

**BUSHFIRE TEST ON A WINDOW  
ROLLER SHUTTER**

**Report number FSZ 1456**

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**Client**

**CROCI AUSTRALIA PTY LTD**

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SPONSORED INVESTIGATION No. FSZ 1456  
BUSHFIRE TEST ON A WINDOW ROLLER SHUTTER

**SUMMARY**

## IDENTIFICATION OF SPECIMEN:

The sponsor identified the specimen as a aluminium window roller shutter assembly.

SPONSOR: Croci Australia Pty Ltd  
88-90 Derby Street  
PASCOE VALE VIC

MANUFACTURER: Croci Australia Pty Ltd  
88-90 Derby Street  
PASCOE VALE VIC

TEST STANDARD: Australian Standard 1530, Methods for fire tests on building materials, components and structures,

Part 8.1-2007: Tests on elements of construction for buildings exposed to simulated bushfire attack – Radiant heat and small flaming sources.

TEST NUMBER: FS 4185/3422

TEST DATE: The fire test was conducted on 14 January 2011.

## DESCRIPTION OF SPECIMEN:

The specimen comprised an aluminium window roller shutter assembly, overall size 2360-mm high x 2825-mm wide, protecting an aluminium framed glass window mounted into a brick wall opening.

The roller shutter curtain comprised two different extruded aluminium horizontal slats as shown in drawing numbered S3, dated December 2010, by Croci Australia. The slats were of a double walled cavity filled with Closed Cell Polyurethane Foam injected from the end of the slat. The AR6 flat profile slats, nominally 40-mm x 8-mm, were stated to be made by a 0.4-mm thick aluminium sheet, with profiles shown in drawing numbered S13, dated December 2010, by Croci Australia. The AR17 curved profile slats, nominally 43.5-mm x 7.4-mm, were stated to be made by a 0.4-mm thick aluminium sheet, with profiles shown in drawing numbered S14, dated December 2010 by Croci Australia.

The bottom of the curtain comprised of an aluminium bottom rail approximately 50-mm wide x 8.2-mm thick, was stated to be made from a 0.9-mm thick extruded aluminium, with profiles shown in drawing numbered S15, dated December 2010, by Croci Australia. Rubber seals, 4.6-mm thick and 3.8-mm thick were installed along the bottom rail as shown in drawing numbered S3, dated December 2010, by Croci Australia.

The vertical guides were an extruded aluminium section 62-mm x 25.4-mm, with profiles shown in drawing numbered S4, dated December 2010, by Croci Australia. The vertical guides were fixed to the wall with 32-mm x 6-mm dynabolts spaced at maximum 630-mm centres. Rubber seals, 4.6-mm thick and 3.8-mm thick were installed along the vertical guides as shown in drawing numbered S3, dated December 2010, by Croci Australia.

The head box comprised a two-part aluminium roll formed section designed to completely enclose the working parts of the roller shutter.

An aluminium framed glass window was mounted into the 2100-mm high x 2700-mm wide opening, as shown in Photograph 2, and protected by the roller shutter. The glass pane was 4-mm thick standard glass.

Both side guides and the bottom rail were lined on the inside with rubber seals as shown in drawing numbered S3, dated December 2010, by Croci Australia. Fire retardant plastic side clips were used at the ends of every 2<sup>nd</sup> slat as shown in drawing numbered S3, dated December 2010, by Croci Australia.

Sika Firerate PU sealant was used to seal the gaps around the guides and head box cover.

## ORIENTATION

The roller shutter was tested with the drum exposed to the radiant heat source.

## CRIB SIZE

Crib size selected by the test sponsor was *Class A*, simulating a debris pile not exceeding 0.12 kg (approximately 150-mm wide x 300-mm deep x 75-mm high).

Two cribs were used, one located at the bottom corner of the curtain, and the other on top of the head box.

## LEVEL OF RADIANT HEAT EXPOSURE

Level of radiant heat exposure selected by the test sponsor was Severe – 40 kW/m<sup>2</sup>.

## DOCUMENTATION:

Drawings numbered S2, S3, S4, S13, S14 and S15 dated December 2010 by Croci Australia.

Confidential information about the test specimen has been submitted and is retained at CSIRO Materials Science and Engineering.

## EQUIPMENT:

### FURNACE

The furnace had a nominal opening of 3000-mm x 3000-mm for attachment of vertical specimens.

The furnace was lined with refractory bricks and materials with the thermal properties as specified in AS 1530.4-2005 and was heated by combustion of a mixture of natural gas and air.

### TEMPERATURE

The temperature in the furnace chamber was measured by nine type K, 3-mm diameter, 310 stainless steel Mineral Insulated Metal Sheathed (MIMS) thermocouples. Each thermocouple was housed in high-nickel steel tubes opened at the exposed end.

The temperatures of the specimen were measured by glass-fibre insulated and sheathed K-type thermocouples with a wire diameter of 0.5-mm.

### RADIANT HEAT SOURCE

Radiant heat source consisted of a 3-mm thick black steel sheet mounted into a refractory frame in two sections with a vertical joint at its centre. The frame housing the steel sheet was positioned and sealed up against the front of the furnace aperture.

### RADIANT HEAT FLUX CALIBRATION

Prior to the test, positions of the specimen (relative to the radiant heat source) were established that corresponded to the required radiant heat flux levels.

Radiation distribution was also established by measuring radiant heat flux levels at the centre and the centre of each quarter section of the specimen in a plane approximating to the intended position of the specimen such that the central value will be approximately equal to the rest of the radiant heat flux.

### MEASUREMENT SYSTEM

The primary measurement system comprised of multiple-channel data loggers, scanning at two seconds intervals during the test.

**AMBIENT TEMPERATURE:**

The temperature of the test area was 26°C at the commencement of the test.

**TERMINATION OF TEST:**

The test was terminated at 60 minutes.

**TEST RESULTS:****CRITICAL OBSERVATIONS**

The following observations were made during the fire test:

- 0 minutes - Alight cribs placed in positions, one at the bottom corner and one on top of the drum cover of the roller shutter assembly.
- 20 seconds - Specimen moved into position – exposure to 40 kW/m<sup>2</sup>.
- 50 seconds - Paint bubbling – bucking of hood.
- 2:00 minutes - Small amount of smoke emitted from the unexposed face.
- 2:15 minutes - Paint ignited on the unexposed face, directly above crib (Photograph #4).
- 2:20 minutes - Specimen moved into position – exposure to 24 kW/m<sup>2</sup>.
- 2:50 minutes - Paint flaming out, flaming of bottom seal near crib.
- 3:20 minutes - Specimen moved into position – exposure to 16 kW/m<sup>2</sup>.
- 4:20 minutes - Specimen moved into position – exposure to 12 kW/m<sup>2</sup>.  
Integrity Failure: Flaming on unexposed face at crib position (Photograph #5).
- 4:44 minutes - Flaming out.
- 5:00 minutes - Left-hand top pane (unexposed face) cracked.
- 5:20 minutes - Specimen moved into position – exposure to 8.5 kW/m<sup>2</sup>.
- 6:20 minutes - Specimen moved into position – exposure to 7 kW/m<sup>2</sup>.
- 7:30 minutes - Specimen moved into position – exposure to 5 kW/m<sup>2</sup>.
- 8:30 minutes - Specimen moved into position – exposure to 4 kW/m<sup>2</sup>.  
Bottom crib glowing but not flaming.
- 9:30 minutes - Specimen moved into position – exposure to 3 kW/m<sup>2</sup>.
- 14:00 minutes - Top pane second from right cracked.
- 18:25 minutes - Cribs completely out.

- 30 minutes - Pilot flame applied – no ignition.
- 45 minutes - Pilot flame applied – no ignition.
- 59 minutes - Pilot flame applied – no ignition.
- 60 minutes - Test terminated – no flaming is observed.

#### RADIANT HEAT FLUX

Figure 1 shows the curves of target and incident radiation versus time and the actual curves of received radiation at 365-mm from the unexposed face and 250-mm from the exposed face versus time recorded during the test period.

Figure 2 shows the curve of received radiation versus time at 365-mm from the unexposed face of the specimen.

Figure 3 shows the curve of received radiation versus time at 250-mm from the exposed face of the specimen.

#### PERFORMANCE

Performance observed in respect of Clause 14.4 of AS1530.8.1-2007 criteria:

Performance Criteria	Time to failure (min:sec)	Position of failure
Formation of through gaps greater than 3-mm	No failure	-
Sustained flaming for 10 seconds on the non-fire side	4:20	Bottom right near crib position.
Flaming on the fire-exposed side at the end of the 60 minutes test period	No failure	-
Radiant heat flux 365-mm from the non-fire side exceeding 15 kW/m <sup>2</sup>	No failure	-
Mean and maximum temperature rises greater than 140 K and 180 K	Not applicable	-
Radiant heat flux 250-mm from the specimen, greater than 3 kW/m <sup>2</sup> between 20 minutes and 60 minutes	No failure	-
Mean and maximum temperature of internal faces exceeding 250°C and 300°C respectively between 20 minutes and 60 minutes after commencement of test	Not applicable	-
<b>Crib class</b>	<b>A</b>	<b>Peak heat flux</b>
		<b>40 kW/m<sup>2</sup></b>

For the purpose of building regulations in Australia, the test specimen did NOT achieve a Bushfire Attack Level (BAL) of A40.

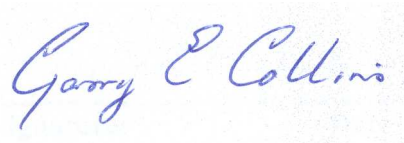


This report details methods of construction, the test conditions and the results obtained when the specific element of construction described herein was tested in accordance with AS 1530.8.1-2007.

TESTED BY:



Chris Wojcik  
Testing Officer



Garry E Collins  
Manager, Fire Testing and Assessments

25 February 2011

## APPENDICES

### APPENDIX 1



Photograph 1 - Exposed face of the specimen prior to testing



Photograph 2 - Unexposed face of the specimen prior to testing



Photograph 3 - Specimen at 30 seconds of testing

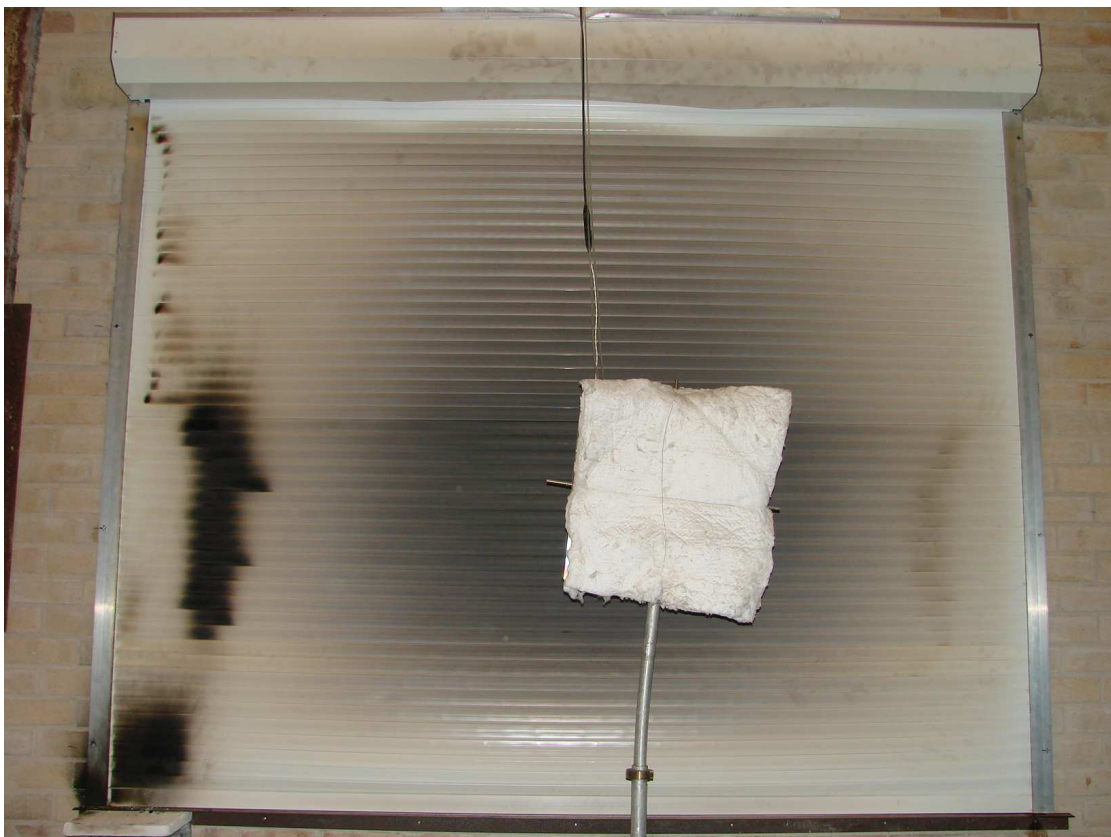


Photograph 4 - Specimen at 2:15 minutes into the test





Photograph 5 - Exposed face of the specimen at 4:20 minutes into the test

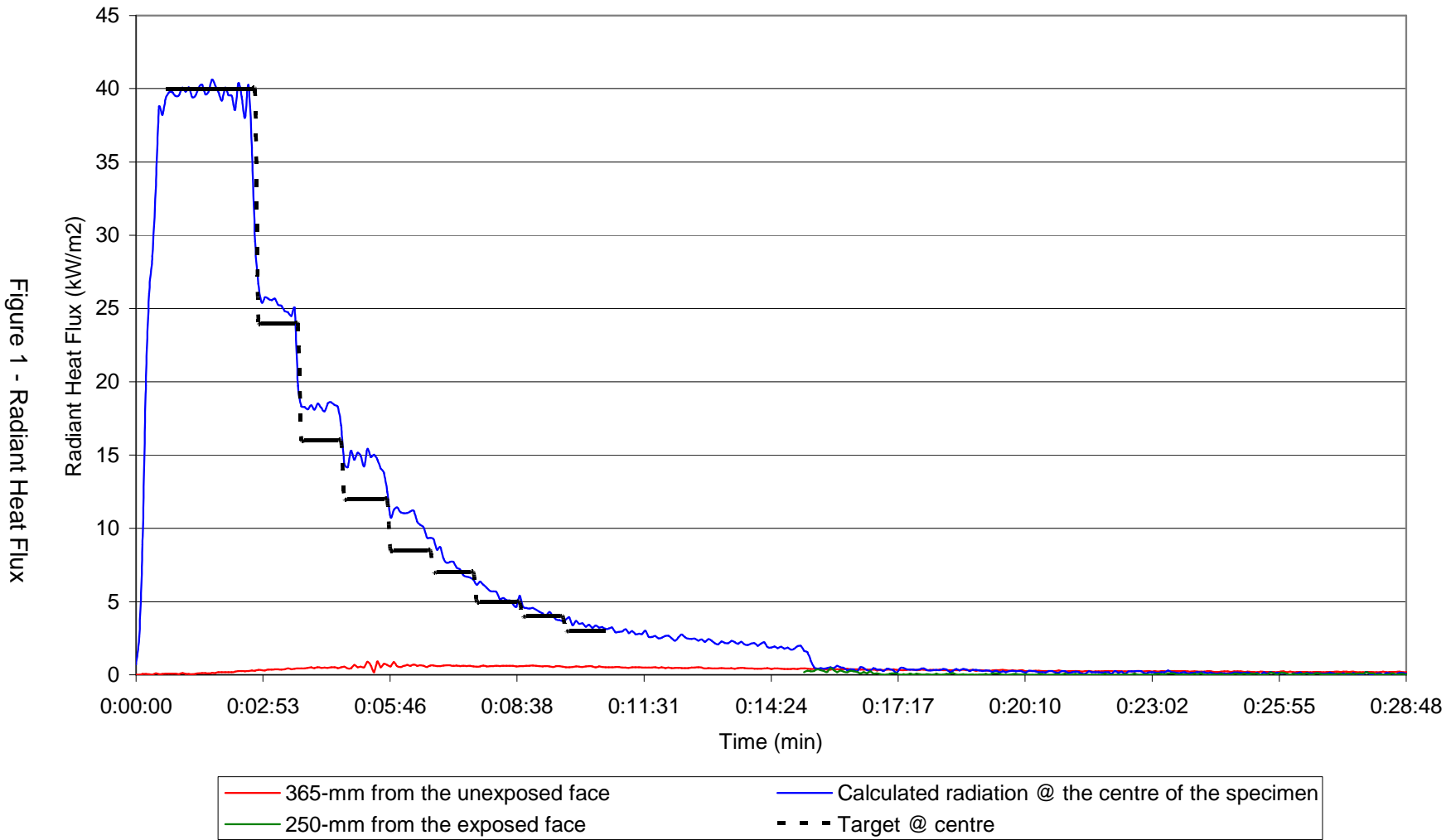


Photograph 6 - Exposed face of the specimen at the conclusion of testing



Photograph 7 - Unexposed face of the specimen at the conclusion of testing

## APPENDIX 2



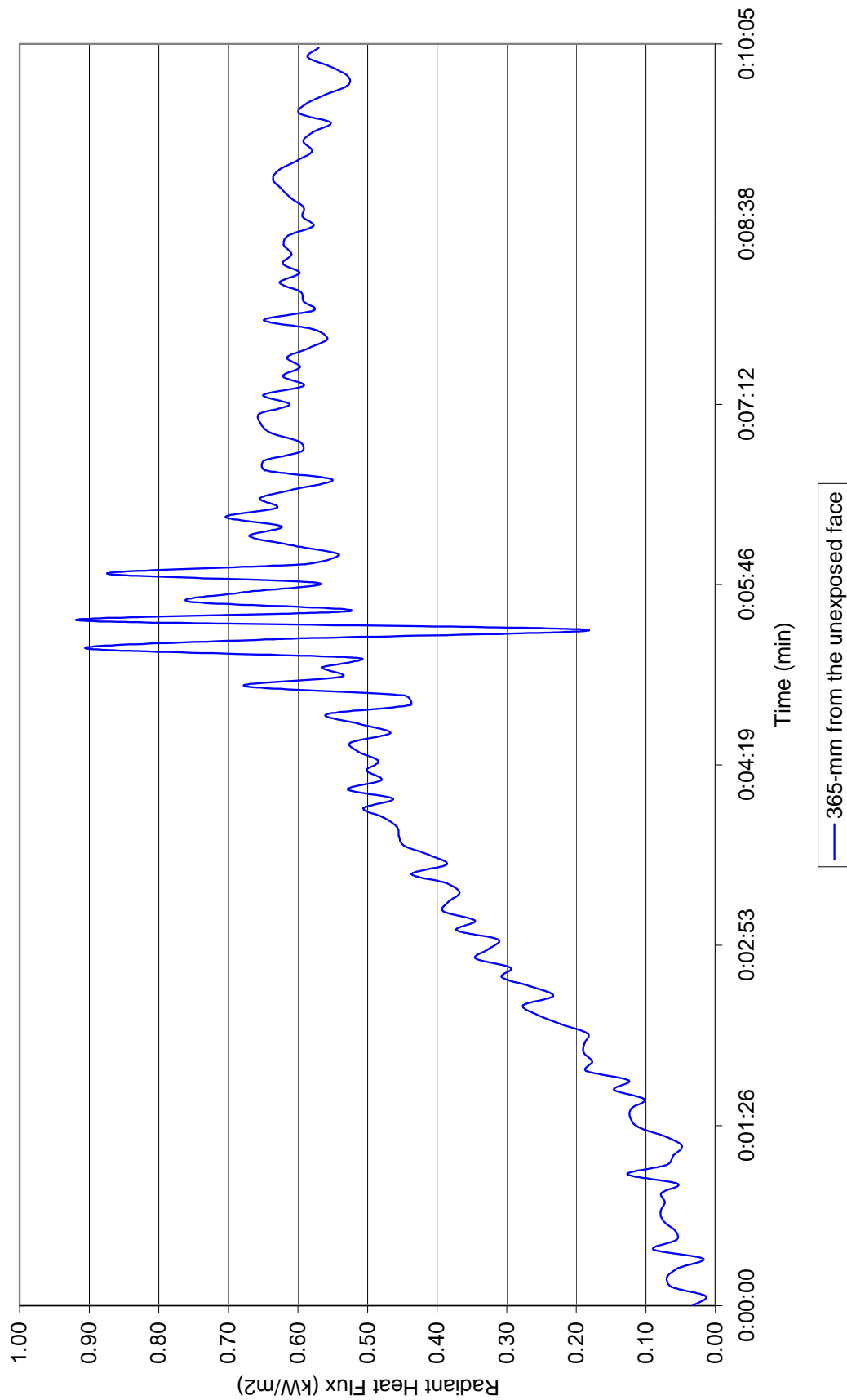


Figure 2 - Radiant Heat Flux received @ 365-mm from the unexposed face

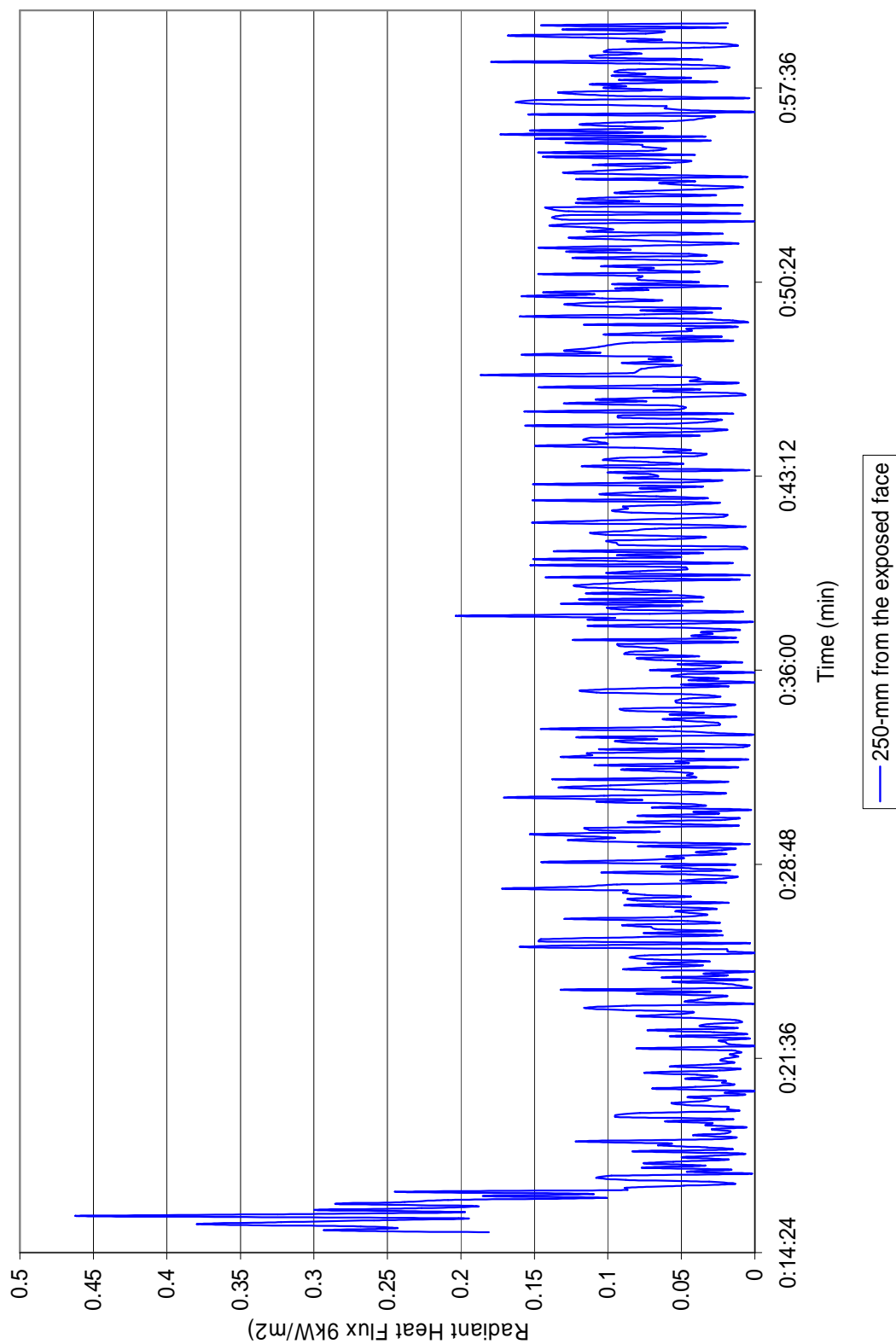
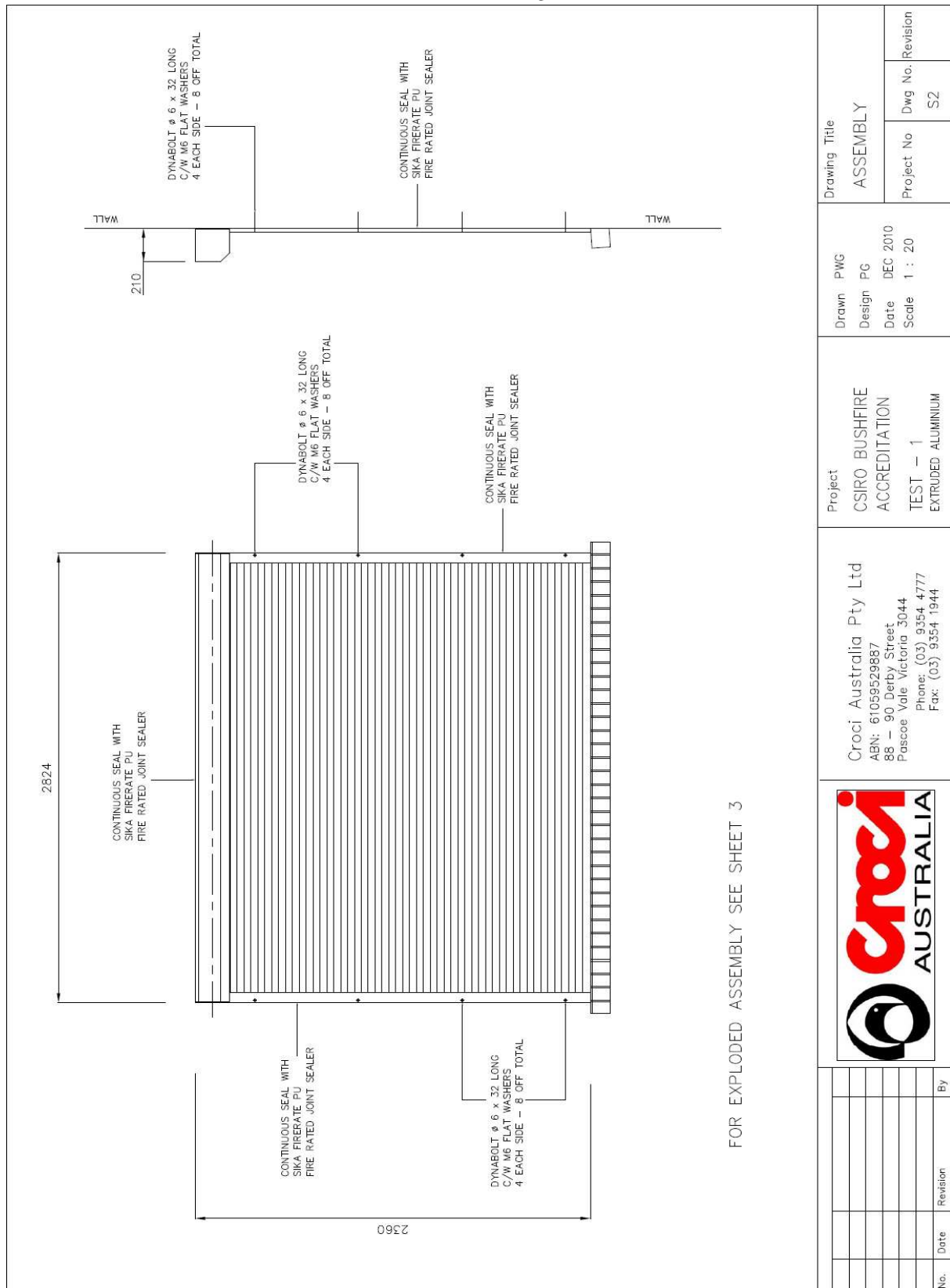


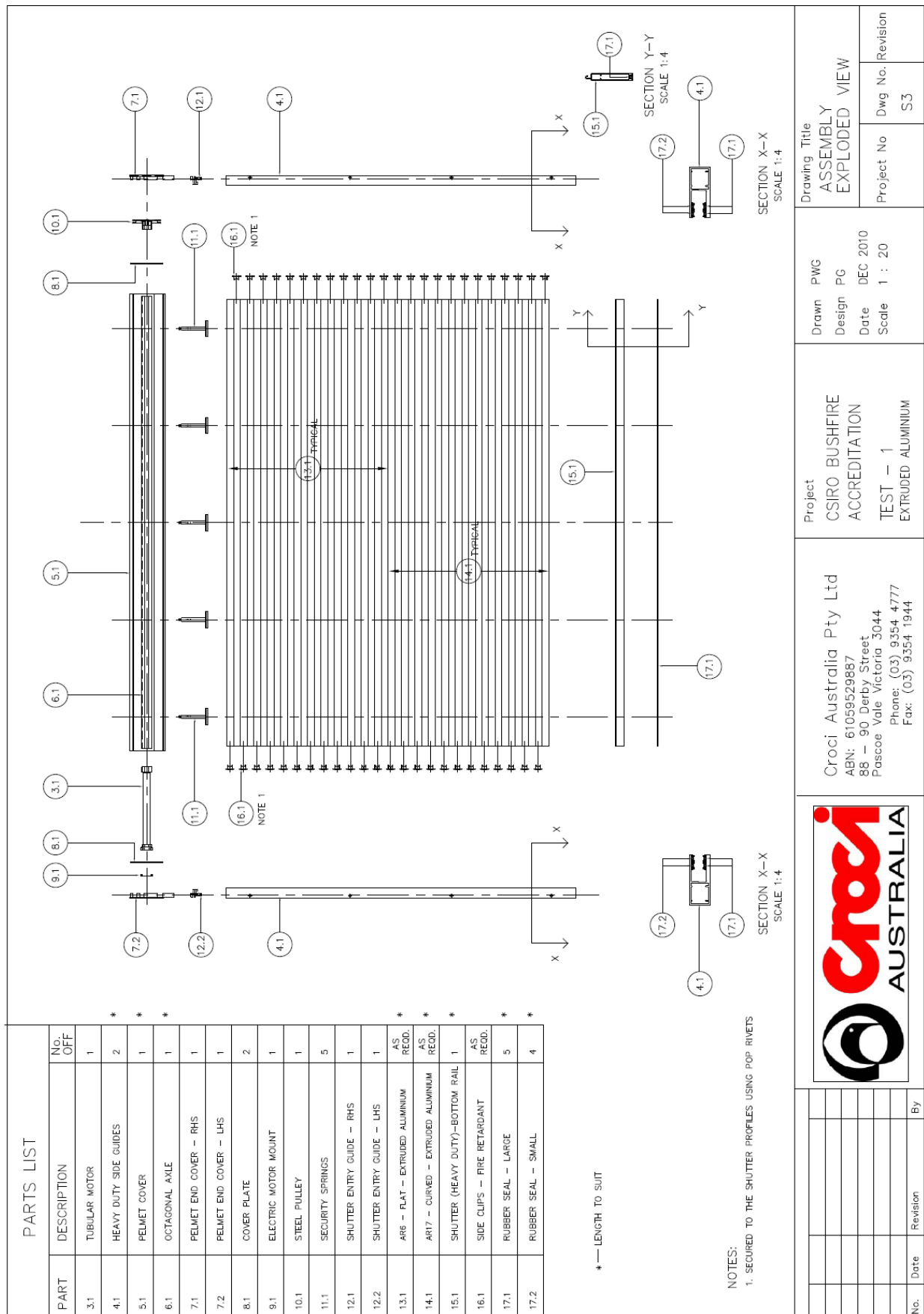
Figure 3 - Radiant Heat Flux received @ 250-mm from the exposed face



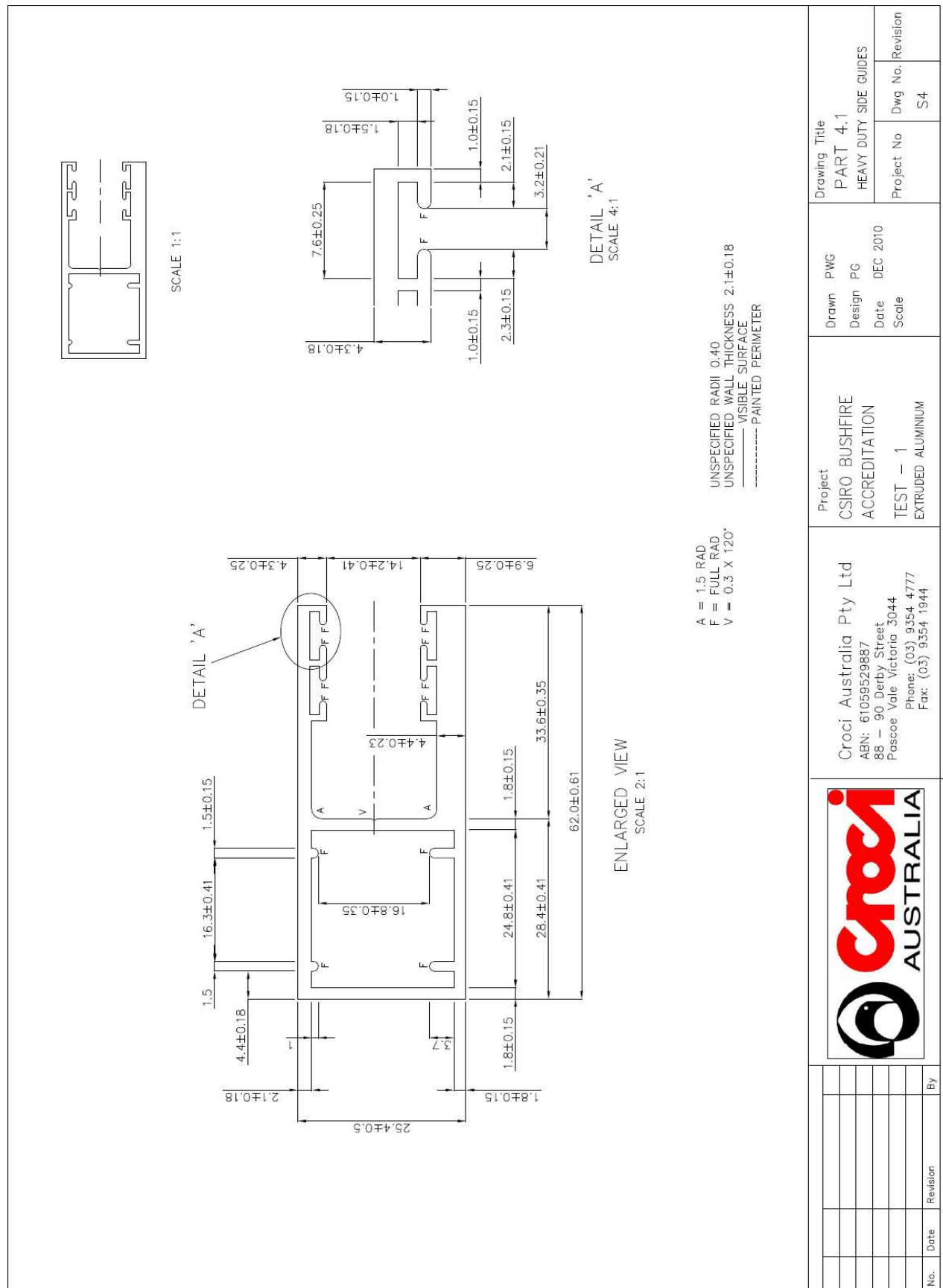
## APPENDIX 3



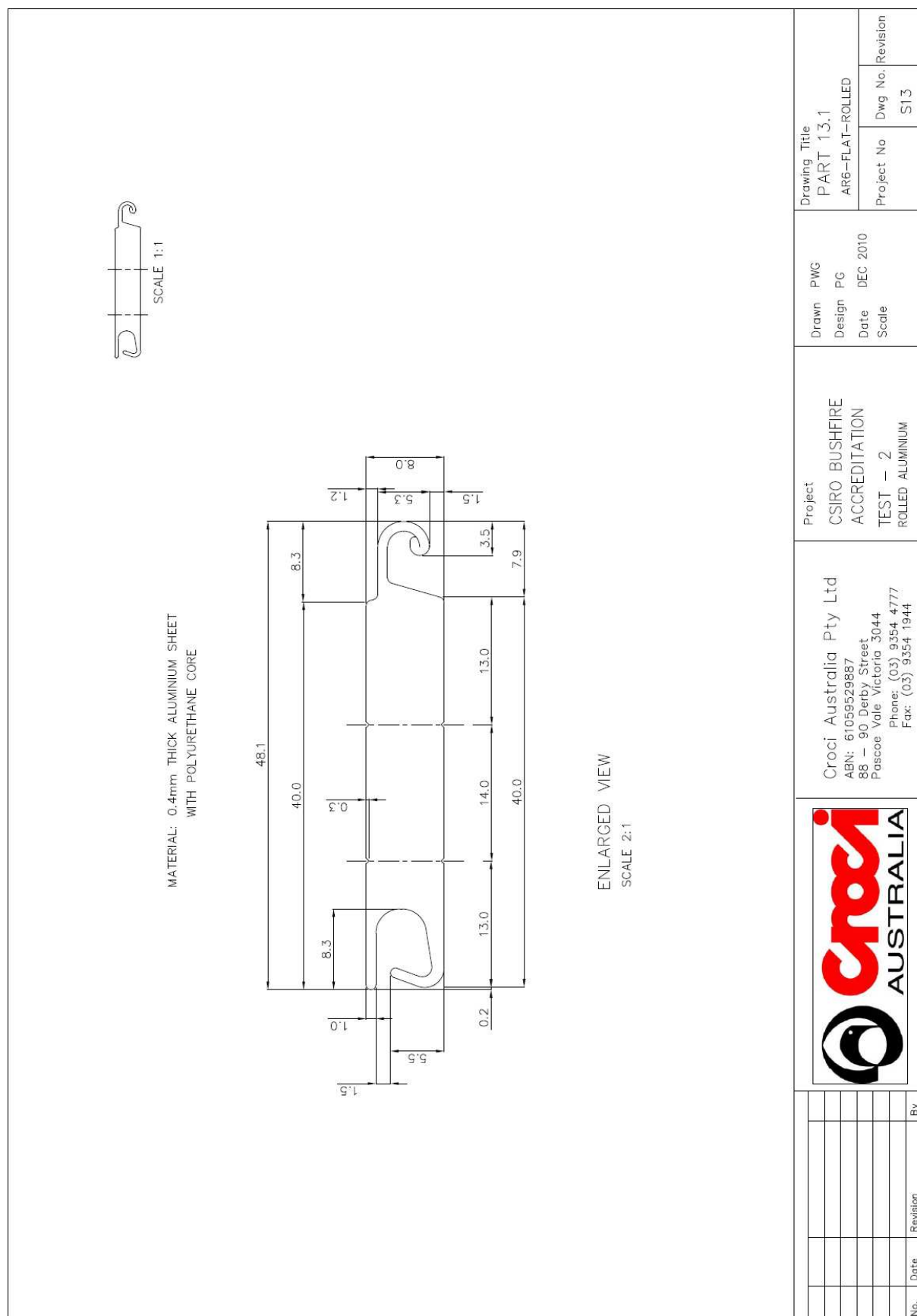
Drawing numbered S2 dated December 2010, by Croci Australia



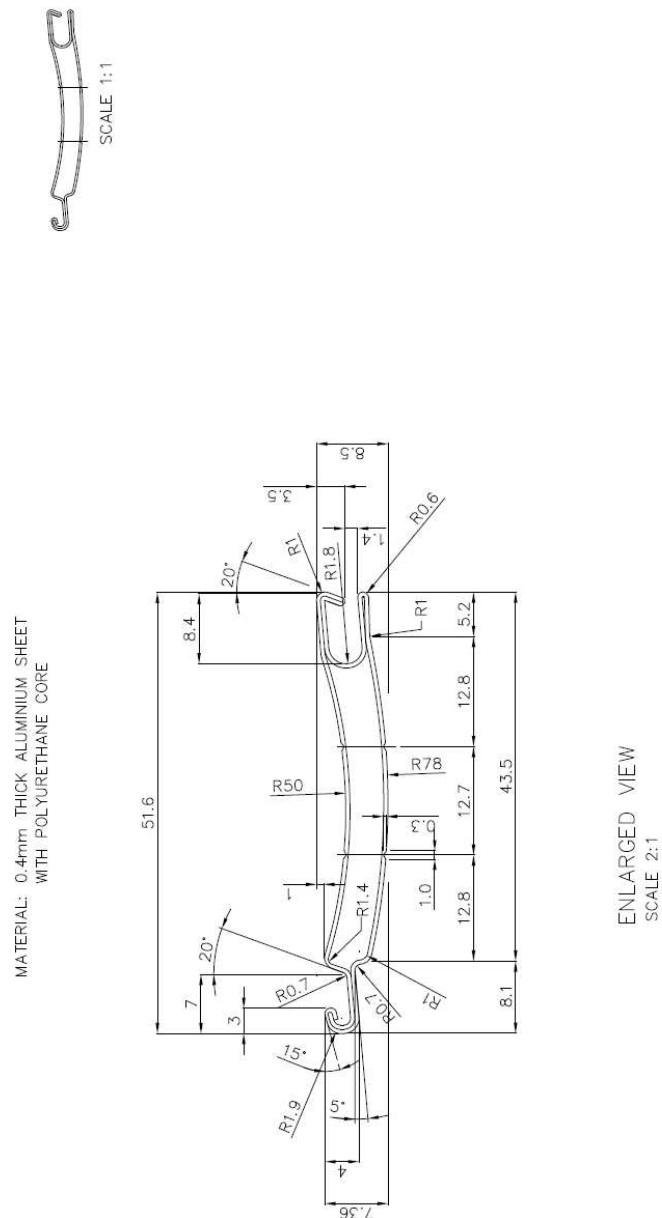
Drawing numbered S3 dated December 2010, by Croci Australia



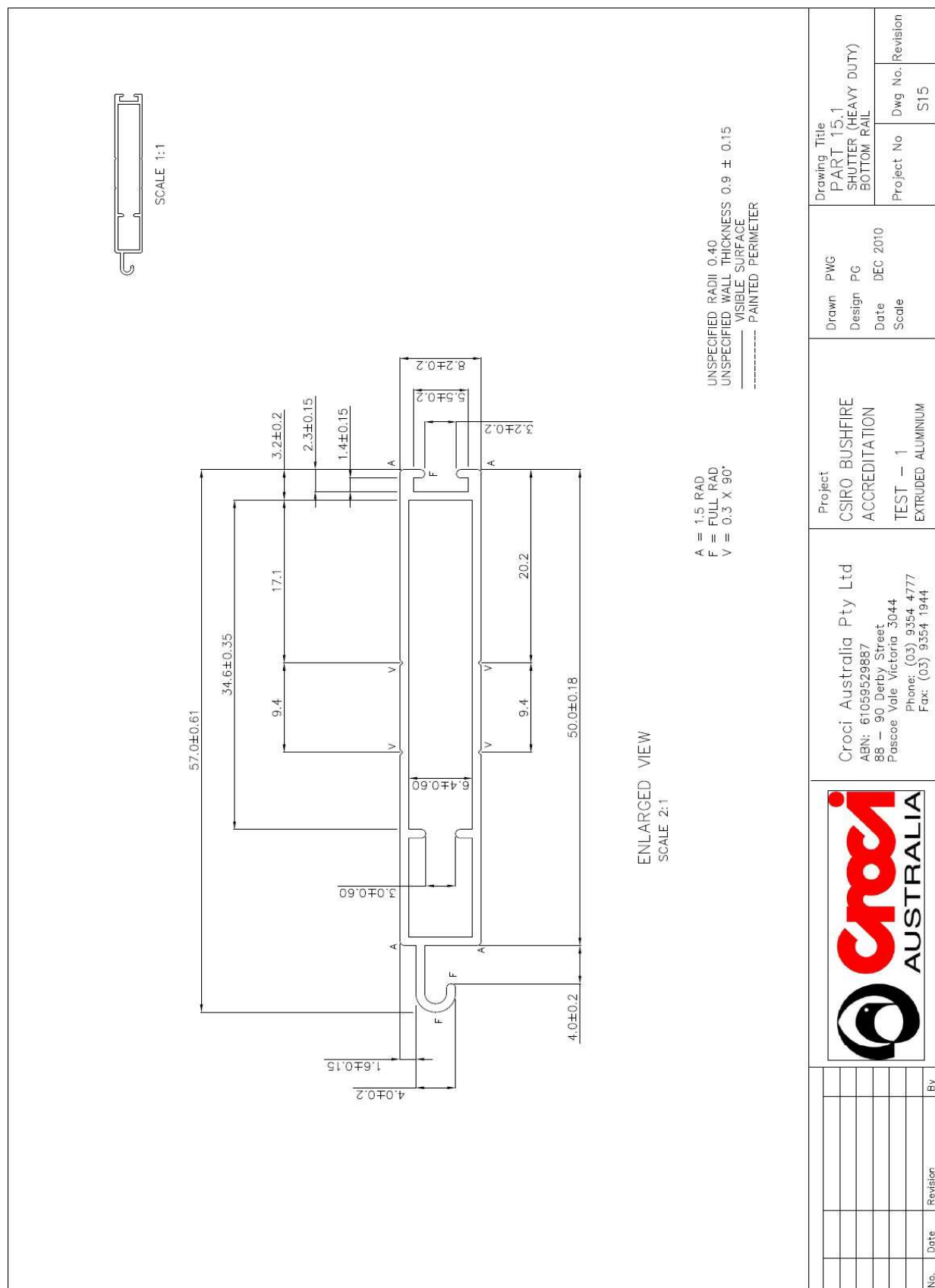
Drawing numbered S4 dated December 2010, by Croci Australia



Drawing numbered S13 dated December 2010, by Croci Australia

[illegible]

Drawing numbered S14 dated December 2010, by Croci Australia



Drawing numbered S15 dated December 2010, by Croci Australia