BUSHFIRE TEST ON GLAZED VERTICAL ELEMENTS

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Client
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Commercial-in-confidence

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SPONSORED INVESTIGATION No. FSZ 1572

BUSH FIRE TEST ON GLAZED VERTICAL ELEMENTS

SUMMARY

IDENTIFICATION OF SPECIMEN:

The sponsor identified the specimen as aluminium framed glass window assembly.

SPONSOR: Breezway Pty Ltd
35 Cambridge Street
COOPAROO QLD

MANUFACTURER: Breezway Pty Ltd
35 Cambridge Street
COOPAROO QLD

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 4325/3559

TEST DATE: The fire test was conducted on 10 January 2013

DESCRIPTION OF SPECIMEN:

The specimen comprised six glass window installations, mounted into a 2400-mm wide x 2400-mm high opening in a double brick wall.

The glass window assembly was mounted into Easyscreen aluminium frame. The glass window assembly was retro-fitted into the opening in a double brick wall using masonry anchors spaced at nominally 600-mm centres.

Specimen 1: Fire Retardant Altair Louvre aluminium framed window including MK2 Clips

The specimen comprised an 1194-mm high x 799-mm wide Altair Louvre window, mounted into an aluminium Easyscreen Frame and Easyscreen Mullions with mullions profiles shown in drawing numbered ESY Fire Testing sheet 1, dated 15 February 2013, by Breezway.

The adjustable louvre system comprised eight sections of 720-mm long x 152-mm wide x 6-mm thick toughened glass fitted within MK2 clips. The MK2 clips, stated to be made of Retpol PDR 9044 UVA copolymer polypropylene compound, were held to the aluminium frame by MK4 bearings, retainers, pins and stabilisers stated to be made of Acetal. A nominal 3.2-mm clearance between the glass edges and the clips was maintained along the vertical sides The Low Profile Handle was stated to be made of stainless steel. Along the bottom of the glass window, a Marcott SCE17-27 FR Wheatherseal was installed as shown in drawing numbered ESY Fire Testing sheet 3, dated 15 February 2013, by Breezway.

On the exposed face of the window, a 1194-mm high x 800-mm wide x 0.9-mm thick Tensile-Tuff Crimsafe 304 grade stainless steel security mesh was fixed to the aluminium frame by 22-mm Self Drilling Pan Head screws at 300-mm centres.

Details of construction are specified in drawings numbered ESY Fire Testing sheets 1 and 3, dated 15 February 2013, by Breezway.

Specimen 2: Fixed Lite aluminium framed window with fire retardant seals

The specimen comprised an 1194-mm high x 796-mm wide fixed window, mounted into an aluminium Easyscreen frame and mullions with profiles shown in drawing numbered ESY Fire Testing sheets 1 and 2, dated 15 February 2013, by Breezway. A 720-mm wide x 6-mm thick toughened glass was fitted within the window's frame, held in place with PVC Setting Blocks and Foam Tape, on the unexposed face, and a Gap Wedge stated to be made out of 3-430-026-6FR material, on the exposed face. A nominal 3.2-mm clearance between the glass edges and the clips was maintained along the vertical sides. Bostik Firecaulk was applied on the corners between glass and frame. Along the bottom of the assembly, a Marcott SCE17-27 FR Wheatherseal was installed as shown in drawing numbered ESY Fire Testing sheet 3, dated 15 February 2013, by Breezway.

Details of construction are specified in drawings numbered ESY Fire Testing sheets 1 and 3, dated 15 February 2013, by Breezway.

Specimen 3: Fire Retardant Stronghold Louvre aluminium framed window including Stronghold Clips

The specimen comprised an 1194-mm high x 798-mm wide Altair Louvre window, mounted into an aluminium Easyscreen frame and mullions with profiles shown in drawing numbered ESY Fire Testing sheets 1 and 2, dated 15 February 2013, by Breezway.

The adjustable louvre system comprised eight sections of 720-mm long x 152-mm wide x 6-mm thick toughened glass fitted within Stronghold clips. The Stronghold clips, stated to be made of Retpol PDR 9044 UVA copolymer polypropylene compound, were held to the aluminium frame by Stronghold bearings, retainers, pins and stabilisers stated to be made of Acetal. A nominal 3.2-mm clearance between the glass edges and the clips was maintained along the vertical sides. The Low Profile Handle was stated to be made of stainless steel. Along the bottom of the glass window, a Marcott SCE17-27 FR Wheatherseal was installed as shown in drawing numbered ESY Fire Testing sheet 3, dated 15 February 2013, by Breezway.

On the exposed face of the window, an 1194-mm high x 800-mm wide x 0.9-mm thick Tensile-Tuff Crimsafe 304 grade stainless steel security mesh was fixed to the aluminium frame by 22-mm Self Drilling Pan Head screws at 300-mm centres.

Details of construction are specified in drawings numbered ESY Fire Testing sheets 1 and 3, dated 15 February 2013, by Breezway.

Specimen 4: Standard Altair Louvre aluminium framed window including MK2 Clips

The specimen comprised a 1194-mm high x 799-mm wide Altair Louvre window, mounted into an aluminium Easyscreen frame and mullions with profiles shown in drawing numbered ESY Fire Testing sheets 1 and 3, dated 15 February 2013, by Breezway.

The adjustable louvre system comprised eight sections of 720-mm long x 152-mm wide x 6-mm thick toughened glass fitted within MK2 clips. The MK2 clips, stated to be made of POLYCOMP CA03 UVH copolymer polypropylene compound, were held to the aluminium frame by MK4 bearings, retainers, pins and stabilisers stated to be made of Acetal. A nominal 3.2-mm clearance between the glass edges and the clips was maintained along the vertical sides. The Standard Handle was stated to be made of stainless steel. Along the bottom of the glass window, a Santoprene PVC Wheatherseal was installed as shown in drawing numbered ESY Fire Testing sheet 2, dated 15 February 2013, by Breezway.

On the exposed face of the window, an 1194-mm high x 800-mm wide x 0.9-mm thick Tensile-Tuff Crimsafe 304 grade stainless steel security mesh was fixed to the aluminium frame by 22-mm Self Drilling Pan Head screws at 300-mm centres.

Details of construction are specified in drawings numbered ESY Fire Testing sheets 1 and 2, dated 15 February 2013, by Breezway.

Specimen 5: Fixed Lite aluminium framed window with standard seals

The specimen comprised a 1194-mm high x 796-mm wide fixed window, mounted into an aluminium Easyscreen frame and mullions with profiles shown in drawing numbered ESY Fire Testing sheets 1 and 3, dated 15 February 2013, by Breezway. A 720-mm wide x 6-mm thick toughened glass was fitted within the window's frame, held in place with PVC Setting Blocks and Foam Tape, on the unexposed face, and a Gap Wedge made out of Santoprene, on the exposed face. A nominal 3.2-mm clearance between the glass edges and the clips was maintained along the vertical sides. Silicone sealant was applied on the corners between glass and frame. Along the bottom of the glass window, a Santoprene PVC Wheatherseal was installed as shown in drawing numbered ESY Fire Testing sheet 2, dated 15 February 2013, by Breezway.

Details of construction are specified in drawings numbered ESY Fire Testing sheets 1 and 2, dated 15 February 2013, by Breezway.

Specimen 6: Fire Retardant Stronghold Louvre aluminium framed window including Stronghold Clips

The specimen comprised a 1194-mm high x 798-mm wide Altair Louvre window, mounted into an aluminium Easyscreen frame and mullions with profiles shown in drawing numbered ESY Fire Testing sheets 1 and 3, dated 15 February 2013, by Breezway.

The adjustable louvre system comprised eight sections of 720-mm long x 152-mm wide x 6-mm thick toughened glass fitted within Stronghold clips and sealed with silicone sealant. The Stronghold clips, stated to be made of POLYCOMP CA03 UVH copolymer polypropylene compound, were held to the aluminium frame by Stronghold bearings, retainers, pins and stabilisers stated to be made of Acetal. A nominal 3.2-mm clearance between the glass edges and the clips was maintained along the vertical sides. The Standard Handle was stated to be made of stainless steel. Along the bottom of the glass window, a Santoprene PVC Wheatherseal was installed as shown in drawing numbered ESY Fire Testing sheet 2, dated 15 February 2013, by Breezway.

On the exposed face of the window, an 1194-mm high x 800-mm wide x 0.9-mm thick Tensile-Tuff Crimsafe 304 grade stainless steel security mesh was fixed to the aluminium frame by 22-mm Self Drilling Pan Head screws at 300-mm centres.

Details of construction are specified in drawings numbered ESY Fire Testing sheets 1 and 2, dated 15 February 2013, by Breezway.

ORIENTATION

The glass window assembly was tested with the exterior face 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).

LEVEL OF RADIANT HEAT EXPOSURE

Level of radiant heat exposure selected by the test sponsor was Very High – 29 kW/m^2.

DOCUMENTATION:

Drawings numbered ESY Fire Testing sheets 1, 2 and 3, dated 15 February 2013, by Breezway.

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 eight 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.

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 22℃ at the co mmencement 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 position.
20 seconds -	Specimen moved in position – exposure to 29 kW/m^2.
1:20 minutes -	Seals on exposed face are burning along the bottom of exposed face.
2:00 minutes -	Seals are melting along the bottom of Specimen 2 (Photograph 4).
2:20 minutes -	Specimen moved in position – exposure to 21 kW/m^2.
3:00 minutes -	Seal along the bottom of Specimen 2 ceased burning.
3:20 minutes -	Specimen moved in position – exposure to 14 kW/m^2.
4:20 minutes -	Specimen moved in position – exposure to 11 kW/m^2.
5:00 minutes -	No change to the unexposed face of the specimens.
5:20 minutes -	Specimen moved in position – exposure to 8 kW/m^2.
6:00 minutes -	Bottom crib has ceased flaming – crib is glowing.
6:20 minutes -	Reduced temperature on the furnace – exposure to 6.5 kW/m^2.
7:30 minutes -	Turned the furnace off – exposure to 5 kW/m^2.
8:20 minutes -	Exposure to 3.5 kW/m^2.
9:00 minutes -	Top crib has ceased flaming – crib is glowing.
9:20 minutes -	Exposure to 3 kW/m^2.
10 minutes -	Crib has ceased burning.
15 minutes -	Radiant heat source shielded.

16 minutes - Radiometer moved into position - 250-mm from the exposed face.
20 minutes - Pilot flame applied - no ignition is observed.
40 minutes - Pilot flame applied - no ignition is observed.
50 minutes - Pilot flame applied - no ignition is observed.
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 for all the specimens:

Performance Criteria		Time to failure (min)	Position of failure
Formation of through gaps greater than 3-mm		No failure	-
Sustained flaming for 10 seconds on the non-fire side		No failure	-
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^2		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^2 between 20 minutes and 60 minutes		No failure	-
Mean and maximum temperature of internal faces exceeding 250ºC and 300ºC respectively between 20 minutes and 60 minutes after commencement of test		Not applicable	-
Crib class	**A**	**Peak heat flux**	**29 kW/m²**

For the purpose of building regulations in Australia, the test specimen achieved a Bushfire Attack Level (BAL) of A29.

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 test method of AS 1530.8.1.

TESTED BY:

Mario Lara
Testing Officer

for Garry E Collins
Manager, Fire Testing and Assessments

22 February 2013

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 the start of the testing

Photograph 4 - Specimen 2 at 2 minutes into the test

Photograph 5 - Exposed face of the specimen at 17 minutes into the test

Photograph 6 - Unexposed face of the specimen at the completion of testing

Photograph 7 - Exposed face of the specimen at the completion of testing

APPENDIX 2

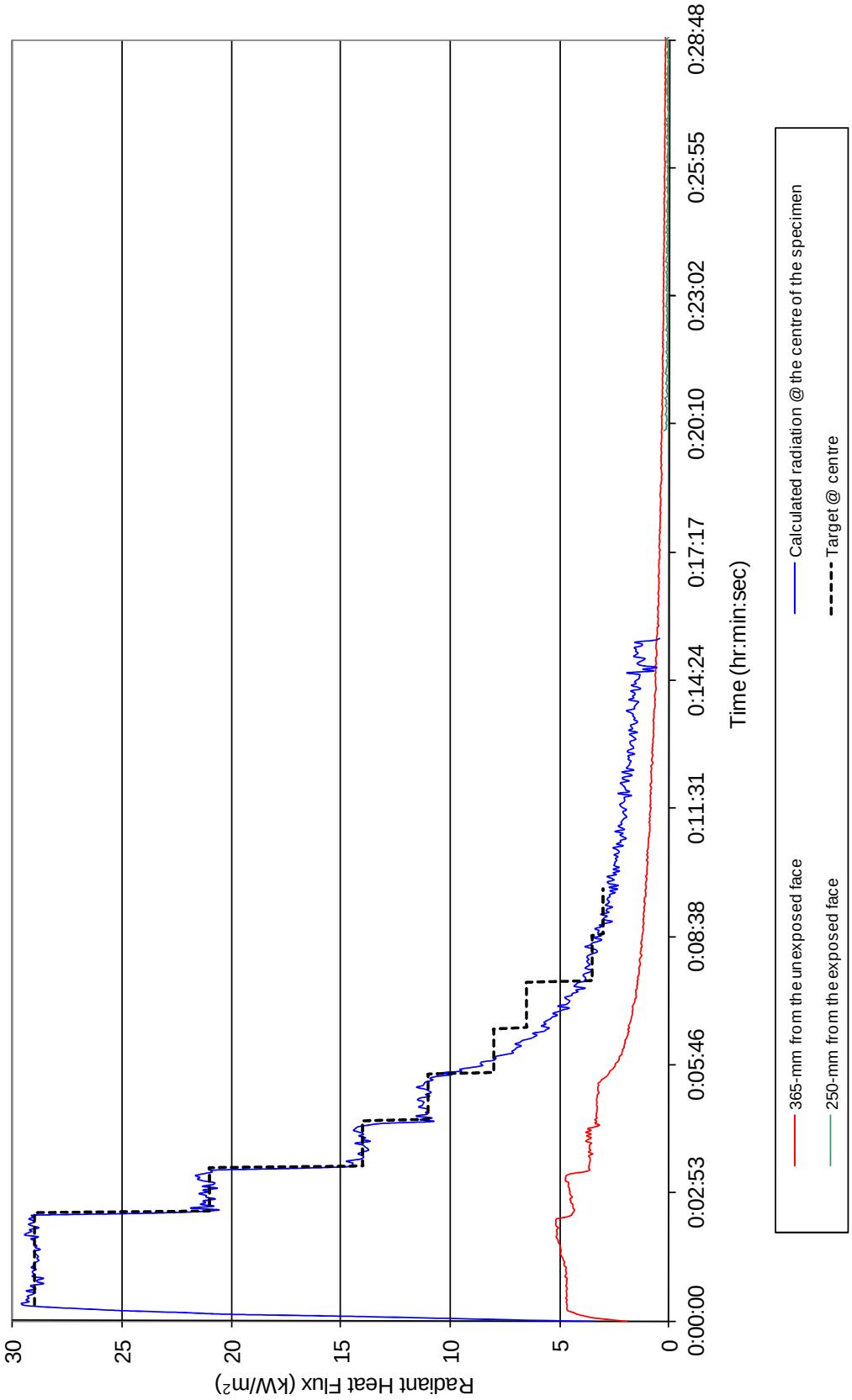


Figure 1 - Radiant Heat Flux

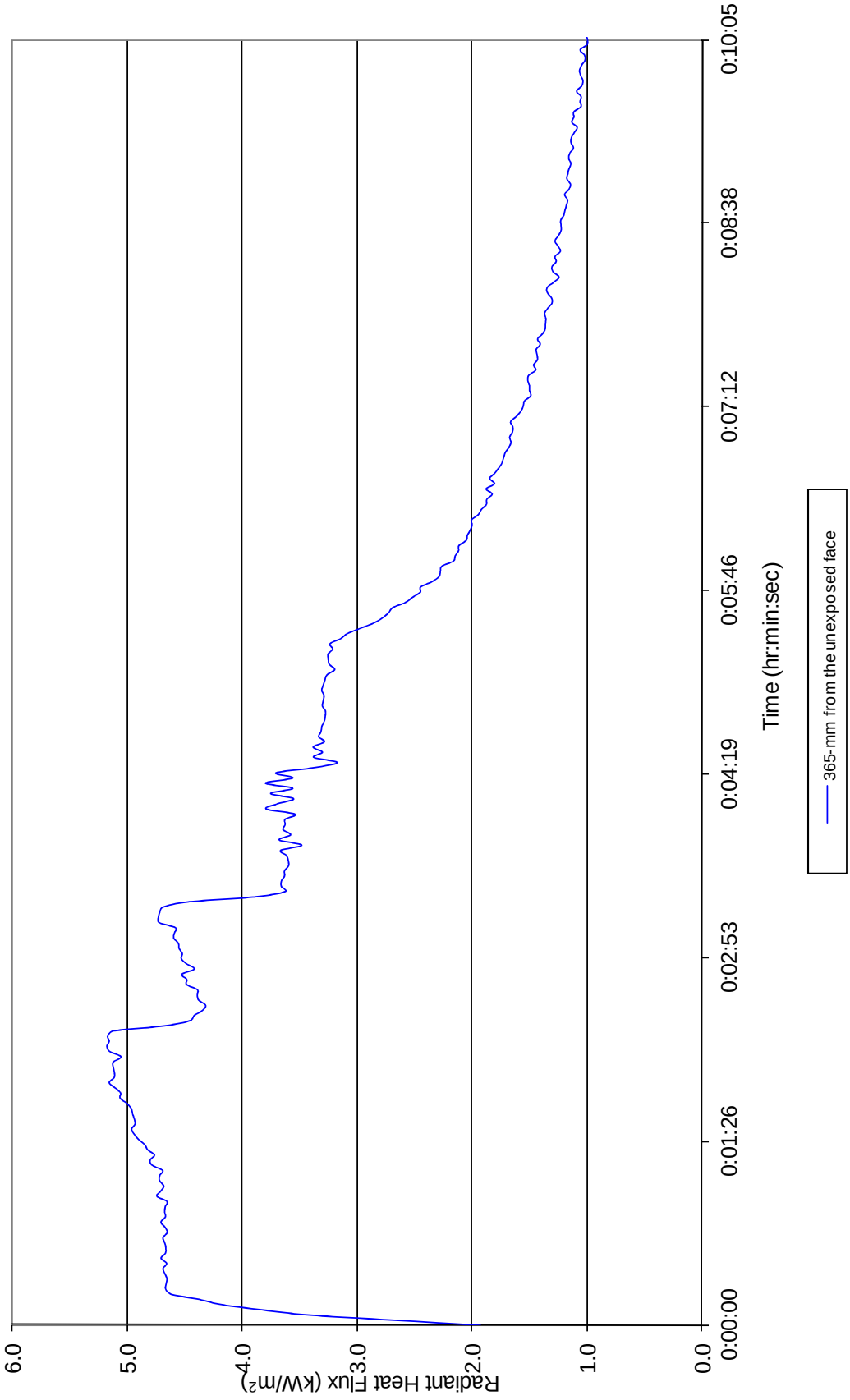


Figure 2 - Radiant Heat Flux received @ 365-mm from the unexposed face

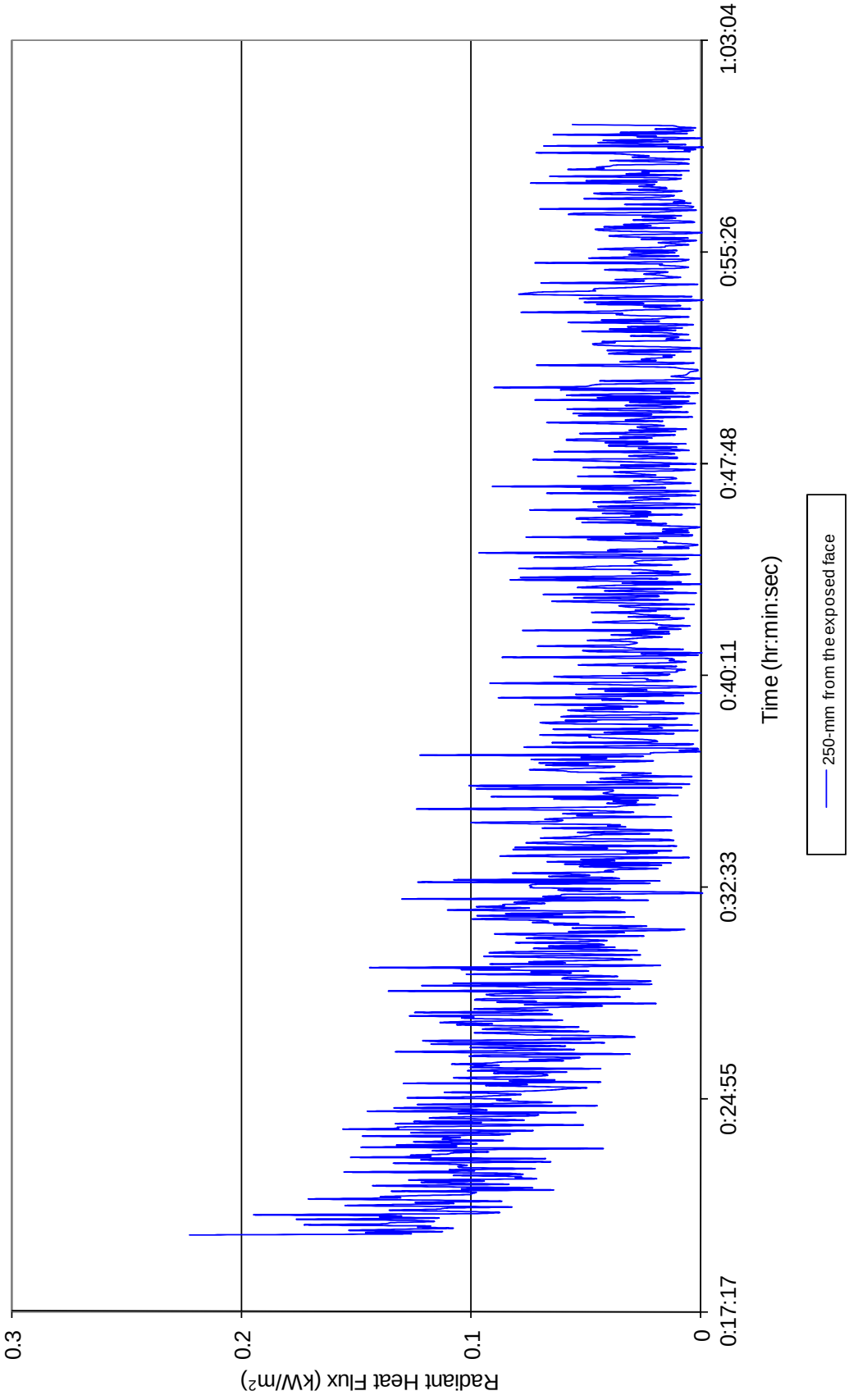
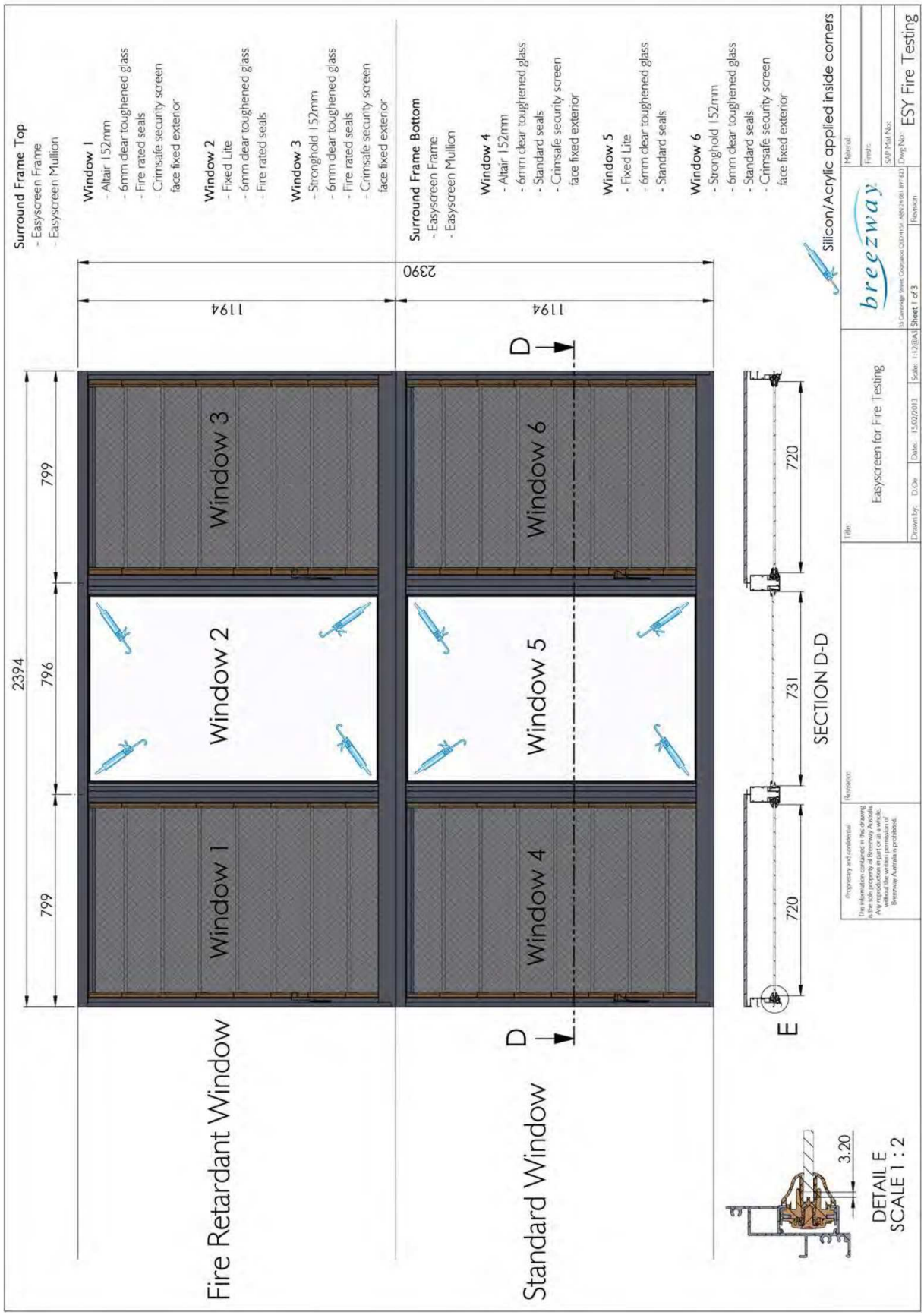
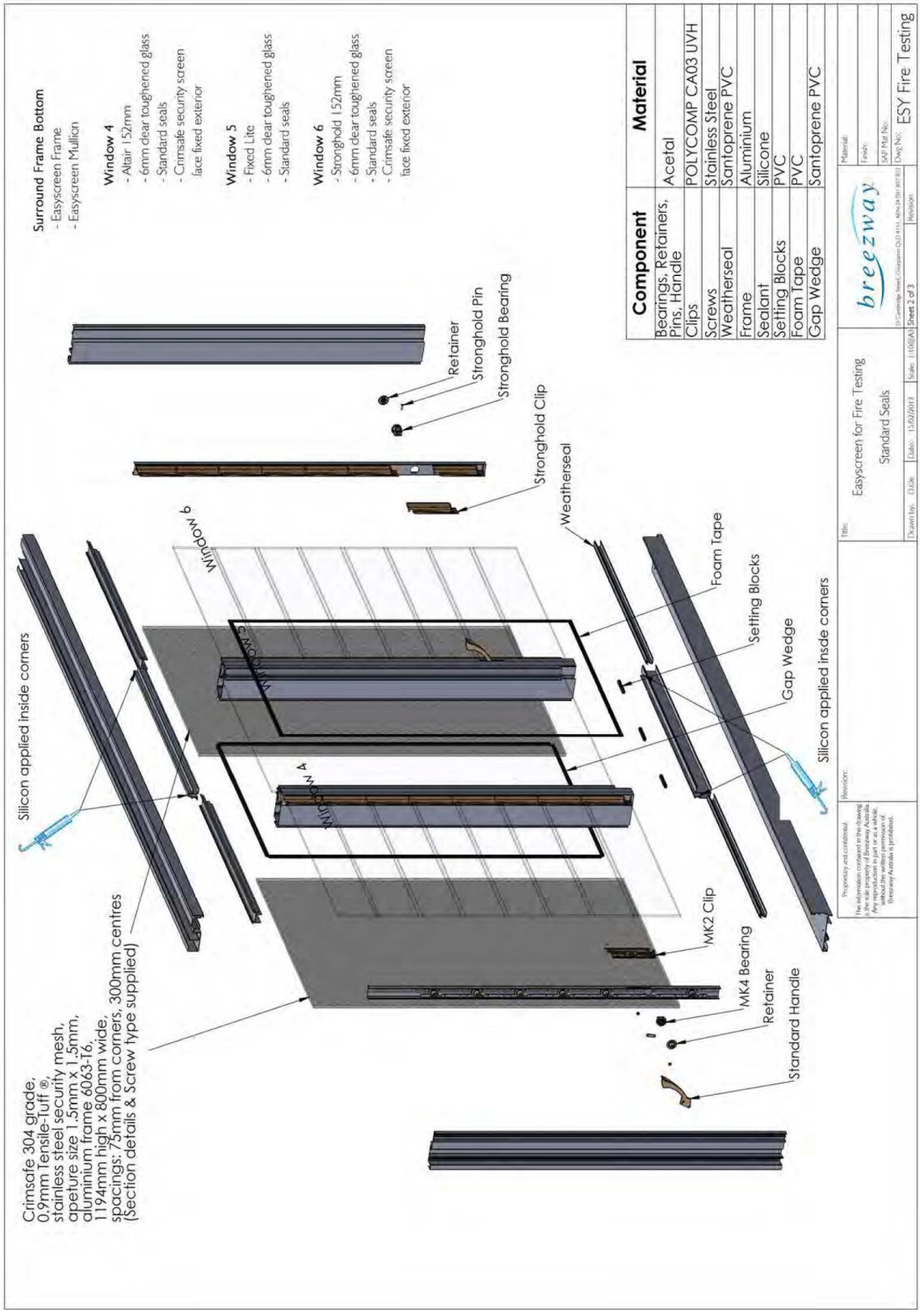


Figure 3 - Radiant Heat Flux received @ 250-mm from the exposed face

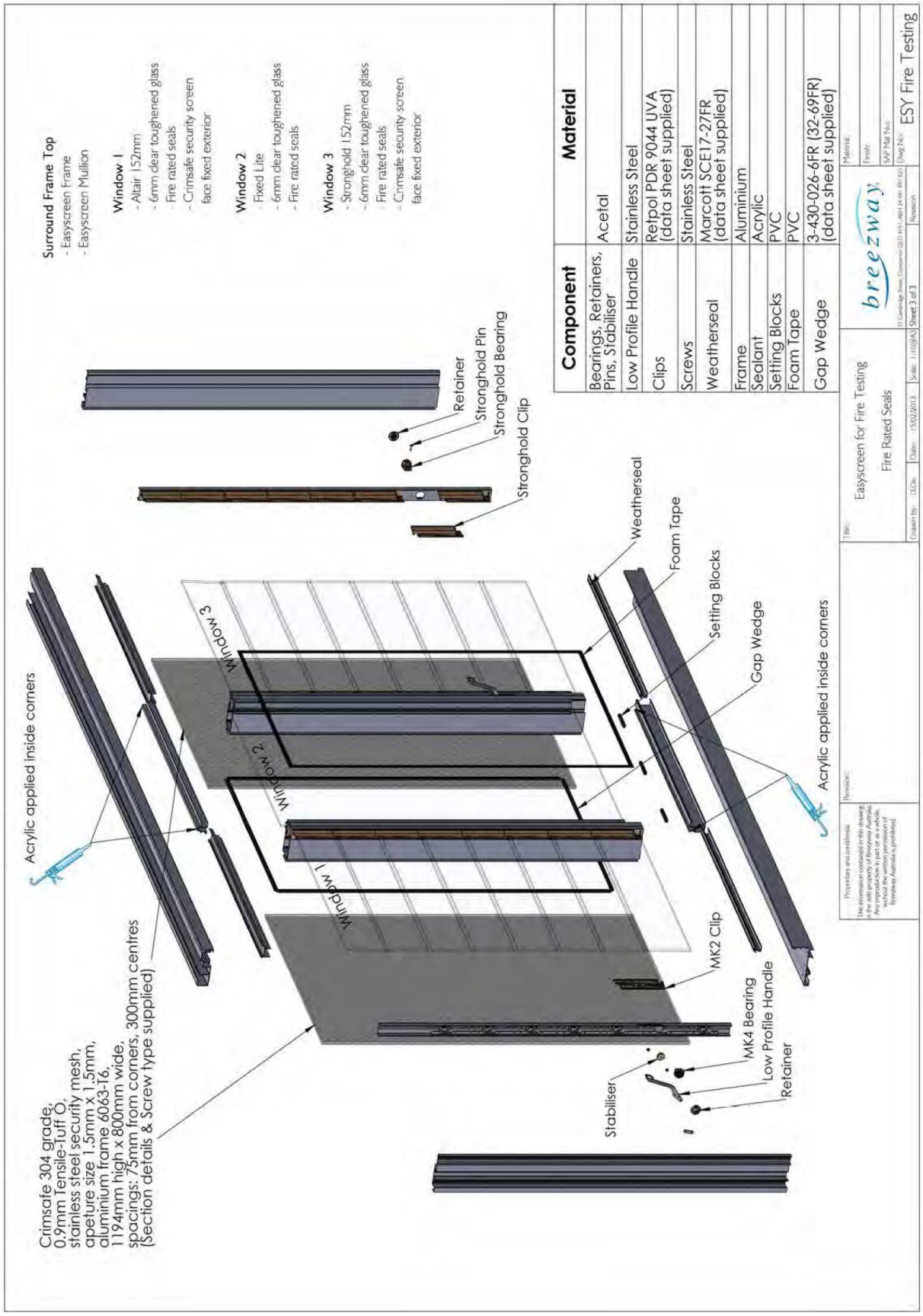
APPENDIX 3



Drawing numbered EZY Fire Testing sheet 1, dated 15 February 2013, by Breezway



Drawing numbered EZY Fire Testing sheet 2, dated 15 February 2013, by Breezway



Drawing numbered EZY Fire Testing sheet 3, dated 15 February 2013, by Breezway