TEST REPORT

Fire-resistance test of GSM Wall Boxes protecting General Power Outlet systems and Wall switches installed into a 116mm thick fire rated plasterboard wall system tested in accordance with AS1530.4-2014

EWFA Report No:

47083900.1

Report Sponsor:

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Test Date:

17th January 2017

Testing. Advising. Assuring.

DOCUMENT REVISION STATUS

Date Issued	Issue No	Description
27/01/2017	47083900.1	Initial Issue

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GENERAL CONDITIONS OF USE

CONTENTS

1 CONSTRUCTION DETAILS

TEST ASSEMBLY

The test assembly comprised a nominal 1200mm wide × 1200mm high × 116mm thick steel stud/plasterboard wall with different GPO and light switch systems mounted on both the exposed and unexposed sides in various configurations.

TEST SPECIMEN

The wall was comprised of 64mm deep galvanised steel frame and fire-rated plasterboard. The frame consisted of Rondo 64mm deep × 0.5BMT galvanised steel studs and tracks. Two noggings were also included in the frame. Two (2-off) layers of 13mm Gyprock Fyrchek were screw fixed on each side of the frame. Studs and noggings were packed with stonewool to separate the services from one another.

The wall included three powerpoint outlets and wall switch configurations. The first service consisted of two (2-off) PUPP2G Powerpoint Outlets mounted back-to-back into the wall either side (i.e. on the exposed side and non-exposed side). The second service consisted of two (2-off) PUPP2G Powerpoint Outlets mounted in a horizontally staggered orientation (i.e. not in-line) into the wall either side. The third service consisted of two (2-off) PUSWV1G light switches mounted in a vertically staggered orientation (i.e. not in-line) into the wall either side, with the lower switch being on the exposed side. The openings behind the socket outlets and wall switches were protected by HY1GFRWB Fire and Acoustic Rated Wall Boxes. The full descriptions of the specimens are provided in Figures A1.1 to A1.6 and the 'Schedule of Components' Section 2.

ID	GPO/switch	Side	Hole Sizes (mm)		Perimeter gaps (mm)			
			Height	Wide	Top	Bottom	West	East
A	2x PUPP2G	Unexposed	53	100	1.0	0	3.3	2.1
		Exposed	52	100	0	0	3.2	3.2
B	2x PUPP2G	Unexposed	54	100	1.2	0	2.7	1.9
		Exposed	51	100	0.9	0	2.8	2.8
C	2x PUSWV1G	Unexposed	100	53	3.4	1.2	2.5	1.5
		Exposed	100	54	1.8	1.8	0	0.8

ASSEMBLY AND INSTALLATION METHODS

The plasterboard wall was constructed on 12th and 13th January 2017 and the GPOs and Wall Boxes were installed on 16th January 2017 by representatives of EWFA.

ORIENTATION

The assembly was asymmetric for 2 of the GPOs/switches (Specimen B and C) on the exposed and unexposed side and for the other GPOs/switch (Specimen A), its fixing position was symmetrical on the exposed and unexposed side.

2 SCHEDULE OF COMPONENTS

Item	Description	
SERVICE A		
1	**GPO**	**Exposed and unexposed side**
	Product name	PUPP2G, Trader™ Power Point Switched 2 Gang 10A 250V~ 
	GPO dimensions	Overall dimensions of the GPO was 116mm wide × 75mm high × 24mm deep Visible dimensions of the GPO was 116mm wide × 75mm high × 13mm deep
	GPO material	Polycarbonate (PC)
	Cut out dimension	The cut out behind the GPO was: Unexposed side: 100mm wide × 53mm high Exposed side: 100mm wide × 52mm high
2	**Wall box**	
	Product Name	HYGFRWB Fire and Acoustic Rated Wall Box with Earth

Item	Description	
	GPO wall box size	Overall dimension of the wall box was nominal 95mm wide × 51mm high × 50mm deep on the longer edge and 38mm deep on the shorter edge. The shell of the wall box was made from 0.9mm thick galvanized steel. There are three holes located at the top edge plate with dimension 16mm wide × 10mm high.  
	Location	GPOs and the wall boxes were installed on both exposed and unexposed side. There was 16mm spacing between the exposed and unexposed side wall box. Both wall boxes were located at 920mm above the sill of the specimen.
	Intumescent	2 pieces of intumescent were installed inside the wall box. The overall dimensions of the intumescent pieces were approximately 46mm wide × 48mm long × 7mm with a density of 1294kg/m^3.
	Perimeter gaps	Unexposed side: Top: 1.0mm, Bottom: 0mm, West: 3.3mm, East: 2.1mm Exposed side: Top: 0mm, Bottom: 0mm, West: 3.2mm. East: 3.2mm
	Fixing	The wall box was fixed to the plasterboard behind the opening with pair of 30mm wide × 6.5mm high (centre) and 8mm high (edge) × 1.5mm thick metal strips and Ø3.4mm × 40mm long screws
3	**Cable**	
	Product Name	General 2 cores + Earth (2.5mm^2) cable
	Cable exit location	The cables exited the wall box through the holes on the top edge
	Installation	The cable was connected to the GPO and had 500mm extension length outside the wall box located in the cavity of the plasterboard wall.
SERVICE B		
4	**GPO**	**Exposed and unexposed side**

Item	Description	
	Product name	PUPP2G, Trader™ Power Point Switched 2 Gang 10A 250V~ 
	GPO dimensions	Overall dimensions of the GPO was 116mm wide × 75mm high × 24mm deep Visible dimensions of the GPO was 116mm wide × 75mm high × 13mm deep
	GPO material	Polycarbonate (PC)
	Cut out dimension	The cut out behind the GPO was: Unexposed side: 100mm wide × 54mm high Exposed side: 100mm wide × 51mm high
5	**Wall box**	
	Product Name	HYGFRWB Fire and Acoustic Rated Wall Box with Earth
	GPO wall box size	Overall dimension of the wall box was nominal 95mm wide × 51mm high × 50mm deep on the longer edge and 38mm deep on the shorter edge. The shell of the wall box was made from 0.9mm thick galvanized steel. There are three holes located at the top edge plate with dimension 16mm wide × 10mm high.  

Item	Description	
	Location	GPOs and the wall boxes were installed on both exposed and unexposed side. There was 16mm spacing between the exposed and unexposed side wall box. Both wall boxes were located at 920mm above the sill of the specimen. The GPOs were staggered and had an east-west offset of 30mm in between each other.
	Intumescent	2 pieces of intumescent were installed inside the wall box. The overall dimensions of the intumescent pieces were approximately 46mm wide × 48mm long × 7mm with a density of 1294kg/m^3.
	Perimeter gaps	Unexposed side: Top: 1.2mm, Bottom: 0mm, West: 2.7mm, East: 1.9mm Exposed side: Top: 0.9mm, Bottom: 0mm, West: 2.8mm. East: 2.8mm
	Fixing	The wall box was fixed to the plasterboard behind the opening with pair of 30mm wide × 6.5mm high (centre) and 8mm high (edge) × 1.5mm thick metal strips and Ø3.4mm × 40mm long screws
6	**Cable**	
	Product Name	General 2 cores + Earth (2.5mm^2) cable
	Cable exit location	The cables exited the wall box through the holes on the top edge
	Installation	The cable was connected to the GPO and had 500mm extension length outside the wall box located in the cavity of the plasterboard wall.
SERVICE C		
7	**Switch**	**Exposed and Unexposed side**
	Product name	PUSWV1G, Trader™ Switch Vertical 1 Gang 10AX/16A 250W~ 
	Switch dimensions	Overall dimension of the switch was 117mm high × 75mm wide× 13mm deep
	Switch material	Polycarbonate (PC)
	Cut out dimension	The cut out behind the GPO was: Unexposed side: 100mm wide × 53mm high Exposed side: 100mm wide × 54mm high
8	**Wall box**	
	Product Name	HYGFRWB Fire and Acoustic Rated Wall Box

Item	Description	
	GPO wall box size	Overall dimension of the wall box was nominal 57mm wide × 95mm high × 50mm deep on the longer edge and 38mm deep on the shorter edge. The shell of the wall box was made from 0.9mm thick galvanized steel. There are three holes located at the top edge plate with dimension 8mm wide × 20mm high. 
	Location	GPOs and the wall boxes were installed on both exposed and unexposed side. There was 16mm spacing between the exposed and unexposed side wall box. The unexposed wall box was located 874mm above the sill of the specimen, whilst the exposed side wall box was located 750mm above the sill of the specimen.
	Intumescent	2 pieces of intumescent were installed inside the wall box. The overall dimensions of the intumescent pieces were approximately 46mm wide × 48mm long × 7mm with a density of 1294kg/m^3.
	Perimeter gaps	Unexposed side: Top: 3.4mm, Bottom: 1.2mm, West: 2.5mm, East: 1.5mm Exposed side: Top: 1.8mm, Bottom: 1.8mm, West: 0 mm. East: 0.8mm
	Fixing	The wall box was fixed to the plasterboard behind the opening with pair of 30mm wide × 6.5mm high (centre) and 8mm high (edge) × 1.5mm metal strips and Ø3.4mm × 40mm long screws
9	**Cable**	
	Product Name	General 2 cores + Earth (2.5mm^2) cable
	Cable exit location	The cables exited the wall box through the holes on the top edge
	Installation	The cable was connected to the GPO and had 500mm extension length outside the wall box located in the cavity of the plasterboard wall.
SEPARATING ELEMENT		
10	**Product Name**	Plasterboard Wall
	Size	1170mm high × 1200mm wide × 116mm thick wall. 2-off layers, each side, 13mm Fyrchek plasterboard
	Density	836 kg/m^3 (measured)

Item	Description	
	Installation	Perimeter studs and tracks were fixed to the concrete blockwork using Ø6.5mm × 55mm Sleeve Anchor Hex Head fasteners. Internal studs were installed at 380mm from the sides and the noggings were installed 395mm (East) and 716mm from the bottom, and 410mm (Centre) and 816mm from the bottom Noggins and studs were screwed fixed to one another at the junctions using 16mm long × 10 Gauge Needle Point button head screws. Inner sheet fixed to steel stud frame using 32mm long × 12 Gauge Needle Point Fine Thread ZY plasterboard screws. Outer sheet fixed to steel stud using 45mm long x 8 Gauge Needle Point Fine Thread ZY plasterboard screws. Nominal 300mm centres at edges and in the field. Stonewool was placed within the framework work insulating the different segments. See Appendix 1 for more details.

3 TEST PROCEDURE

STATEMENT OF COMPLIANCE

The test was performed in accordance with the requirements of AS 1530.4-2014 Sections 2 & 10 apart from the variations indicated below.

VARIATIONS TO TEST METHOD

The pressure applied during the test was set to simulate a service installation at 1000mm above floor level and as such the results are limited to installation of this height or lower.

The average pressure during the 5-10 minute stage was 6 Pa, which is higher than the 2Pa ± 3Pa limit. The increased pressure conditions during the test were more onerous on the specimens and therefore did not affect the applicability of the results.

PRE-TEST CONDITIONING

The installation of the services was finished on the 16th January 2017 and was tested on the 17th January 2017. During the period prior to testing, 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 specimens for the test.

AMBIENT TEMPERATURE

The ambient temperature at the start of the test was 35°C and did not vary significantly throughout the duration of the test.

TEST DURATION

The test duration was 121 minutes

INSTRUMENTATION AND EQUIPMENT

The instrumentation was provided in accordance with AS 1530.4-2014 and as detailed below:

The furnace temperature was measured by 4-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 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 thermocouples 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.

Cotton pads and gap gauges were available during the test to assess the performance under the criteria for integrity.

The furnace pressure was measured 280mm below the centre of the lowest penetration. This represented a normal service install of 1000mm from the floor.

4 TEST MEASUREMENTS

FURNACE TEMPERATURE AND PRESSURE MEASUREMENTS

Furnace temperature and pressure data are provided in Appendix 5.

SPECIMEN TEMPERATURES

Specimen temperature data is provided 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 1530.4-2014 is provided in Appendix 2. Photographs of the specimen are included in Appendix 6.

5 TEST RESULTS

The specimens listed below achieved the following performance with respect to the performance criteria of AS 1530.4-2014, Section 2 & 10 subject to the test method variations noted in section 3 of this report.

Service	Criteria	Result
A	Structural Adequacy	Not applicable
	Integrity	No failure at 120 minutes
	Insulation	No failure at 120 minutes
	FRL	**-/120/120**
B	Structural Adequacy	Not applicable
	Integrity	No failure at 120 minutes
	Insulation	No failure at 120 minutes
	FRL	**-/120/120**
C	Structural Adequacy	Not applicable
	Integrity	No failure at 120 minutes
	Insulation	No failure at 120 minutes
	FRL	**-/120/120**

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 methods of construction, the test conditions and the results obtained when the specific element of construction described herein was tested in accordance with the test method with 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

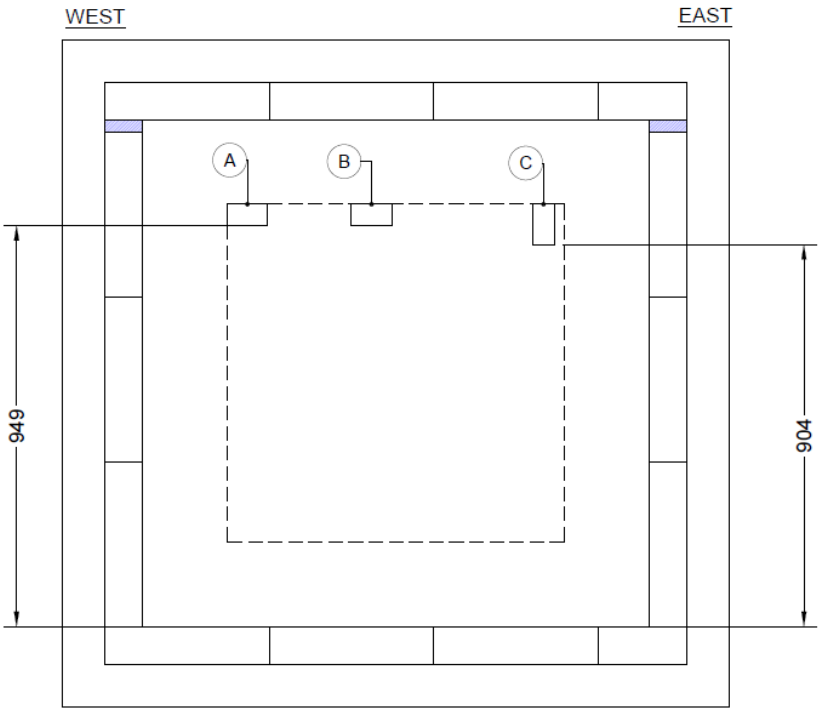


Figure A1.1: Unexposed side of test specimen

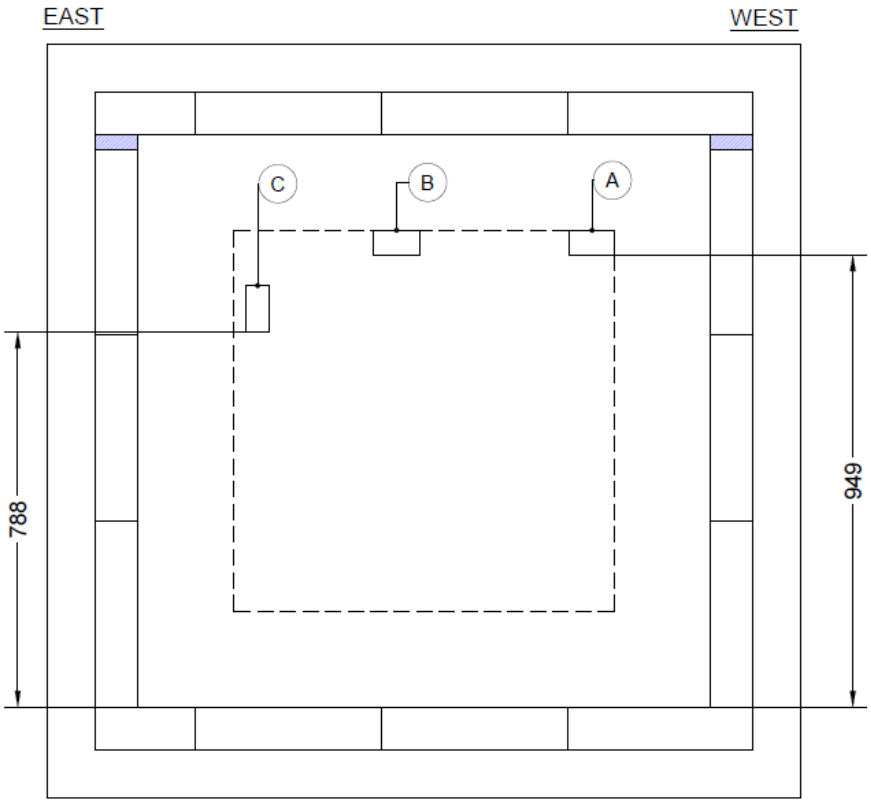


Figure A1.2: Exposed side of test specimen

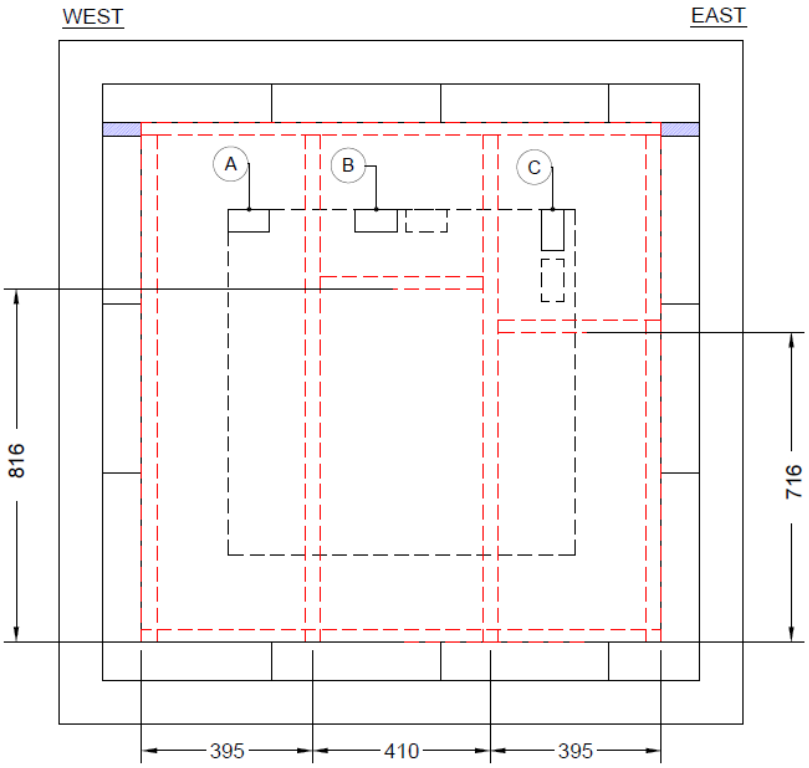


Figure A1.3: Overall View – Unexposed Side View

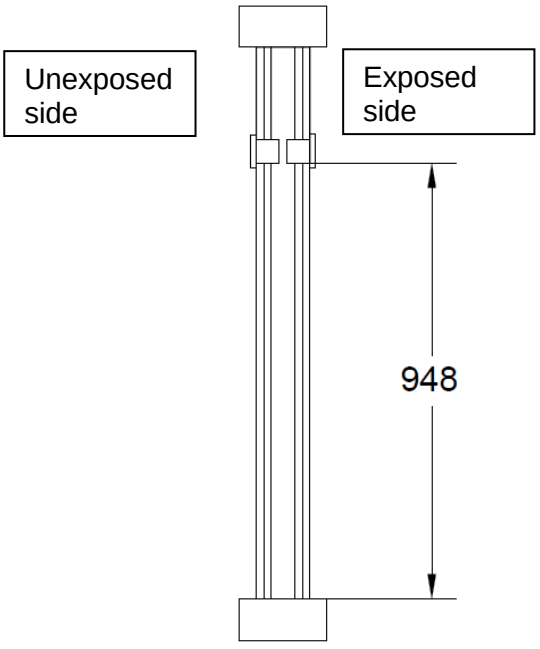


Figure A1.4: Vertical Cross-Section of Services A & B

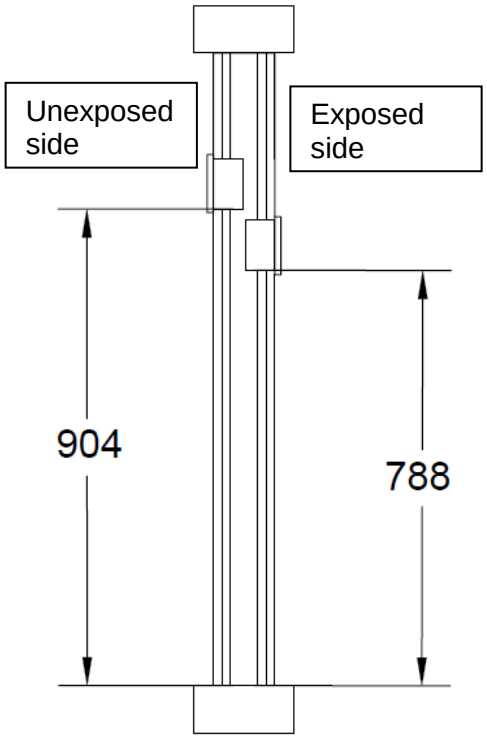


Figure A1.5: Vertical Cross-section of Service C

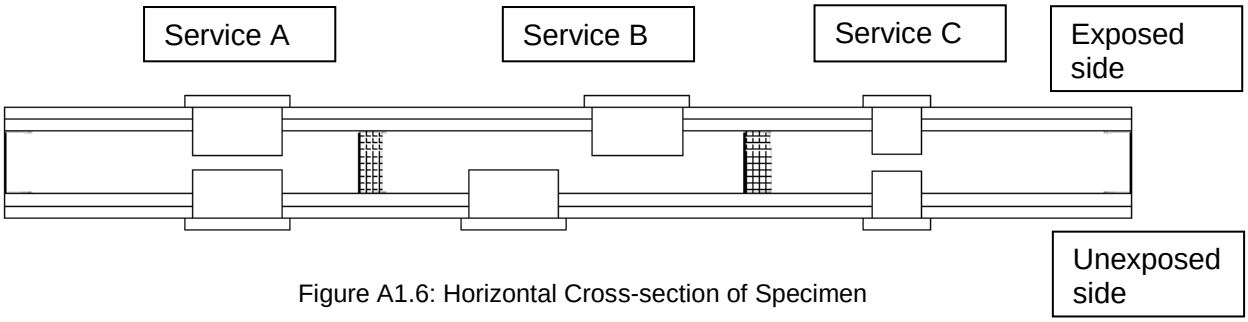


Figure A1.6: Horizontal Cross-section of Specimen

APPENDIX 2 TEST OBSERVATIONS

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

Time Min	Time Sec	Observation
Specimen A		
0	00	Fire resistance test commenced and the ambient temperature was approximately 35°C
05	00	It had become evident that smoke has started from the GPO.
15	00	Charring around the perimeter of the GPO had become evident.
25	33	It had become evident that the GPO on the exposed side has melted off.
30	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
36	51	Stream of liquid below the GPO, from the bottom edge of the GPO down to the joint of the plaster board had become evident.
60	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
63	45	It had become evident that the charring around the GPO had become darker.
66	11	It had become evident that the GPO has detached from the plasterboard along the top edge.
71	50	Roving thermocouple applied above the GPO on the plasterboard recording a maximum temperature of 65°C in accordance with AS 1530.4-2014, clause 2.12.3 b). No failure.
82	22	It had become evident that the mastic from inside the GPO has started falling off.
90	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
120	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
121	00	Test terminated at the request of the sponsor.
Specimen B		
0	00	Fire resistance test commenced and the ambient temperature was approximately 35°C
05	00	It had become evident that smoke has started from the GPO.
15	00	Charring around the perimeter of the GPO had become evident.
25	33	It had become evident that the GPO on the exposed side has melted off.
30	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
36	51	Stream of liquid below the GPO, from the bottom edge of the GPO down to the joint of the plaster board had become evident.
60	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
63	45	It had become evident that the charring around the GPO had become darker.
66	11	It had become evident that the GPO has detached from the plasterboard along the top edge.
66	25	A 30 second cotton pad test was carried out in accordance with AS 1530.4- 2014, clause 2.13.2.2 on the plasterboard right above the GPO. No failure.
90	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
120	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
121	00	Test terminated at the request of the sponsor.
Specimen C		
0	00	Fire resistance test commenced and the ambient temperature was approximately 35°C
05	00	It had become evident that smoke has started from the GPO.
15	00	Charring around the perimeter of the GPO had become evident.
25	33	It had become evident that the GPO on the exposed side has melted off.

Time Min	Sec	Observation
30	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
41	34	Stream of liquid below the GPO, from the bottom edge of the GPO down to the joint of the plaster board had become evident.
60	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
68	50	It had become evident that the GPO has detached from the plasterboard along the top edge.
73	00	Roving thermocouple applied above the GPO on the plasterboard recording a maximum temperature of 79°C in accordance with AS 1530.4-2014, clause 2.12.3 b). No failure.
87	38	It had become evident that the mastic from inside the GPO has started falling off.
90	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
91	10	Roving thermocouple applied on the mastic inside the GPO recording a maximum temperature of 101°C in accordance with AS 1530.4-2014, clause 2.12.3 b). No failure.
120	00	Specimen continued to maintain integrity and insulation in accordance with AS1530.4- 2014.
121	00	Test terminated at the request of the sponsor.

APPENDIX 3 DIRECT FIELD OF APPLICATION

A 3.1 GENERAL

AS 1530.4-2014 indicates that the results of a fire resistance test contained in this report are directly applicable without reference to the testing authority to similar constructions where one or more of the following changes are made:

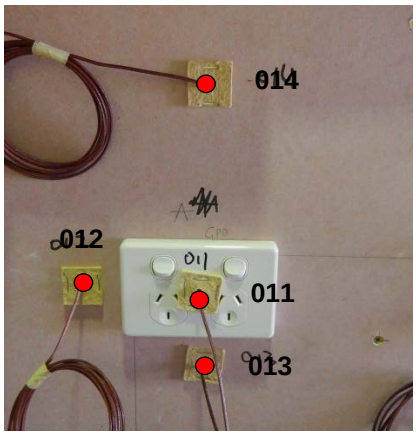
A 3.2 SEPARATING ELEMENTS

a) Results obtained from framed wall systems may be applied to the performance of a system in concrete, masonry or solid gypsum blocks of greater or equal thickness to that of the tested prototype. The reverse does not apply.

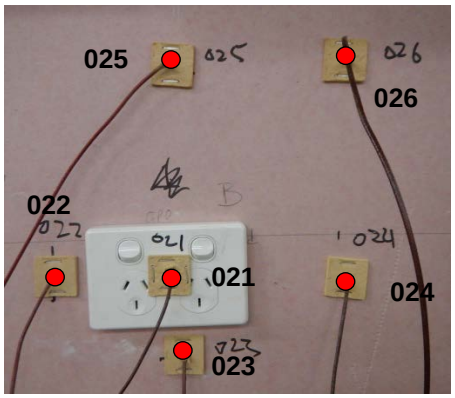
b) Results obtained from framed wall systems may be applied to similar walls having studs of the same material with sizes greater than the tested prototype.

c) Results obtained from a prototype test may be applied to framed wall systems of similar construction but having thicker facings of the same material applied to the stud.

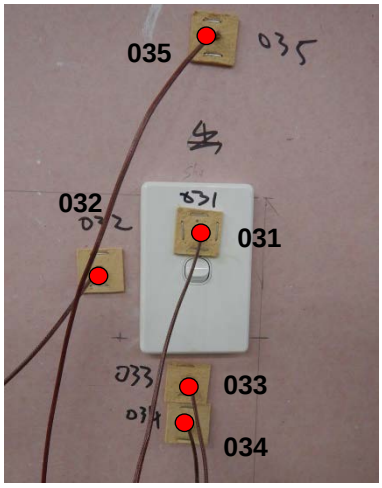
APPENDIX 4 INSTRUMENTATION POSITIONS



Specimen A



Specimen B



Specimen C

Figure A4.1: Thermocouple locations

Table A4.1 Thermocouple locations

Service	T/C No	Description
A	**011**	At the centre of the socket outlet on the unexposed side wall
	012	25mm west of the socket outlet on the unexposed side wall
	013	25mm under the socket outlet on the unexposed side wall
	014	On the unexposed side wall, 150mm above the Socket Outlet
B	**021**	At the centre of the socket outlet on the unexposed side wall
	022	25mm west of the socket outlet on the unexposed side wall
	023	25mm under socket outlet on the unexposed side wall
	024	On the plasterboard wall behind the exposed side socket outlet
	025	On the unexposed side wall, 150mm above the socket outlet
	026	150mm above the point on the unexposed plasterboard behind the exposed side socket outlet
C	**031**	At the centre of the wall switch on the unexposed side wall
	032	25mm west of the wall switch on the unexposed side wall
	033	25mm under the wall switch on the unexposed side wall
	034	On the plasterboard wall behind the exposed side wall switch
	035	150mm above the point on the unexposed plasterboard behind the exposed side wall switch

APPENDIX 5 TEST DATA

A 5.1 FURNACE TEMPERATURE

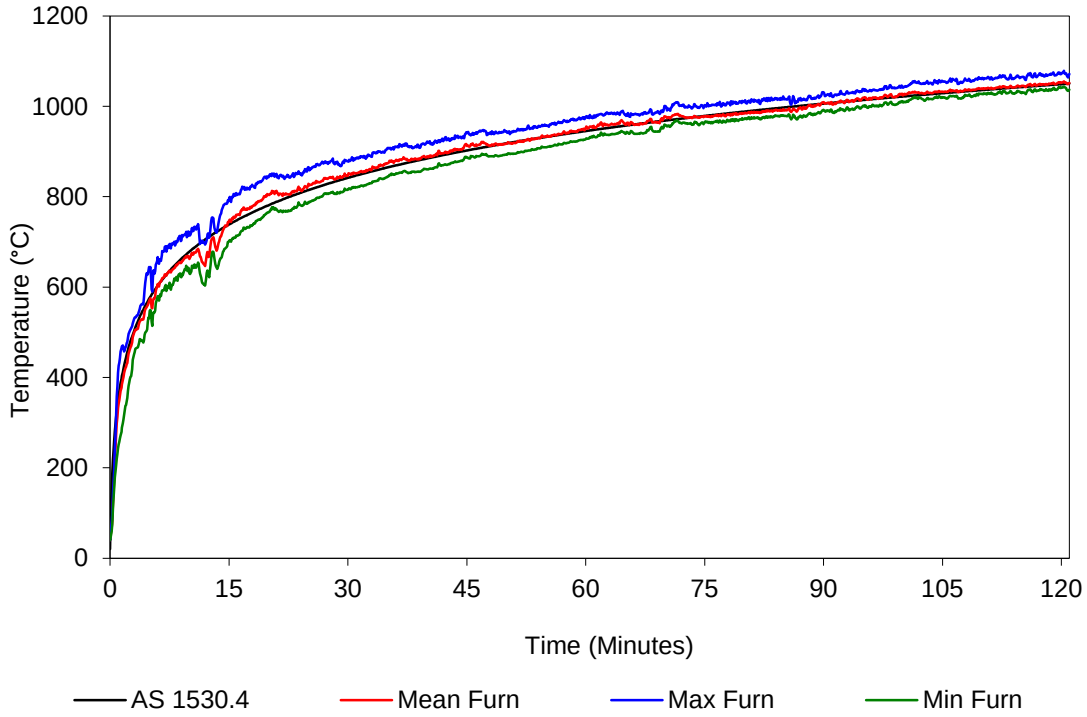


Figure A5.1: Furnace Temperatures vs. Time

A 5.2 FURNACE PRESSURE

Time (minutes)	Pressure (Pa) Avg.	Time (minutes)	Pressure (Pa) Avg.
5-10	**3**	65-70	**2**
10-15	**6**	70-75	**2**
15-20	**3**	75-80	**3**
20-25	**3**	80-85	**3**
25-30	**2**	85-90	**3**
30-35	**2**	90-95	**3**
35-40	**2**	95-100	**3**
40-45	**1**	100-105	**3**
45-50	**2**	105-110	**3**
50-55	**2**	110-115	**3**
55-60	**3**	115-120	**4**
60-65	**3**		

Note: The furnace pressure was set to 2Pa at the 280mm below the centre of the lowest penetration. This represented a normal service install of 1000mm from the floor.

A 5.3 SPECIMEN TEMPERATURES

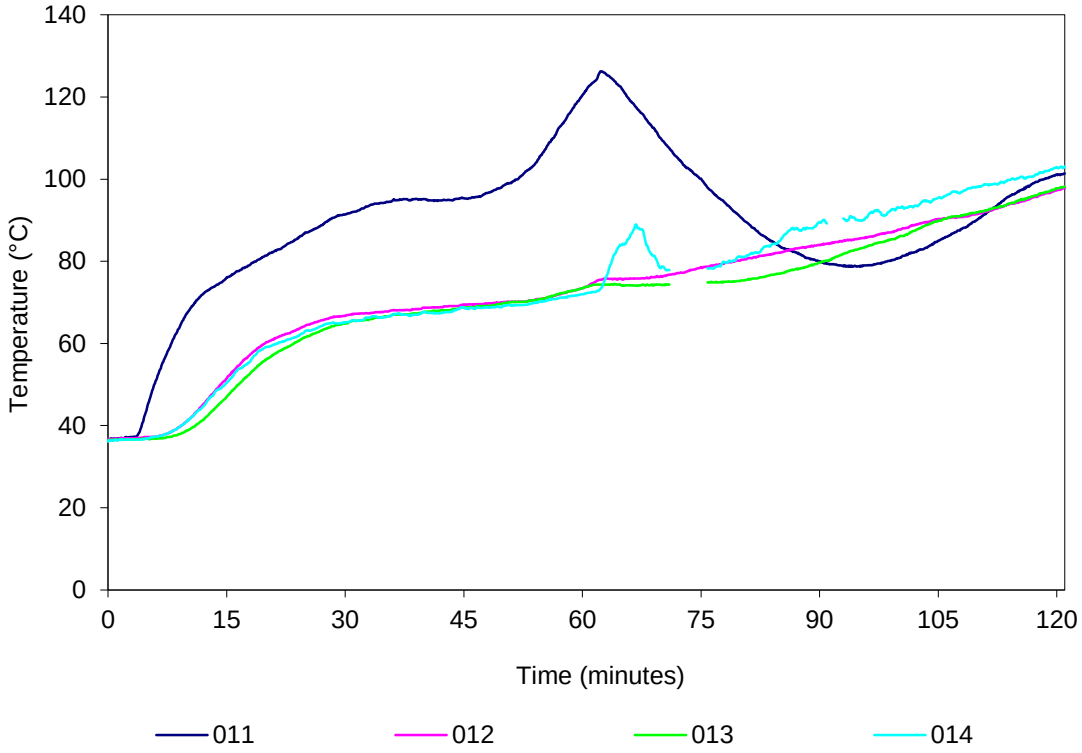


Figure A5.2: Service A. Temperatures vs. Time

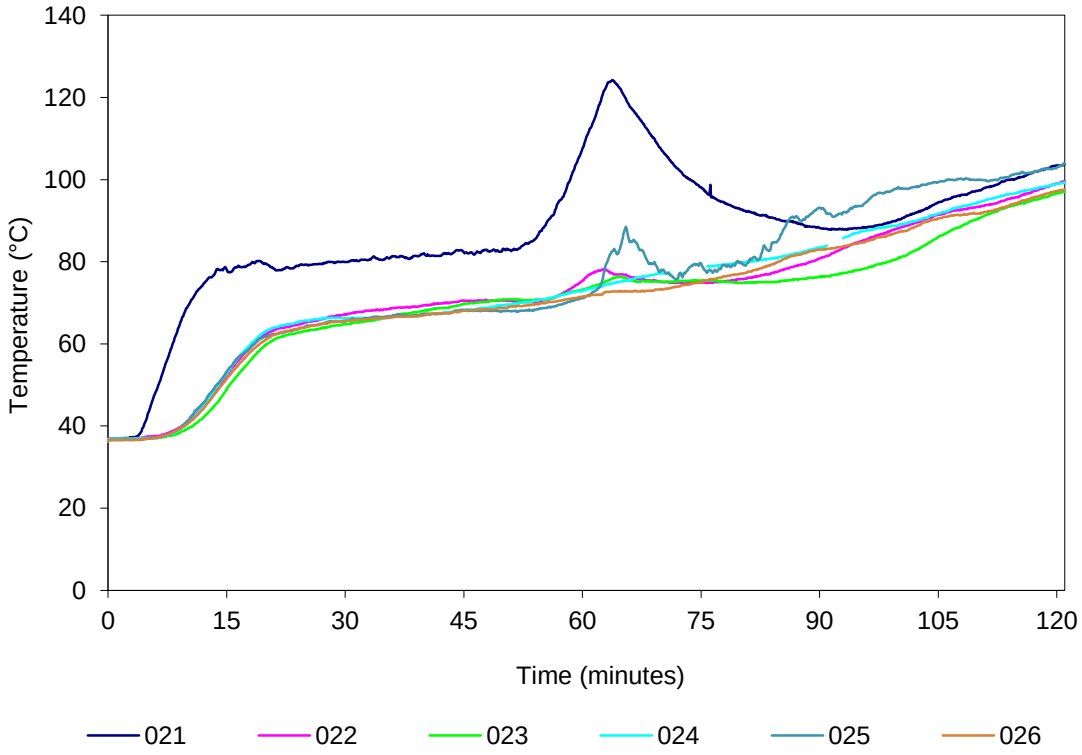


Figure A5.3: Service B. Temperatures vs. Time

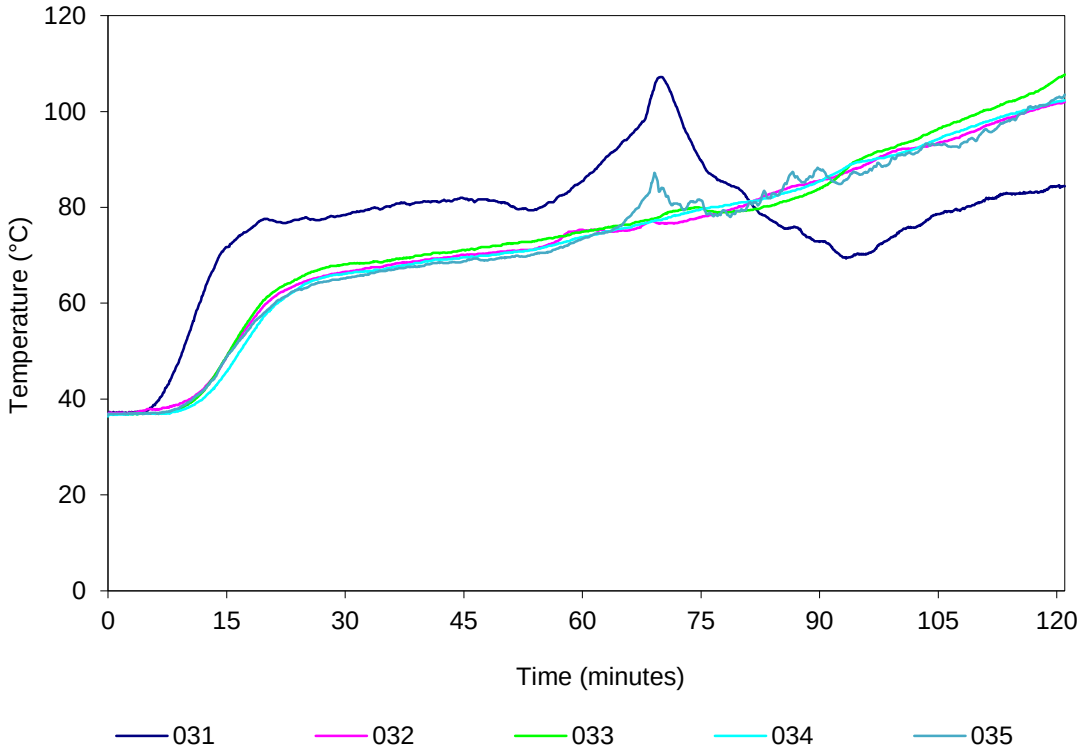


Figure A5.4: Service C. Temperatures vs. Time

Table A5.1: Test Specimen Temperatures

Service	T/C No	Description[2]	Temp. (°C) at t (minutes)					Limit[1] (Mins.)
			t=0	t=30	t=60	t=90	t=120	
A	011	At the centre of the socket outlet on the unexposed side wall	37	92	120	80	101	-
	012	25mm west of the socket outlet on the unexposed side wall	36	67	73	84	97	-
	013	25mm under the socket outlet on the unexposed side wall	36	65	73	80	97	-
	014	On the unexposed side wall, 150mm above the Socket Outlet	36	65	72	90	103	-
B	021	At the centre of the socket outlet on the unexposed side wall	37	80	107	88	103	-
	022	25mm west of the socket outlet on the unexposed side wall	37	67	75	81	99	-
	023	25mm under socket outlet on the unexposed side wall	36	65	73	76	96	-
	024	On the plasterboard wall behind the exposed side socket outlet	37	66	73	84	99	-
	025	On the unexposed side wall, 150mm above the socket outlet	36	66	71	93	103	-
	026	150mm above the point on the unexposed plasterboard behind the exposed side socket outlet	36	66	71	83	97	-
C	031	At the centre of the wall switch on the unexposed side wall	37	79	85	73	84	-
	032	25mm west of the wall switch on the unexposed side wall	37	67	75	86	102	-
	033	25mm under the wall switch on the unexposed side wall	37	68	75	84	106	-
	034	On the plasterboard wall behind the exposed side wall switch	36	66	74	86	102	-
	035	150mm above the point on the unexposed plasterboard behind the exposed side wall switch	37	65	73	88	102	-

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.

[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.

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.

APPENDIX 6 PHOTOGRAPHS

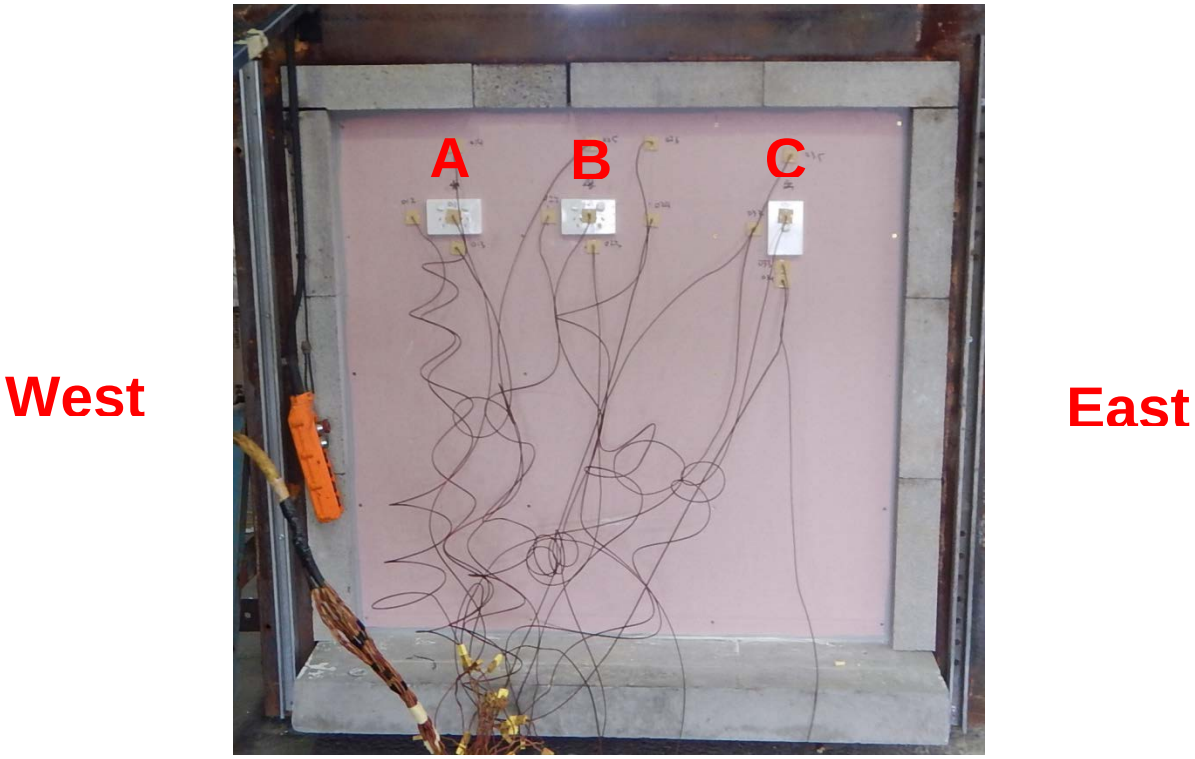


Figure A6.1. Unexposed face of specimen before commencement of the fire-resistance test.

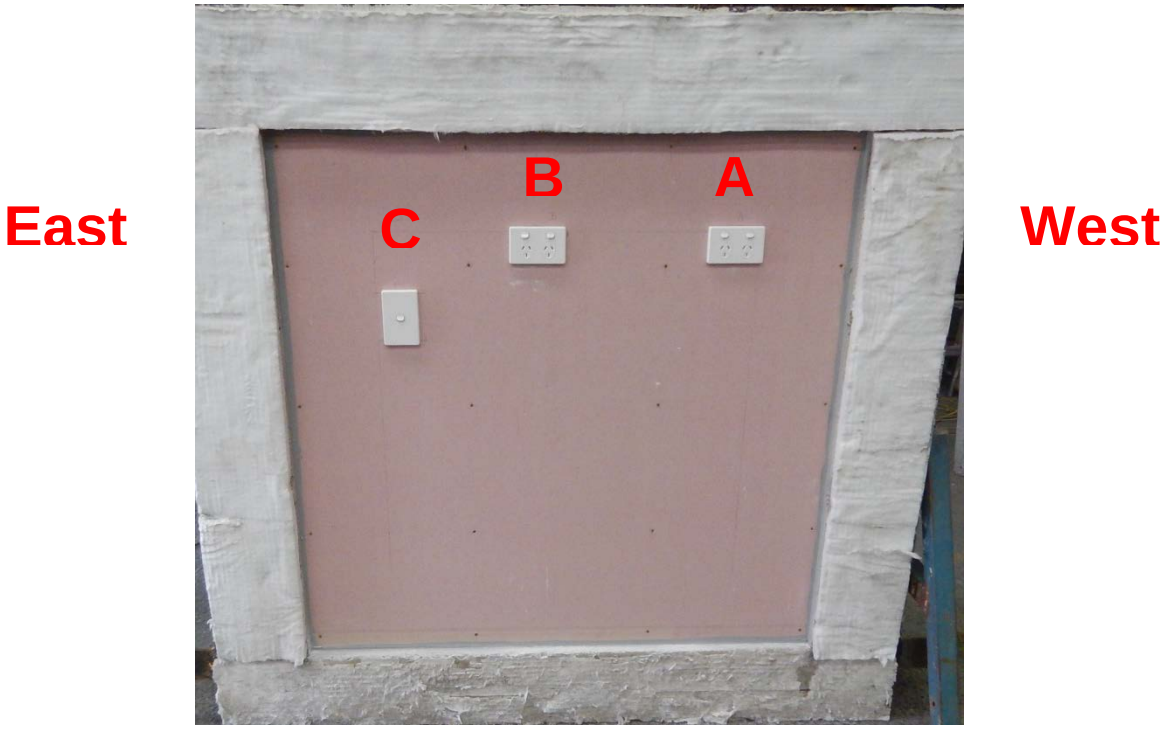
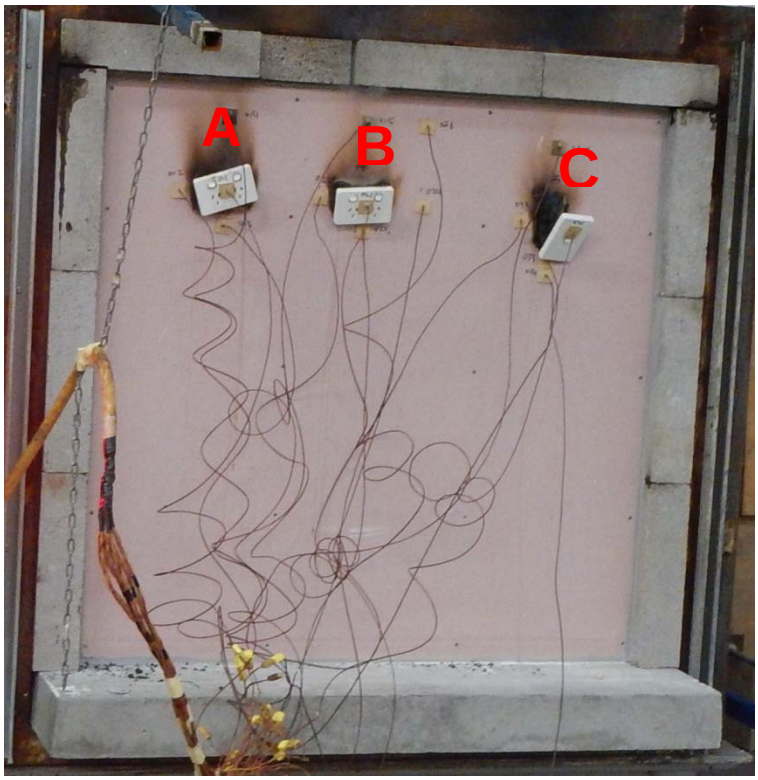


Figure A6.2. Exposed face of specimen before commencement of the fire-resistance test.

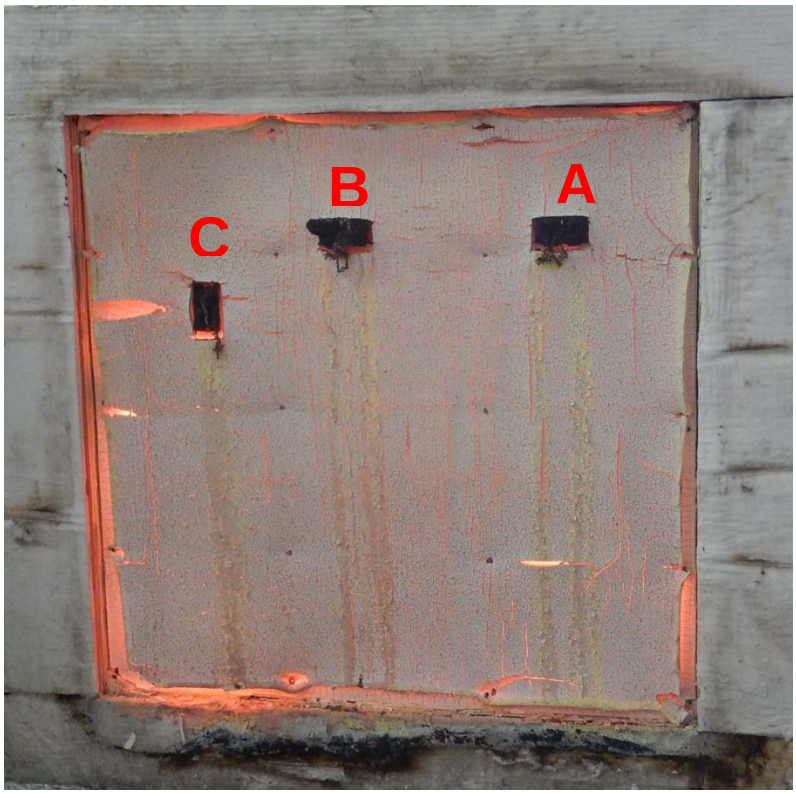
West



East

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

East



West

Figure A6.4. Exposed face of specimen after the end of the fire-resistance test.