

### **TEST REPORT**

Fire resistance test of an external wall when exposed to 80kW/m<sup>2</sup> of radiant heat in accordance with AS5113: 2016

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Testing. Advising. Assuring.

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## 1 CONSTRUCTION DETAILS

#### TEST ASSEMBLY

The test assembly comprised a nominal 3000mm wide  $\times$  3000mm high  $\times$  160mm thick nonloadbearing panel wall system.

The wall was restrained at top, bottom and south edges and free on north edge.

#### **TEST SPECIMENS**

The wall system comprised of 70mm × 35mm MGP10 timber stud framing at 500mm nominal centres. Wall wrap was stapled on the exposed side of timber framing, 50mm × 25mm deep timber battens were vertically installed over the studs and wall wrap. 50mm thick QT EcoSeries panels were installed over the battens and screw fixed to battens using 10g × 75mm long screws (Class 3) with QT<sup>™</sup> Buttons at 200mm centres. Bosman Low Expanding Glue Foam was applied to the horizontal and vertical butt joints.

Acroloc Wallcote Pro render was trowelled over the panels. Dulux AcraTex- AcraShield was then roller applied.

10mm thick Gyprock plasterboard was installed on the unexposed side and all joints were sealed with tape and Gyprock Base Coat 45.

The full description of the specimen is provided in Figures A1.1 to A1.3 and the 'Schedule of Components' in Section 2.

#### ASSEMBLY AND INSTALLATION METHODS

The timber framing, wall wrap, battens and panels were installed by client on the 24<sup>th</sup> august 2016. The render was applied on 2<sup>nd</sup> of September 2016, texture and unexposed plasterboard was applied on the 8<sup>th</sup> of September 2016.

#### ORIENTATION

The specimen was asymmetrical with the exposed side of the wall coated with rendered QT EcoSeries panels 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.



# SCHEDULE OF COMPONENTS

No.	Item	Description				
Substr	Substrate					
	Product	QT EcoSeries Wall panels				
	Material	Conpolcrete				
	Size	2250mm high × 900mm wide × 50mm thick (nominal uncut, measured)				
	Density	374 kg/m <sup>3</sup> (measured)				
1	Location/ Fixing	Panels were installed horizontally and screw fixed to timber battens using 10g × 75mm long screws (Class 3) with QT <sup>™</sup> Buttons at nominal 200mm centres.				
		All vertical and horizontal butt joints were sealed with Bosman Low Expanding Glue Foam.				
		The vertical butt joints in panels were additionally backed by timber battens (Item 4).				
Rende	r System					
2	Thickness (Total)	Nominal 5.0mm thick				
0	Product	Acroloc Wallcote Pro render				
a	Location	Trowel applied directly over the panels (Item 1).				
h	Product	Dulux AcraTex- AcraShield				
b	Location	Roller applied over rendered panels (Item 1).				
Framing						
	Product	70 × 35 MGP10 Radiata Pine				
3	Location	Studs were located at 500mm nominal centres and noggings at 1000mm nominal centres.				
0		The south stud, top and bottom end plates were fixed to test frame blockwork with dynabolts at nominal 500mm centres.				
		Refer to Figure A1.1 for frame details.				
Batten	S					
	Product	Treated Pine Timber Battens				
4	Size	50mm wide × 25mm deep				
·	Location/ Fixing	Battens were nailed to the timber framing over wall wrap at stud locations. Additional battens were installed behind all vertical butt joints on panels.				
Wraps and Sealants						
	Product	Bradford Thermoseal Wall Wrap				
5	Location	Single layer on exposed side of timber framing.				
	Fixing	Stapled to the timber framing at nominal 300mm centres.				
	Product	Bosman Low Expanding Glue Foam				
6	Location	Sealing horizontal and vertical butt joints between panels (Item 1). Applied to Panel –timber batten interface.				
Unexp	osed Cladding					



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No.	Item	Description					
	Product	Gyprock 10mm Plasterboard					
	Size	1200mm wide × 3000mm long sheets cut to suit.					
	Density	660 kg/m <sup>3</sup> (measured)					
7	Location	ion Clad horizontally on the unexposed side of the timber framing.					
	Fixings	32mm × 6g Bugle Head Drill Point Fine Thread ZY Plasterboard Screws at nominal 300mm centres.					
		All joints and fixing locations were stopped with CSR Base Coat 45 and Gyprock Perforated mesh Tape.					



## 3 TEST PROCEDURE

#### STATEMENT OF COMPLIANCE

The test was performed in accordance with the requirements of AS5113: 2016 Clause 5.2(b)(i) as appropriate for an external wall when exposed to 80kW/m<sup>2</sup> of radiant heat.

#### VARIATIONS TO TEST METHOD

The specimen reached the required exposure level faster than the prescribed period in the standard.

The specimen was also greater than 450mm from the radiant panel during the prescribed exposure period however the uniformity of the radiation was such that the specimen exposure was at the prescribed radiant heat flux.

#### **PRE-TEST CONDITIONING**

The wall construction was finished on the 8<sup>th</sup> of September 2016. Test specimen was subjected to normal laboratory temperatures and conditions during this period.

#### 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 21°C and varied between 21°C and 26°C during the test.

#### TEST DURATION

The test duration was 31 minutes.

#### INSTRUMENTATION AND EQUIPMENT

The instrumentation was provided in accordance with AS 5113: 2016 and as detailed below:

The non-fire side specimen temperatures were measured by Type K thermocouples with wire diameters less than 0.5mm soldered to 12mm diameter  $\times$  0.2mm thick copper discs covered by 30mm  $\times$  30mm  $\times$  2.0 mm inorganic insulating pads. The thermocouple positions are described in Table A3.1, and are shown on Figure A3.1 in Appendix 3.

The radiant panel surface temperatures were measured by 2-off mineral insulated metal sheathed (MIMS) Type K thermocouples with overall diameter of 1.5mm installed mid-height of radiant panel, 1m in from each vertical edge.

All internal temperatures were measured by mineral insulated metal sheathed (MIMS) Type K thermocouples with overall diameter of 1.5mm with the measuring junction insulated from the sheath.

A pilot ignition source was available to assess any areas of the specimen producing significant quantities of volatiles.

Radiant heat flux at the centre of test assembly was made using Medtherm Heat Flux Gauge.

## 4 TEST MEASUREMENTS

#### INCIDENT HEAT FLUX MEASUREMENTS

Heat flux measurements are provided in Figure A4.1 in Appendix 4.

#### SPECIMEN TEMPERATURES

Specimen temperature data is provided in A 4.2 and Table A4.2 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 AS5113: 2016 is provided in Appendix 2. Photographs of the specimen are included in Appendix 5.



# 5 TEST RESULTS

The specimen tested achieved the following performance with respect to the performance criteria listed in AS5113: 2016, Clause 5.2(b)(i) when exposed to  $80 \text{kW/m}^2$  of radiant heat.

Criteria	Result
Structural Adequacy	Not applicable
Integrity	No failure at 31 minutes
Insulation	No failure at 31 minutes

Additional observations and performance criteria were noted during the test and are as follows:

Criteria	Result		
Time at which temperatures at the mid-depth of timber framing exceeded 250°C for a continuous period greater than 30 seconds occurred	Did not occur		
Time at which temperatures at the mid-depth of timber battens exceeded 250°C for a continuous period greater than 30 seconds occurred	Did not occur		
Time at which temperatures at the mid-depth of panels exceeded 250°C for a continuous period greater than 30 seconds occurred	Did not occur		
Time at which continuous flaming for greater than 30 seconds on the side of the specimen exposed to radiant heat occurred	Did not occur		
Time at which continuous flaming on the ground for greater than 20 seconds of any debris or molten material from the specimen occurred	Did not occur		
The total mass of any debris falling in front of the specimen exceeded 2 kg.	Did not occur		

# 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 general procedure outlined in AS5113. 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 AS5113 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.











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REF No.	AS5113BB
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DATE:	11/8/16
DETAIL No.	DETAIL 1BB

Figure A1.2: Vertical Cross-Section (Drawings provided by client)





REF No.	AS5113BB
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DETAIL No.	DETAIL 1BB

### Figure A1.3: Horizontal Cross-Section (Drawings provided by client)



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# APPENDIX 2 TEST OBSERVATIONS

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

Time		Observation					
min	sec	Observation					
0	00	Test commenced and the specimen was exposed to radiant heat.					
		The ambient temperature was approximately 21°C.					
0	52	80kW/m <sup>2</sup> of exposure reached and maintained.					
1	00	Smoke emissions had become evident from the specimen wall.					
2	00	Discolouration had become evident on the rendered panels with fixings location visible.					
3	21	Smoke emissions had become evident from the unexposed side along the edges.					
10	00	Discolouration on the rendered panels had disappeared.					
25	00	A full width horizontal crack (along the panel horizontal butt joint) had become evident on the render at approximately 1800mm from the sill.					
29	40	A vertical crack had become evident on the render extending from sill to the horizontal crack near the north (free) edge.					
31	00	30 minutes of exposure to 80kW/m <sup>2</sup> completed. Test terminated.					



# APPENDIX 3 INSTRUMENTATION POSITIONS



Figure A3.1: Unexposed surface thermocouple locations Note: The green squares indicate internal thermocouples Blue dot indicates heat flux gauge (exposed side)

## Table A3.1: Thermocouple Locations

Location	T/C No.	x	у	Description	
	011	750	2250	Upper south quarter point	
	012	2250	2250	Upper north quarter point	
Qtr. points	013	1500	1500	Centre of specimen	
	014	750	750	Lower south quarter point	
	015	2250	750	Lower north quarter point	
Other Surface	016	1500	2985	At the head of the specimen, mid-width	
Other Surface	017	1500	2400	Mid-width, 15mm from upper horizontal joint	
Internal Otra & contro pointo	021	750	2250	Upper south quarter point	
(Timber framing)	022	2250	2250	Upper north quarter point	
(Timber framing)	023	1500	1500	Centre of specimen	
Internal Otra & contro pointo	031	750	2250	Upper south quarter point	
(Timber bettene)	032	2250	2250	Upper north quarter point	
(Timber batteris)	033	1500	1500	Centre of specimen	
Internal Otr. 8 contro pointo	041	750	2250	Upper south quarter point	
(Papele)	042	2250	2250	Upper north quarter point	
(Faileis)	043	1500	1500	Centre of specimen	



# APPENDIX 4 TEST DATA

## A 4.1 RADIANT HEAT FLUX



Figure A4.1: Irradiance levels during the test to the external wall vs. Time





Figure A4.2: Quarter point and centre on unexposed face. Temperatures vs. time





Figure A4.3: Average of Quarter point and centre on unexposed face. Temperatures vs. Time



Figure A4.4: Other Surface - Head and horizontal joint. Temperatures vs. time





Figure A4.5: Mid-depth of Timber framing, Upper Quarter point and centre. Temperatures vs. time



Figure A4.6: Mid-depth of Timber Battens, Upper Quarter point and centre. Temperatures vs. time





Figure A4.8: Radiant panel. Temperatures vs. time

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Location	T/C	Description <sup>2</sup>		Temp (°C) at t (minutes)		
	NO.			t=15	t=30	(101115)
	011	Upper south quarter point		55	66	-
	012	Upper north quarter point	23	52	62	-
Qtr. points	013	Centre of specimen	22	46	56	-
	014	Lower south quarter point	22	47	55	-
	015	Lower north quarter point	22	45	52	-
Quarter point average			22	49	58	-
Other outfood	016	At the head of the specimen, mid- width	24	82	80	-
Other surface	017	Mid-width, 15mm from upper horizontal joint	23	74	76	-
	021	Upper south quarter point	21	63	72	NA
(Timber froming)	022	Upper north quarter point	21	69	73	NA
(Timber framing)	023	Centre of specimen	22	64	70	NA
Internal Otr. & centre points	031	Upper south quarter point	21	86	87	NA
(Timber battens)	032	Upper north quarter point	21	75	77	NA
(	033	Centre of specimen	21	92	84	NA
Internal Otr & centre points	041	Upper south quarter point	23	96	198	NA
(Panels)	042	Upper north quarter point	24	101	237	NA
(*	043	Centre of specimen	21	97	215	NA
Notoo	Limit time is the time to the nearest w	hala m	inuto			

Notes

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.

Refer to Appendix 3 for locations of thermocouples as only a generic description is included in the table.

Thermocouple failure. <u>،</u>

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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 5 PHOTOGRAPHS



Figure A5.1: Unexposed face of specimen before commencement of the fire-resistance test



South

Figure A5.2: Exposed face of specimen before commencement of the fire-resistance test

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North



Figure A5.3: Unexposed face of specimen at the end of the test.



South

Figure A5.4: Exposed face of specimen at the end of the test.

