

TECHNICAL COMPLIANCE REPORT

PRODUCT

Vitracore G2

PRODUCT DESCRIPTION

The Vitracore G2 is an aluminium composite panel with a profiled aluminium core.

PURPOSE OF THIS REPORT

The purpose of this report is to provide detailed evidence of compliance of the content of combustible adhesive with the BCA in response to the email received by Talissa Ireland, dated 21/09/2018.

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Reviewed By:

Talissa Ireland
General manager

1. SCOPE OF THIS REPORT

CMI has been instructed by JAS-ANZ to respond to concerns raised by the ABCB in regard to recent action taken in the UK to remove the Vitracore G2 product following testing that relied that the product being sold in the UK differed from the one tested for classification under UK requirements. It was reported that the samples tested in the UK contained more combustible adhesive than is specifically referenced in the original classification report.

'A recent article in the Financial Review reported that authorities in the UK had withdrawn the Vitracore G2 product from the market following testing that demonstrated the product being sold on the market differs from the one tested for classification under UK requirements. It was reported that the results show the samples tested contain more combustible adhesive than is specified in the original classification report.'

Vitracore G2 is also sold in Australia and has been issued with a CodeMark Australia Certificate of Conformity (Certificate number CM40170 Rev 4) by CertMark International. In light of the concerns raised by authorities in the UK, the ABCB requests of JAS-ANZ that it requires that CertMark International, within 14 days of notification-

1. determine whether the product currently being supplied in Australia is identical in all respects to the sample assessed when the Certificate of Conformity was issued and whether its certification remains valid; and

2. provide the basis on which it makes this determination.

This request of JAS-ANZ is made under 22(j) of the CodeMark Australia Scheme Rules (Version 2016.1).'

2. ACTIONS TAKEN BY CMI

CMI has undertaken the following actions in response to the request by the ABCB.

1. Initially applying a temporary suspension of the Certificate on 21/09/2018 and requesting the Certificate Holder supply a response to the issue raised before lifting the suspension same day following receipt of sufficient information.
2. CMI sent our senior auditor to a active job site to select random samples for independent testing.
3. CMI have had the samples mentioned in (2) sent to Excelplas Polymer Technology (a NATA accredited testing laboratory) for testing to determine the average thickness of the adhesive layers of the samples.
4. Fairview advised additional testing was being undertaken by independent persons, received 18/10/2018.

3. EVIDENCE SUPPLIED BY THE CERTIFICATE HOLDER

1. Report from Red Fire engineers # 181005_JV18-00268_Fairview Architectural Vitracore G2_Rev 1.docx Dated 5th October 2018.
2. Letter (unsigned or dated) from Sky Rainbow (product manufacturers).
3. CSIRO report FNE11089 testing to AS/NZS 1530.3.
4. CSIRO report FCN11476B testing to AS 1530.1-1994.
5. CSIRO report FCN11459C testing to AS/NZS 1530.3.
6. Evidence to support the manufacturing quality.

4. DISCUSSION

a. CMI Product Description

CMI describe the product on CodeMark Certificate CM40170 as follows:

'Vitracore G2 is comprised of 3 layers of aluminium; a face skin, a profiled aluminium core and a rear skin. Between these layers is a film of VE-998 polymer adhesive which is applied as a continuous film during manufacturing resulting in a continuous thickness of 0.101mm, this means the total thickness of the adhesive layers is approximately 0.2mm'.

b. Report from Red Fire engineers (cited in italics below).

This report addresses how the Vitracore G2 complies with C1.9(e)(vi). The report goes on to state the NCC Deemed-to-Satisfy (DtS) provisions for bonded laminated materials. These are:

NCC Volume 1 Clause C1.9(e) states the following (emphasis underlined):

(e) The following materials may be used wherever a non-combustible material is required:

(i) Plasterboard.

(ii) Perforated gypsum lath with a normal paper finish.

(iii) Fibrous-plaster sheet.

(iv) Fibre-reinforced cement sheeting.

(v) Pre-finished metal sheeting having a combustible surface finish not exceeding 1 mm thickness and where the Spread-of-Flame Index of the product is not greater than 0.

(vi) Bonded laminated materials where –

(A) each lamina, including any core, is non-combustible; and

(B) each adhesive layer does not exceed 1 mm in thickness and the total thickness of the adhesive layers does not exceed 2 mm; and

(C) the Spread-of-Flame Index and the Smoke-Developed Index of the bonded laminated material as a whole do not exceed 0 and 3 respectively.

The report goes on to provide an opinion on how the Vitracore G2 meets the Deemed-to-Satisfy provisions. There are given as:

Vitracore G2 is a bonded laminated material comprising of the following layers:

Layer 1: 0.7 mm thick aluminium face finished with 0.030 mm thick surface finish;

Layer 2: 0.1 mm thick adhesive film;

Layer 3: 0.3 mm thick aluminium core that is corrugated into a profile that is 2.6 mm thick;

Layer 4: 0.1 mm thick adhesive film;

Layer 5: 0.5 mm thick aluminium face finished with 0.010 mm thick surface finish.

The aluminium components are non-combustible (as individually tested in accordance with AS 1530.1).

Each adhesive layer is 0.1 mm thick, which is 10 % of the maximum adhesive layer thickness accepted by the NCC Clause C1.9(e)(vi)(B).

The aluminium sheets have different painted finishes and corrosion protection layers depending on the end use.

When tested in accordance with AS 1530.3-1999, Vitracore G2 achieves the following fire hazard indices^[3]. We have underlined the results that are relevant for meeting the requirements in Clause C1.9(e)(vi)(C):

- Ignitability Index 0 (Range 0-20, lowest-highest); and*
- Spread of Flame Index 0 (Range 0-10, lowest-highest); and*
- Heat Evolved Index 0 (Range 0-10, lowest-highest); and*
- Smoke Developed Index 1 (Range 0-10, lowest-highest).*

Therefore, Vitracore G2 meets the requirements in NCC Clause C1.9(e)(vi).

The report then addresses the issue of the thickness of the adhesive by providing the following information:

During manufacturing, the adhesive film is applied as follows:

- 0.05 mm Layer A1 to the inside of the 0.7 mm thick aluminium sheet (front face),*
- 0.05 mm Layers A2 and A3 to each side of the 0.3 mm thick aluminium core, and*

- 0.05 mm Layer A4 to the inside of the 0.5 mm thick aluminium sheet (rear face).

The layers are then pressed together in a production sequence that results in hemispherical dimples being formed at regular intervals on one side of the central sheet. We have carried out a destructive test of the finished product which allows us to view the core and adhesive. A small crater area approximately 6 mm in diameter is formed where the two aluminium layers are pressed together, where the adhesive is flattened. Some adhesive is forced away from the peak of the dimple. This results in a crater ring that appears to be approximately 0.5 mm to 1 mm in width. This is shown in Figure 1.

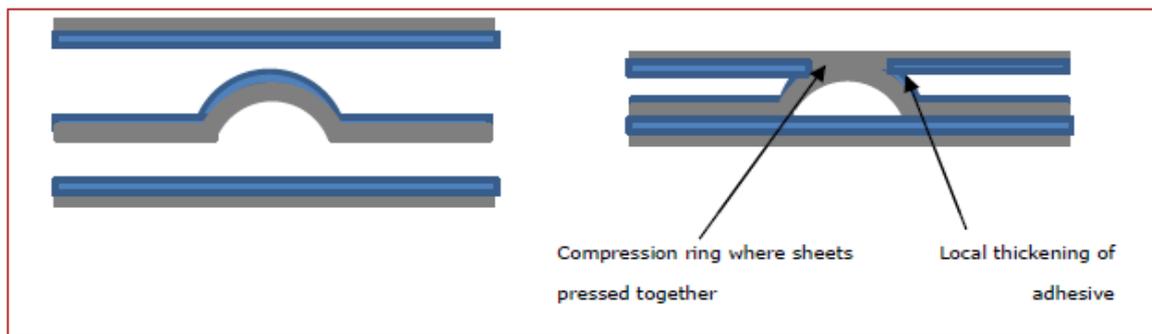


Figure 1: Schematic section through Vitracore G2 layers prior to being compressed together (left), and after compression (right). Image not to scale.

If all of the 0.1 mm from the central disk of adhesive were pushed into this crater, we have calculated that it would add between 0.2 mm and 0.1 mm to the thickness of the adhesive layer at this point, resulting in a local area where the adhesive layer is up to 0.3 mm or 0.2 mm thick[4]. The total thickness of the adhesive layer at the edge of the compression ring would therefore remain significantly less than 1 mm in any layer and less than 2 mm overall, hence at any time during or after manufacture the material would still meet the requirements in NCC Clause C1.9(e)(vi).

In addition to the local thickening of the adhesive from the manufacturing process, theoretically even if each of the adhesive layer thickness was doubled, Vitracore G2 would still have individual adhesive layer less than 1 mm and less than 2 mm total adhesive thickness, which meet the requirements in NCC Clause C1.9(e)(vi).

Note: RED Fire engineer have recommended that Fairview carries out non-destructive laboratory testing to confirm the thickness of any adhesive layer following the manufacturing process remains below 1mm.

c. Sky Rainbow letter

This letter confirms the manufacturing quality in place and states that 'the adhesive as fed into the manufacturing line does not exceed 100µm per side and 200µm overall'.

d. Manufacturing Process Letter

Clearly shows the manufacturing process utilising heat and pressure in the application of the adhesive. The adhesive in its original condition is stated to be maximum 0.05µm thick, totalling 0.100µm per side.

e. CSIRO report FCN11476B testing to AS 1530.1-1994 - 2015

This report dated September 2015 provided evidence that the product when tested to AS 1530.1-1994 in Not Deemed Combustible.

The reported thickness of the adhesive was as stated by the client. The adhesive layer was not tested.

f. CSIRO report FCN11459C testing to AS/NZS 1530.3 – 2015 testing (6 samples)

CSIRO report states that the description of the product, including product layer measurements was supplied by Fairview Architectural.

Results:

Ignitability Index (0-20)	Spread of Flame Index (0-10)	Heat Evolved Index (0-10)	Smoke Developed Index (0-10)
0	0	0	1

g. AWTA testing 18-005985 testing to AS/NZS 1530.3 – 2018 testing (6 samples)

No description of the product sample was supplied for the purpose of this report.

Results:

Regulatory Indices:

Ignitability Index	0	Range 0-20
Spread of Flame Index	0	Range 0-10
Heat Evolved Index	0	Range 0-10
Smoke Developed Index	1	Range 0-10

h. Report from Excelplas Polymer Technology report number 7807 dated 15/10/2018.

CMI commissioned Excelplas Polymer Technology to undertake testing of the samples supplied by CMI to determine the average thickness of adhesive layers.

Measurement of the thickness of adhesive layers via microscopy using a Niko SMZ25.

Excelplas Polymer Technology have supplied the following test results and conclusion.

Sample Number	Front Panel μm	Average μm	Inner_1 μm	Average μm	Inner_2 μm	Average μm	Back Panel μm	Average μm
1	62.27	62.10	70.67	72.31	66.00	62.71	75.86	80.67
1	62.01		72.41		59.17		80.05	
1	62.01		73.86		62.97		86.10	
2	61.24	61.53	59.14	61.10	52.77	55.53	59.17	59.07
2	61.25		61.68		56.90		59.47	
2	62.09		62.49		56.91		58.56	
3	60.41	59.96	60.35	60.82	60.69	63.06	67.62	70.08
3	57.94		59.34		63.75		68.92	
3	61.52		62.78		64.73		73.69	
4	68.02	69.29	83.22	85.80	58.92	64.79	68.38	69.72
4	69.54		86.26		66.99		68.98	
4	70.3		87.91		68.45		71.81	
5	65.90	61.62	67.33	65.86	67.08	59.52	82.91	83.39
5	58.28		66.40		57.38		83.78	
5	60.69		63.86		54.10		83.47	
Average μm	62.9		69.2		61.1		72.6	
StDev	3.8		9.8		5.0		9.3	

'The supplied sample was observed to contain multiple layers of approximately 0.06mm of adhesive on each surface of the core and on the internal surfaces of the front and back panels. In our opinion the sampled areas are likely to be representation of the adhesive thickness across the whole sample area and hence the total adhesive thickness at the joint locations, prior to bonding the core and panels, is approximately 0.12mm (a combination of two 0.06mm layers, as observed). The adhesive thickness across the whole panel, prior to bonding, was likely to be approximately 0.24mm (a combination of the two 0.12mm adhesive layers either side of the core).'

CMI OPINION ON TEST REPORT - EXCELPLAS

It is possible for the heating process to have expanded the polymer adhesive and that the cooling process may result in a change from 0.05 μ m to 0.06 μ m at the points measured by Exelplas.

Given the adhesive thickness to be 0.05 μ m before any manufacturing process or 0.06 μ m after the heating process; it is not unreasonable to conclude the thickness of the adhesive at contact points to be approximately 0.08 μ m (inclusive of two layers per side) after the laminating process.

The report by Exelplas has not provided a thorough investigation into adhesive thickness however supports the published material to within allowable tolerances.

i. Report from University of Wollongong – Adhesive Measurements – dated 18/10/2018

Fairview architectural engaged the services of Associate Prof. Yue Zhao School of Mechanical, Materials, Mechatronic & Biomedical Engineering Faculty of Engineering & Information Sciences University of Wollongong on the G2 panel. The conclusion and results of Prof. Zhao state:

“The adhesive thickness measurement results in Table 1 indicate that:

- a. The glue layers on free surfaces are generally 30-60 μ m thick across the 5 samples observed, with a middle thickness of 45 μ m*
- b. The gap thickness in the glued areas varies between 0-70 μ m, with a middle thickness of 35 μ m; and*
- c. There are enlarged gap spaces at the bottom of the cup shape between the middle plate and the back plate but the glue thickness is difficult to calculate. At the edge of the glue contacts there are beading up of the glue, likely to relate to a combination of the glue being pushed out from the contact are and a papillary effect due to surface tension of the melted glue”*

CMI OPINION ON TEST REPORT

The evidence provided by Prof. Zhao supports the manufacturers claims of 0.08 μ m to 0.100 μ m per side, therefore any change to published material is not warranted.

COMPARISON BETWEEN EXCELPLAS & WOLLONGONG UNIVERSITY

Prof. Zhao submerged the samples in resin and polished the edges thereby preserving the morphology of the components in original condition; however, ExcelPlas’ methods of deconstruction, likely resulted in deformation of areas of contact, limiting the testing of the adhesive to areas which had not been subjected to the full lamination process.

#	initial code	1	2-1 free surface	2-2 (gap)	3-1 free surface	3-2 (gap)	4	5-1 outside cup	5-2 inside cup
1	ACS-2F	56	51	35 est.	50 est.	35 est.	48	41	48
				Ranging between 0-70, middle value 35 est.		Ranging between 0-70, middle value 35 est.			
2	ACS-1F	58	62	35 est.	45 est.	35 est.	58	45	45
				Ranging between 0-70, middle value 35 est.		Ranging between 0-70, middle value 35 est.			
3	CFS-1F	43	44	35 est.	30	35 est.	44	30	51
				Ranging between 0-70, middle value 35 est.		Ranging between 0-70, middle value 35 est.			
4	CFS-2F	38	49	35 est.	45 est.	35 est.	31	44	45 est.
				Ranging between 0-70, middle value 35 est.		Ranging between 0-70, middle value 35 est.			
5	DLS-1F	43	49	35 est.	45 est.	35 est.	30	47	33
				Ranging between 0-70, middle value 35 est.		Ranging between 0-70, middle value 35 est.			

Table 1 (results)

CMI TECHNICAL INVESTIGATION

It should be noted that neither the CSIRO, AWTA or Red Fire Engineers deconstructed the samples to verify the actual thickness of the adhesive. The CSIRO & RED relied on manufacturing statements from the certificate holder.

The AS/NZS 1530.3 testing of G2 in 2015 and 2018 achieved the same results, indicating that the product has not changed.

The components of the composite panel comprise an aluminium honeycomb core with a sheet of aluminium bonded to each side. Each aluminium component is pre-coated with a layer of adhesive film prior to the lamination process. According to the adhesive manufacturers (Sky-Rainbow) the adhesive is manufactured using Dupont resins; and the thickness of the glue is maximum 0.05µm as applied. The manufacturing process provided by Fairview Architectural also indicates the adhesive comes in a roll of 0.05µm thick. During the laminating process, the components undergo a heating process followed by pressure indicated to be 3.5-6kg/cm², 35-60s.

A report was conducted by Excelplas Polymer Technology, NATA Accredited Testing Laboratory on the G2 panel. The method of deconstruction was to use force to pull the individual components apart. This method renders the section bonding the components together as indeterminable, in relation to adhesive thickness, due to the stress on the adhesive causing deformation. Therefore, Excelplas measured the adhesive thickness at points that were subjected to the heating process but not subject to the pressure during lamination of 3.5-6kg/cm², 35-60s. Excelplas measured the average adhesive thickness to be 0.06µm. The measurement by Excelplas is in contradiction to the information provided by Sky-Rainbow of 0.05µm. The temperature of the heating process is unknown however the melting point of the adhesive is 90°. As stated previously, it is possible for the heating

process to have expanded the polymer adhesive and that the cooling process may result in a change from 0.05µm to 0.06µm at the points measured by Exelplas.

For the purpose of concerns raised, i.e. the quantity of glue with regard to fire safety; the amount of glue in the product will not be altered by the manufacturing process, rather the concentration of adhesive at contact points and non-contact points will likely differ (pressurised, heated glue would result in localisation of the adhesive).

CONCLUSION

In response to the specific questions posed by the ABCB, CMI concludes as follows:

ABCB	CMI Findings
<p>Determine whether the product currently being supplied in Australia is identical in all respects to the sample assessed when the Certificate of Conformity was issued and whether its certification remains valid; and</p>	<p>As stated in the body of this report, The AS/NZS 1530.3 testing of G2 in 2015 and 2018 achieved the same results, indicating that the product has not changed.</p> <p>Reported Adhesive Thicknesses:</p> <ul style="list-style-type: none"> • CodeMark CoC CM40170 - <u>0.101mm</u> per layer. • ExcelPlas Tested Results – Average of <u>0.12mm</u> per layer. • Wollongong University – Average of <u>0.088</u> per layer. <p>The results of the testing carried out by Excelplas Polymer Technology indicate that the thickness of the adhesive differs from that in the reports by the CSIRO used as evidence of compliance for the initial certification, and the “Typical Composition” as advertised by the Certificate Holder, however CMI have provided our professional opinion on the questionable methods of deconstruction and subsequent results.</p> <p>The measurements conducted by Associate Professor Yue Zhao of the University of Wollongong, obtained using a process which involved:</p> <ul style="list-style-type: none"> • stabilisation and sectioning of samples of G2, • measurement of adhesive thickness at key cross-sectional points, and • calculation of average adhesive thickness (accounting for the structure and morphology of the samples). <p>Confirm that the adhesive thickness of the G2 samples is no greater than that stated in the Certification and Fairview architectural product brochures. As the testing methods are appropriate, CMI accept the findings of this report.</p>
<p>Provide the basis on which it makes this determination.</p>	<p>Technical evaluation by Michael Leahy as detailed herein.</p>

FURTHER ACTIONS

CMI have undertaken the following actions:

1. No action is deemed necessary.

ATTACHMENTS TO THIS REPORT

- a. Report from Red Fire engineers
- b. Sky Rainbow letter
- c. Manufacturing Process Letter

- d. CSIRO report FCN11476B testing to AS 1530.1-1994
- e. CSIRO report FCN11459C testing to AS/NZS 1530.3-1999
- f. AWTA report 18-005985 testing to AS/NZS 1530.3-1999
- g. Report from Excelplas Polymer Technology report number 7807 dated 15/10/2018
- h. Report from University of Wollongong dated 18/10/2018.

Appendix A

Sample collection pictures

Description	Image
Sample section taken from job site.	
Samples were taken form off cuts of actual panels being installed on the job.	
Collection site (Kookaburra Road, Prestons NSW 2170)	

Wall section form where the samples were taken.



Sample ready for postage to test lab.



Samples for postage to test lab

