

Likely performance of Breezway aluminium framed glass window assembly incorporating alternative steel mesh screens

Assessment Report

Author: Mario Lara

Report number: FCO-3026

Date: 11 October 2013

Client: Breezway Australia Pty Ltd

Commercial-in-confidence

Inquiries should be address to:

Fire Testing and Assessments

Infrastructure Technologies
14 Julius Avenue
North Ryde, NSW 2113
Telephone +61 2 9490 5444

Author

Infrastructure Technologies
14 Julius Avenue
North Ryde, NSW 2113
Telephone +61 2 9490 5500

The Client

Breezway Australia Pty Ltd
35 Cambridge Street
Coorparoo QLD
Telephone +61 7 3847 0500




Report Details:

Report CSIRO Reference number: FCO-3026/4288.

Report Status and Revision History:

VERSION	STATUS	DATE	DISTRIBUTION
Revision A	Draft for internal review	10/10	CSIRO
Revision B	Final for issue	11/10	CSIRO

Report Authorization:

AUTHOR	REVIEWED BY	AUTHORISED BY
Mario Lara	Brett Roddy	Brett Roddy
		
11 October 2013	11 October 2013	11 October 2013

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Executive summary

This report provides the assessment of this Division on the likely performance of a Breezway aluminium framed glass window assembly incorporating alternative steel mesh screens if tested in accordance with AS1530.8.1-2007.

You have proposed to substitute the existing Tensile-Tuff Crimsafe 304 grade stainless steel security mesh, installed in your Breezway window assembly, by alternative security screens when tested in accordance with AS1530.8.1-2007 to a Bushfire Attack Level (BAL) 29.

In addition to the above, you have requested to this Division to assess the likely performance of the assemblies when the height of the glazing blades on the Altair and Louvre windows decreases from 152-mm to 102-mm.

Based on the established fire performance under test and the factors detailed in this report, it is the opinion of this Division that the fire performance of the Breezway Altair and Louvre aluminium window assemblies reported in FSZ1572 would not be detrimentally affected when replacing the tested steel mesh screen by:

- Screenguard stainless steel security screen reported in EWFA Report Numbered 2519600.1;
- Stainless View stainless steel security screen reported in EWFA Report Numbered 2553300b.1;
- Invisi-Gard stainless steel security screen reported in CSIRO Report Numbered EP1210317;
- ForceField window screen reported in CSIRO Report Numbered FSZ 1552;
- Capral stainless steel security screen reported in BWA Report Numbered 2284200a; or
- Any screen constructed in accordance to Clause 7.5.1A of Australian Standard AS3959-2009.

In addition to the above, it is the opinion of this Division that the fire performance of the Breezway Altair and Louvre aluminium window assemblies reported in FSZ1572 would not be detrimentally affected when decreasing the glazing blades height from 152-mm to 102-mm, provided that the blades are overlapped as per reported and the glass to screen distance is maintained.

Likely performance of a Breezway aluminium framed glass window assembly incorporating alternative steel mesh screens

1 Introduction

This report provides the assessment of this Division on the likely performance of a Breezway aluminium framed glass window assembly incorporating alternative steel mesh screens if tested in accordance with AS1530.8.1-2007.

This Division conducted a bushfire test on a Breezway aluminium framed glass window assembly reported in CSIRO Test Report FSZ 1572.

2 Supporting Data

2.1 CSIRO Test Report numbered FSZ 1572

On 10 January 2013, this Division conducted a bushfire test on 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 a 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.

2.1.1 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.

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 weatherseal was installed.

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.

2.1.2 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.

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 weatherseal was installed.

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.

2.1.3 STANDARD 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 mullions.

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 weatherseal was installed.

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.

2.1.4 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.

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 weatherseal was installed.

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.

The systems as tested achieved a Bushfire Attack Level (BAL) A29.

2.2 CSIRO report numbered FSZ 1552

On 2 August 2012, this Division conducted a radiation test on a ForceField metal screen protecting a 1000-mm x 1000-mm opening in a brick wall.

The ForceField window screen comprised a 0.8-mm thick stainless steel mesh fixed to a FFW9 aluminium frame by ForceField glue and PVC ForceField retainer.

A steel support perimeter frame, made out of 40-mm x 40-mm x 1.6-mm thick steel sections, was fixed to the brick opening flush with the exposed face of the wall by M8 X 75-mm dynabolts at 400-mm centres. The ForceField screen window was then fixed to the exposed face of the steel support perimeter frame by 25-mm long pan head screws at 300-mm centres.

The specimen was exposed to an average radiant heat of 60 kW/m². The radiant heat flux recorded at 1000-mm from the screen did not exceed 8 kW/m².

2.3 CSIRO report numbered EP1210317

On 25 October 2012 this Division conducted a bushfire test on a 1000-mm x 1000 Invisi-Gard metal screen.

The Invisi-Gard screen comprised a IWF1 black powder coated aluminium frame and GR 316 stainless steel mesh (0.8-mm thickness) with mesh apertures being 1.6-mm. Hence open area ratio is approximately 44%. PVC inserts were located between frame and mesh. The frame channel interior dimension was 25-mm and the mesh depth into channel was approximately 23-mm.

The specimen was exposed to the conditions of AS1530.8.1-2007 according to BAL40 exposure level. There was no flaming on the unexposed face or gaps larger than 3-mm diameter noted during the test. The radiant heat flux recorded at 365-mm from the screen did not exceed 15 kW/m².

2.4 Exova Warringtonfire report numbered 2519600.1

On 25 November 2010 Exova Warringtonfire conducted a radiation test on a 1160-mm x 1160-mm Screenguard stainless steel screen.

The Screenguard screen mesh comprised 316 marine grade stainless steel with a 0.89-mm coated wire thickness. The mesh aperture was 1.6-mm. The screen comprised an AU01002 Darley aluminium security window frame. The mesh was fixed to the aluminium frame at nominal 350-mm centres using 29-mm 10g 16TPI needle point stainless steel screws. A flame resistant PVC flexible extrusion seat was located on the exposed face of the screen while a flame resistant PVC flexible co-extrusion wedge was located on the unexposed face.

The specimen was exposed to an average radiant heat flux of 40 kW/m². The average radiant heat flux recorded at 365-mm from the screen was 17.7 kW/m².

2.5 Exova Warringtonfire report numbered 2553300b.1

On 25 March 2010 Exova Warringtonfire conducted a radiation test on a 1160-mm x 1160-mm SecureView stainless steel screen.

The SecureView screen mesh comprised 316 marine grade stainless steel with a 0.81-mm coated wire thickness. The mesh aperture was 1.6-mm. The screen comprised a Window Frame 11-mm (HAR160) extruded aluminium security window frame. The mesh was fixed to the aluminium frame

at nominal 180-mm centres using 32-mm 4g 10TPI drill point button head screws. A 310 Series Hybrid Plug retainer was installed around the perimeter of the mesh, inside the aluminium frame.

The specimen was exposed to an average radiant heat flux of 39.9 kW/m². The average radiant heat flux recorded at 365-mm from the screen was 21.7 kW/m².

2.6 Bodycote Warringtonfire report numbered 2284200a

On 11 December 2008 Bodycote Warringtonfire conducted a radiation test on a 1000-mm x 1000 Capral stainless steel screen.

The Capral Supascreen mesh comprised 316 Marine grade stainless steel with a 0.8-mm coated wire thickness. The mesh aperture was 1.6-mm. The screen comprised a 6060-T5 aluminium security window frame. A 22-mm deep x 2-mm thick retainer was folded into the u-channel of the aluminium frame and holding the steel mesh in the frame.

The specimen was exposed to an average radiant heat of 39.7 kW/m². The average radiant heat flux recorded at 365-mm from the screen was 16.3 kW/m².

3 Proposal

You have proposed to substitute the existing tested Tensile-Tuff Crimsafe 304 grade stainless steel security mesh, installed in the Breezway window assembly, by alternative security screens when tested in accordance with AS1530.8.1-2007 to Bushfire Attack Level (BAL) A29.

In addition to the above, you have requested to this Division to assess the likely performance of the assemblies when the height of the glazing blades on the Altair and Louvre windows decreases from 152-mm to 102-mm.

4 Analysis

CSIRO test report FSZ1572 demonstrates that the Breezway Altair and Louvre aluminium window assemblies would achieve a BAL A29 when exposed to the conditions stated in AS1530.8.1-2007. The assemblies comprised Tensile-Tuff Crimsafe 304 grade stainless steel security mesh held within aluminium frames incorporating Santoprene PVC and Marcott SCE17-27FR weather seals encased within the window frame. The distance from the screen to the glass windows was 85-mm.

Clause 7.5.1A of Australian Standard AS3959-2009 states:

“...Where fitted, screens for windows and doors shall have a mesh or perforated sheet with a maximum aperture of 2-mm, made of corrosion-resistant steel, bronze or aluminium. Gaps between the perimeter of the screen assembly and the building element to which it is fitted shall not exceed 3-mm.

The frame supporting mesh or perforated sheet shall be made from –

- (a) Metal; or*
- (b) Bushfire-resisting timber”*

Clause 14.4 (d) Performance criteria of AS1530.8.1-2007 states that when exposed to the design bushfire conditions, the building exterior shall not permit the following:

“...Radiant heat flux 365 mm from the non-fire side of the specimen in excess of 15 kW/m² from glazed and uninsulated areas during the 60 min test.”

The proposed alternative steel mesh screens, to be installed in Breezway Altair and Louvre aluminium window assemblies, have been exposed to radiant heat flux levels higher than the required 29 kW/m² exposure of BAL29. All the screens attenuated the radiant heat flux to a level that, at 365-mm from the screens, was in the range of 14-22 kW/m² when exposed to an emitted radiant heat flux levels of 40-60 kW/m².

When the proposed screens are installed protecting the Breezway Altair and Louvre aluminium windows, the screens are to be located not closer than 85-mm from the glass windows. Therefore the effective radiant heat flux measuring distance from the screen increases from 365-mm to 450-mm. This effect, together with the protection provided by the glazing barrier, would result in a received radiant heat flux at 365-mm from the glass window under 15 kW/m².

A timber crib is used to evaluate the effects of burning debris and ember attack to horizontal surfaces. During the bushfire test on the Breezway Altair and Louvre aluminium window assemblies, cribs of size A were utilised. The effect of the cribs on the assemblies should not vary providing the PVC wedge and seal, holding the steel mesh within the aluminium frame, are fully fitted within the frame.

5 Conclusion

Based on the established fire performance under test and the factors detailed above, it is the opinion of this Division that the fire performance of the Breezway Altair and Louvre aluminium window assemblies reported in FSZ1572 would not be detrimentally affected when replacing the tested steel mesh screen by:

- Screenguard stainless steel security screen reported in EWFA Report Numbered 2519600.1;
- Stainless View stainless steel security screen reported in EWFA Report Numbered 2553300b.1;
- Invisi-Gard stainless steel security screen reported in CSIRO Report Numbered EP1210317;
- ForceField window screen reported in CSIRO Report Numbered FSZ 1552;
- Capral stainless steel security screen reported in BWA Report Numbered 2284200a; or
- Any screen constructed in accordance to Clause 7.5.1A of Australian Standard AS3959-2009.

In addition to the above, it is the opinion of this Division that the fire performance of the Breezway Altair and Louvre aluminium window assemblies reported in FSZ1572 would not be detrimentally affected when decreasing the glazing blades height from 152-mm to 102-mm, provided that the blades are overlapped as per reported and the glass to screen distance is maintained.

6 Term of validity

This assessment report will lapse on 31 October 2018. Should you wish us to re-examine this report with a view to the possible extension of its term of validity, would you please apply to us three to four months before the date of expiry. This Division reserves the right at any time to amend or withdraw this assessment in the light of new knowledge.

References

The following informative documents are referred to in this Report:

- AS 1530.8.1-2007 Tests on elements of construction for buildings exposed to simulated bushfire attack – Radiant heat and small flaming sources.
- AS 3959-2009 Construction of buildings in bushfire prone areas.
- BWA 2284200a Test determination of radiant heat attenuation of a Capral security screen.
- CSIRO FSZ 1552 Test determination of radiant heat attenuation of a ForceField window screen.
- CSIRO FSZ 1572 Bushfire test on a glazed vertical element.
- CSIRO EP 1210317 Bushfire test to AS1530.8.1 on Invisi-Gard stainless steel security screen
- EWFA 2519600.1 Test determination of radiant heat attenuation of a Screenguard security screen.
- EWFA 2553300b.1 Test determination of radiant heat attenuation of a Secure View security screen.

CONTACT US

t 1300 363 400
+61 3 9545 2176
e enquiries@csiro.au
w www.csiro.au

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FOR FURTHER INFORMATION

Infrastructure Technologies

Mario Lara
Senior Fire Resistance and Assessments Engineer
t +61 2 94905500
e mario.lara@csiro.au

w www.csiro.au/Organisation-Structure/Divisions/CMSE/Infrastructure-Technologies/Fire-safety.aspx

Infrastructure Technologies

Brett Roddy
Manager, Fire Testing and Assessments
t +61 2 94905449
e brett.rodny@csiro.au

w www.csiro.au/Organisation-Structure/Divisions/CMSE/Infrastructure-Technologies/Fire-safety.aspx