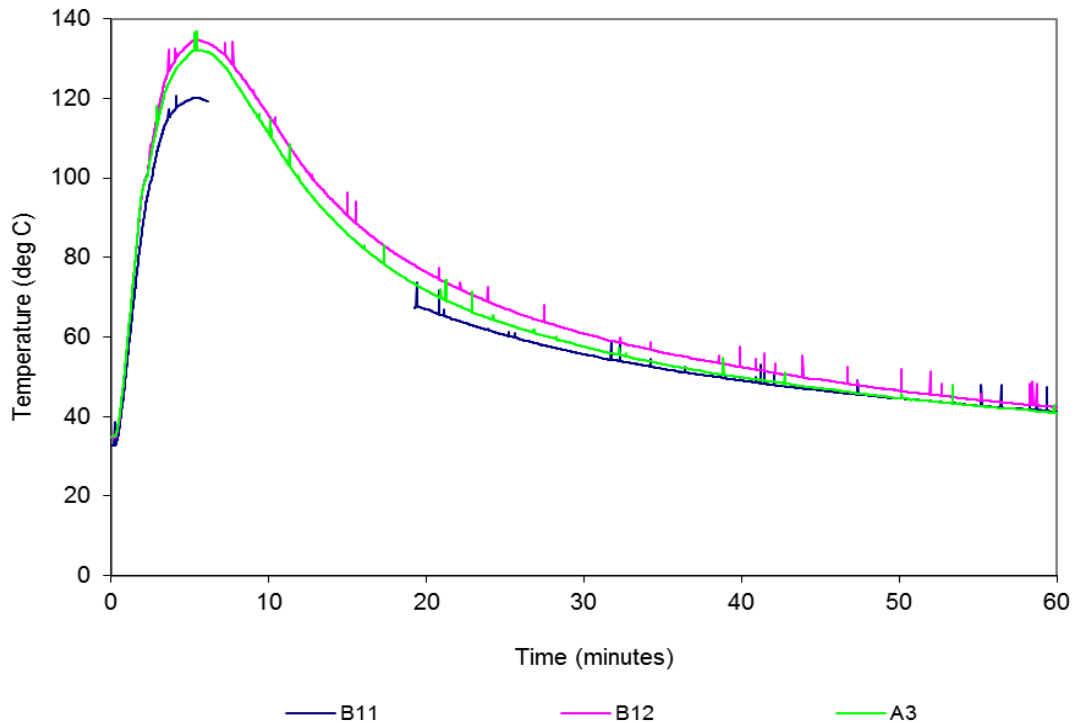


Figure A5.4: Specimen temperatures. Temperatures vs time
Eave mean and maximum
Thermocouple B11 disconnected during the exposure period and
was reconnected when it was deemed safe to do so.

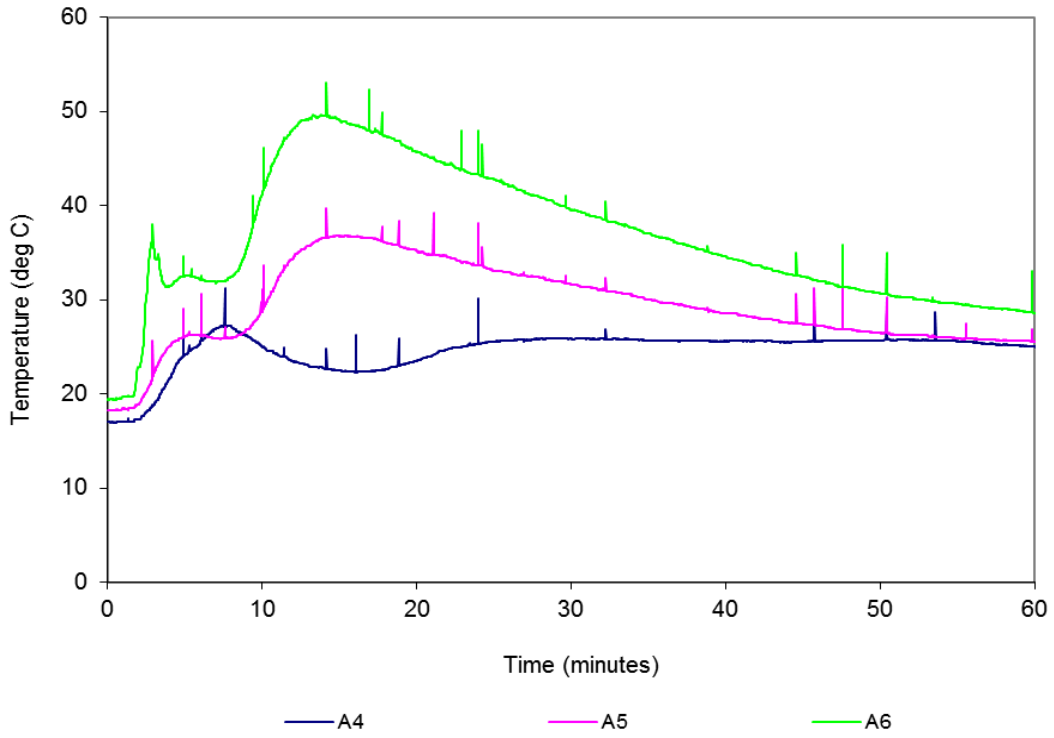


Figure A5.5: Specimen temperatures. Temperatures vs time
Internal around crib

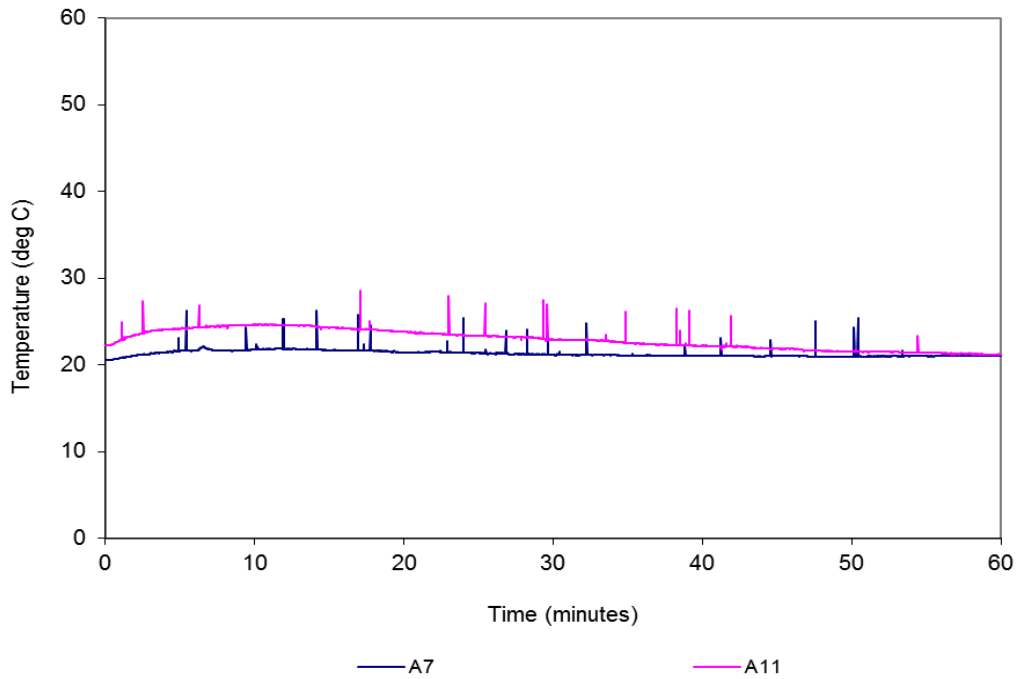


Figure A5.6: Specimen temperatures. Temperatures vs time
Unexposed around crib

Table A5.3: Test Specimen Temperatures

T/C	Description ³	Temp (°C) at t (min)					Limit ^{1,2} Mins
		0	15	30	45	60	
B1	North west internal quarter point	29	71	57	44	37	-
B2	North east internal quarter point	29	45	35	30	27	-
B3	West internal quarter point	22	32	31	27	25	-
B4	East internal quarter point	21	34	30	27	25	-
B5	South internal quarter point	24	43	43	36	31	-
Average of internal quarter points		25	45	39	33	29	-
B6	North west surface quarter point	28	33	31	28	26	-
B7	North east surface quarter point	26	61	51	42	36	-
B8	West surface quarter point	22	25	24	23	23	-
B9	East surface quarter point	22	24	23	22	22	-
B10	South surface quarter point	22	24	23	23	22	-
Average of surface quarter points		24	33	30	28	26	-
B11	Eave above crib	33	#	26	47	41	-
B12	Eave at middle of specimen	35	91	61	49	42	-
A3	Eave above east window reveal	35	86	58	47	41	-
A4	Centre of crib on inside of return wall	17	23	26	26	25	-
A5	Centre of crib on inside of back wall	18	37	32	28	26	-
A6	Above mid-width of crib inside of back wall	19	49	40	32	29	-
A7	Centre of crib on unexposed side of return wall	21	22	21	21	21	-
A11	Centre of crib on unexposed side of back wall	22	24	23	22	21	-

- Notes
- ¹ Limit time is the time to the nearest whole minute, rounded down to the nearest minute, at which the temperature recorded by any surface thermocouple does not rise by more than 180°K above the initial temperature.
Limit time for the average of surface quarter points is the time to the nearest whole minute, rounded down to the nearest minute, at which the average measured temperature does not rise by more than 140°K above the initial temperature.
 - ² Limit time is the time to the nearest whole minute, rounded down to the nearest minute, at which the temperature recorded by any internal thermocouple does not reach 300°C.
Limit time for the average of internal quarter points is the time to the nearest whole minute, rounded down to the nearest minute, at which the average measured temperature does not reach 250°C.
 - ³ Refer to Appendix 4 for locations of thermocouples as only a generic description is included in the table.
 - # Thermocouple failure.
 - ⁴ 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.

APPENDIX 6 PHOTOGRAPHS

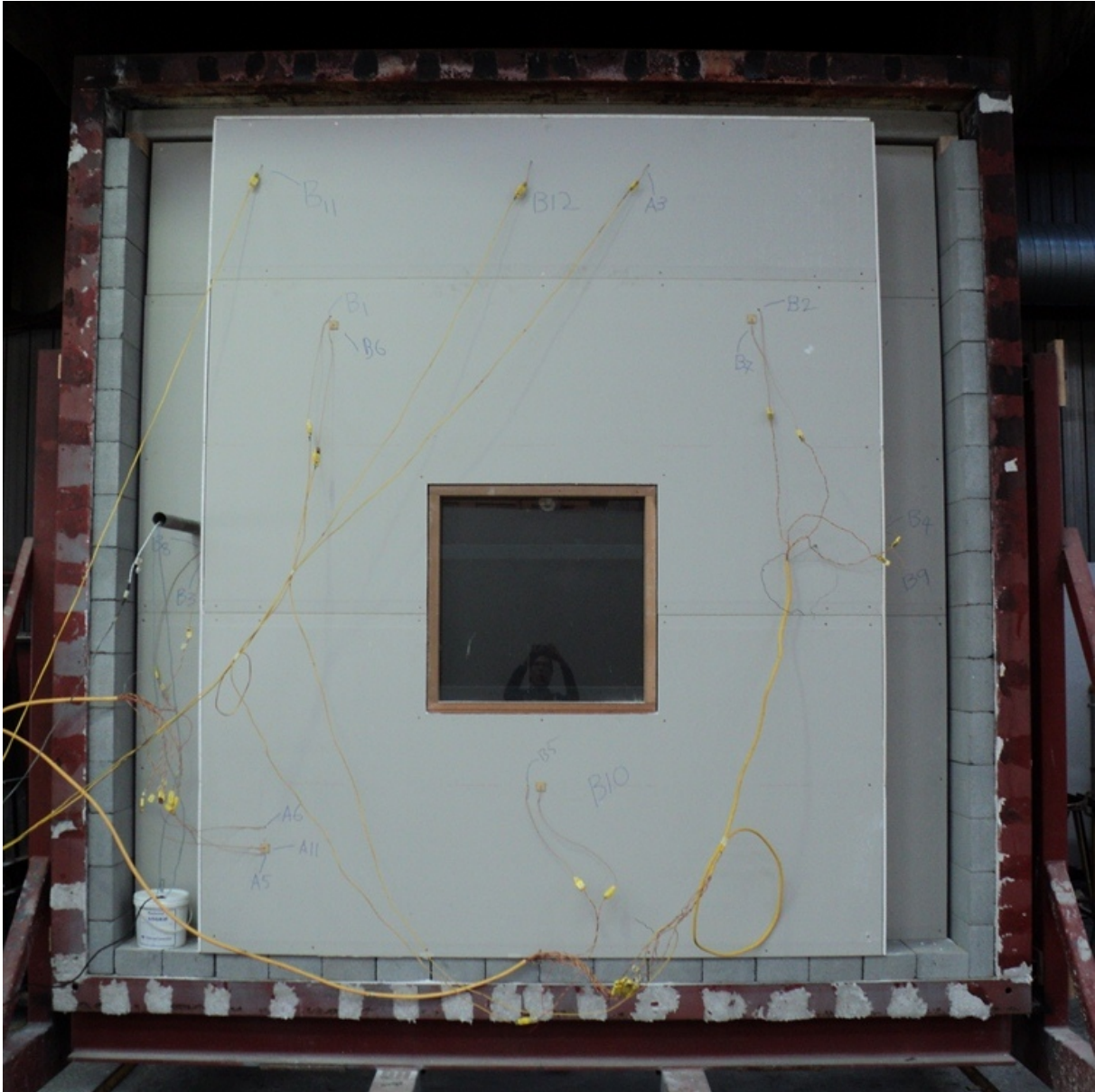


Figure A6.1: Unexposed face of the specimen prior to the test.



Figure A6.2 Exposed face of the specimen prior to the test.



Figure A6.3 Unexposed face of test specimen at completion of test.

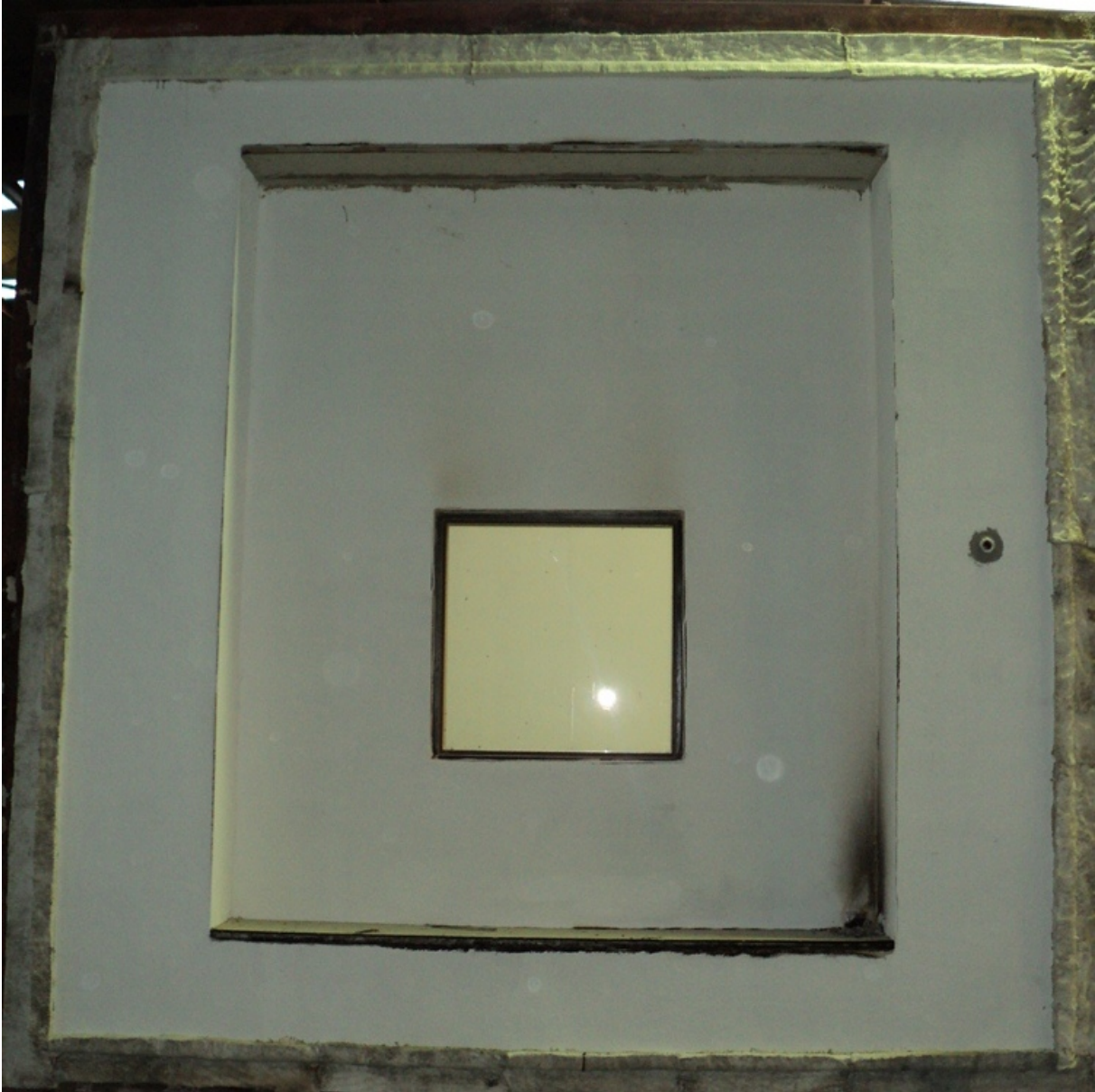


Figure A6.4 Exposed face of test specimen at completion of test.