

White Paper on

ALPOLIC[™] NC / ALPOLIC[™] A1 Non-Combustible Cladding



prepared by ExcelPlas Materials Testing & Cladding Test







Introduction:

This White Paper discusses the test results and performance data of ALPOLIC[™] NC / A1 *Non-Combustible Composite* Cladding manufactured by Mitsubishi Chemical Infratec Co., Ltd In Japan.



Independent testing and analysis has been performed by NATA-Certified ExcelPlas Labs who are specialists in the compositional analysis and testing of polymers and polymer composites.



Independent ExcelPlas testing has shown that ALPOLIC NC/A1 is composed of a non-combustible mineral core that contains ZERO Polyethylene sandwiched between two 0.5mm thick non-combustible aluminium skins.

ALPOLIC NC/A1 is a Codemark Certified material and is fully compliant with DtS provisions as per NCC/BCA and is permitted for use as external wall cladding in new buildings and retrofit applications wherever a non-combustible material is required.

Additionally, this material has also obtained the A1 Classification when tested in accordance with EN13501-1, which is a milestone for an ACP to pass this criteria.

ALPOLIC[™] NC/A1 core is also certified non-combustible when tested in accordance with BS476 Part 4.

ALPOLIC[™] NC/A1 is the only ACP with a non-combustible mineral core in Australia that achieves the highest possible safety rating (Category D) with the Insurance Council of Australia.



Fourier Infra-red Spectroscopy (FTIR) testing of mineral components in ALPOLIC[™] NC/A1 Cladding





ALPOLIC[™] NC/A1 has ZERO polyethene as tested at ExcelPlas, one of the few official laboratories in Australia which are recommended by the Insurance Council of Australia

ExcelPlas White Paper – April 2021





X-Ray Diffraction (XRD) testing of mineral components in ALPOLIC[™] NC/A1 Cladding.



Figure 3. XRD pattern of the cladding core sample 9396/1.

Gibbsite – Aluminum Tri-hydrate Calcite – Calcium Carbonate











Thermogravimetry (TGA) testing of mineral components in ALPOLIC[™] NC/A1.





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Independent Testing of ALPOLIC[™] NC / A1 Aluminium Composite Cladding



ALPOLIC[™] NC / A1 – Deemed non-combustible to BCA 2019

This is in compliance with Clause C1.9(e)(vii) of the National Construction Code, specifically relating to the use of bonded laminated products wherever a non-combustible material is required:

- Each lamina, including the core, is non-combustible; and
- Each adhesive layer does not exceed 1mm in thickness and the total thickness of the adhesive layers does not exceed 2mm; and,
- 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.

ALPOLIC[™] NC / A1 Technical Note on Adhesive Layer April 2020

Following the announcement by Mitsubishi Chemical Corporation on January 14, 2020 that ALPOLIC NC has passed the European Fire Standard "Euroclass A1" tested in accordance with EN13501-1, therefore ALPOLIC[™] NC is now **A1 Classified**. This is the first ACM in the world to be certified under the Euroclass A1 standard, which is a milestone in ACM history. ALPOLIC[™] NC / A1 is a Deemed-to-Satisfy (DtS) panel which <u>fully</u> <u>complies</u> with Clause C1.9(e)(vii) of the National Construction Code.

While there are products that have claimed to be DtS under Clause C1.9(e)(vii) of the National Construction Code, the adhesive layer in ALPOLIC[™] NC / A1 is less than 0.05 mm in thickness on each side and total thickness of adhesive layer is less than 0.10 mm.



ALPOLIC[™] NC / A1 is the first ACM under Category D (non-combustible) in the Insurance Council of Australia Hazard Identification and Category Rating Guide, which is the BEST possible rating;

Category	Polymer Percentage	Polymer%	Inert Filler%
Α	30-100% Polymer and 0-70% inert materials	30-100%	0-70%
В	8-29% Polymer and 71-92% inert materials	8-29%	71-92%
С	1-7% Polymer and 93-99% inert materials	1-7%	93-99%
D	0% Polymer and 100% inert materials or deemed non-combustible by the NCC	0%	100%



ALPOLIC[™] NC / A1 offers higher performance than solid aluminium cladding in the following ways:

- Thermal Conductivity : The Thermal Conductivity of 3mm Solid Aluminium is over 500x higher than that of ALPOLIC[™] NC / A1.
 Solid Aluminium 205 (W/mk) vs ALPOLIC[™] NC / A1 0.4 (W/mk) which will dramatically affect the buildings energy rating.
 This increased Thermal Conductivity can also result in a higher chance of structural panel failure through thermal movement and waterproofing failures.
- **Rigidity**: ALPOLIC[™] NC / A1 has better rigidity than 3mm thick solid aluminium, which, as a consequence, means that solid aluminium will incur significant oil-canning effects at high temperatures. This will in turn dramatically reduce the aesthetic appearance of your project. This increased Thermal Conductivity can also result in a higher chance of structural panel failure through thermal movement and waterproofing failures.
- **Coating Quality** : ALPOLIC[™] NC / A1 utilises state-of-the-art die-coating technology ensuring complete colour uniformity.



Mitsubishi ALPOLIC[™] NC / A1 offers higher performance than solid aluminium cladding in the following ways:

- Safety In Fire : ALPOLIC[™] NC / A1, when tested to AS5113 Large Scale Fire Testing produces only 6.65kg of debris mass, with the largest individual piece being 100gms. In contrast the 3mm Solid Aluminium Cladding panels produce a very large 44kg of flaming, falling debris with the largest individual piece at 19.5kg. Large, falling debris like this creates extreme danger for both firefighters and people trying to exit a burning building.
- Environmental: ALPOLIC[™] NC / A1 is recyclable, and CO₂ emissions during production are 48.2% lower than 3mm solid aluminium (18.5 kg CO₂/m² vs 36.57 kg CO₂/m²) and use of the product may contribute to LEED credits.
- Warranty: ALPOLIC[™] NC / A1 is backed by globally trusted Mitsubishi Chemical Infratec from Japan, offering a FULL COVER 20-year coating and panel warranty including rectification costs associated with material faults for Oceania. In contrast warranties from many suppliers of solid aluminium only cover replacement materials (not labour and access) and require bi-annual cleaning/maintenance.

Calorific Value of ACM

Calorific value = Heat produced in MJ on burning 1 kg of fuel



WORLD NOVELTY: ALPOLICTM A1!

The Euroclass system

Euroclass	Contribution to fire	
A1	Non Combustible	
A2	Limited Combustible No Flashover	
в	No Flashover	34
с	Flashover after 10 minutes	
D	Flashover before 10 minutes	
E	Flashover before 2 minutes	
	No Performance Determined	





		100% PE Core	ALPOLIC™ /fr	ALPOLIC™ A2	ALPOLIC [™] A1 / ALPOLIC [™] NC
Portion of combustible ingredients within the core material		100% ≤ 30%		≤10%	≤ 5%
				5	
Heat potential of the core material		≥46 MJ/kg	≤ 14 MJ/kg	≤ 3 MJ/kg	≤1 MJ/kg
	Europe	Euroclass C-D (EN 13501-1)	Euroclass B (EN 13501-1)	Euroclass A2 (EN 13501-1)	Euroclass A1 (EN 13501-1)
Fire Classification	Australia	-	-	-	AS1530.1 (Non-combustible core material)

CERTIFICATE

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Material Fire Test Certificate

IGN	L-41	57-0	01C	01	R01

DATE OF TEST 01.12.2020 ISSUE DATE EXPIRY DATE

04.12.2020 03.12.2025

AS 1530.1:1994 Combustibility test for materials

SPONSOR

Network Architectural 71 Marigold Street Revesby NSW 2212

TEST BODY

Ignis Labs Pty Ltd ABN 36 620 256 617 **3** Cooper Place Queanbeyan NSW 2620 Australia www.ignislabs.com.au (02) 6111 2909 Test body is the test location



Specimen Identification

Aluminium Skin of Mitsubishi Alpolic

Specimen Description

The sponsor described the tested specimen as:

Aluminium skin of composite panel. The nominal thickness of the specimen is 0.5mm and the end use being cladding. Individual pieces are stacked together to the required specimen height for each test.

The test specimens are cylindrical, and each has:

(a)	Nominal diameter (mm):	44.68
(b)	Nominal height (mm):	51.64
(c)	Nominal volume (cm ³)	80.93
(d)	Nominal Mass (g):	204.62
(e)	Colour:	Silver

Test Method

Five (5) specimens were tested in accordance with Australian Standard 1530 Methods for fire tests on building materials, components and structures, Part 1 - 1994: Combustible test for Materials. The test apparatus is constructed in accordance with the requirements of ISO 1182:2010, which has been verified to be equivalent to the apparatus requirements of AS 1530.1:1994, with the exception that a suitable alternative insulating material was used to fill the annular space between the furnace tubes as specified in Clause 4.2 of ISO 1182:2010.

Observations

All five specimens exhibited equivalent performance. No ignition was observed. The tests were stopped after 30 min due to the phase change of the specimen (melting). The specimens, being aluminium, have a melting temperature of approximately 600°C and, therefore, evaluated in accordance with Clause A4 of AS 1530.1-1994 as applicable to thermally unstable materials. The tests were undertaken at 750±5°C, at which temperature stabilisation was evaluated.

Results

The specimen achieved the following results:

	Symbol	Arithmetic
Mean furnace thermocouple temperature rise:	ΔTf	2.10 °C
Mean specimen centre thermocouple temperature rise:	ΔΤc	4.80 °C
Mean specimen surface thermocouple temperature rise:	ΔTs	8.42 °C
Mean duration of sustained flaming:		0 s
Mean mass loss:		0.30%

Combustibility

The specimens are NOT deemed COMBUSTIBLE according to the test criteria specified in Clause 3.4 of AS 1530.1-1994.



Test Supervisor Darren Laker

Technical Lead Ram Prakash

Number: 20534 Site number: 24604 Accredited for compliance with ISO/IEC 17025 - Testing

IGNL-QF-031-Issue 03 Revision 01

Disclaimer These test results relate only to the behaviour of the test specimens of the material under the particular conditions of the test, and they are not intended to be the sole criterion for assessing the potential fire hazard of the material in use. The information contained in this document is provided for the sole use of the recipient and no reliance should be placed on the information by any other person. In the event that the information is disclosed or furnished to any other person, ignis Labs Pty Ltd accepts no liability for any loss or damage incurred by that person whatsoever as a result

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Certificate of test

Test sponsor	Certificate issue date	Certificate number
Mitsubishi Chemical Corporation 1-1, Marunouchi 1 - chome, Chiyoda-Ku Tokyo 100-8251 Japan	15 August 2019	SFCRTF190153

Description of the test specimen

The material comprised of Aluminium Tri-Hydroxide, Calcium Carbonate and a proprietary polymer binder as nominated by the test sponsor. The material is to be used as the core of Mitsubishi ALPOLIC™ NC Aluminium Composite Panels, which will be used on internal and external walls as lining and cladding, as nominated by the test sponsor. The material was off white in colour and had a measured density of 1803 kg·m⁻³. Please refer to the referenced test report in Table 1 for a complete description of the test specimen, construction and significant behaviour.

Test information

The specimen was tested by Warringtonfire Australia on behalf of the test sponsor in accordance with the test standard identified in Table 1. It achieved the results shown below.

Table 1 Test and report details

Referenced report	Test standard	Test date	Referenced report issue date
RTF190153.3	AS 1530.1:1994 (R2016)	2 July 2019	24 August 2019

Test results

The material, as described in the referenced test report in Table 1, is <u>NOT DEEMED COMBUSTIBLE</u> according to the test criteria for combustibility specified in Clause 3.4 of AS 1530.1:1994 (R2016).

Conditions/validity

- This certificate is provided for general information only and does not comply with the regulatory requirements for evidence of compliance.
- Please refer to the relevant test report to determine the applicability of the test result to a proposed installation and for a full description of the tested construction.
- The results of these fire tests may be used to assess fire hazard, but it should be recognised that a single test method will not provide a full assessment of fire hazard under all conditions.
- All work and services carried out by Warringtonfire Australia are subject to, and conducted in accordance with our standard terms and conditions. These are available on request or at https://www.element.com/terms/terms-and-conditions.

Testing authority	Warringtonfire Australia Pty Ltd		
Address	Unit 2, 409-411 Hammond Road, Dandenong South, VIC 3175		
Phone	T: +61 (0)3 9767 1000		
ABN	81 050 241 524		
Email	info.fire.melbourne@warringtonfire.com		
Authorisation	Prepared by: Reviewed by:		
	Anthony Rosamilia	Tanmay Bhat	

SFCRTF190153.1

QA version: 12 June 2019

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Certificate of Test

REPORT No.: FNE12292

AS/NZS 1530.3:1999 SIMULTANEOUS DETERMINATION OF IGNITABILITY, FLAME PROPAGATION, HEAT RELEASE AND SMOKE RELEASE

Quote No.: NE8089

TRADE NAME:	4-mm ALPOLIC NC				
SPONSOR:	Mitsubishi Chemical Corporation 1-1, Maruouchi 1-chome CHIYODA-KU 100-8251 JAPAN				
DESCRIPTION OF					
SAMPLE:	The sponsor describe	the tested specir	men as an alumi	nium composi	te panel comprised of the following layers:
	Layer 1: 2	28-μm thick fluor	opolymer coatir	ig;	
	Laver 3: 3	35-um thick adhe	sive film;	6	
	Layer 4: 3	-mm thick core c	comprised of po	lymers, alumir	nium hydroxide (Al(OH) ₃), calcium
	Lavor Et	arbonate (CaCO ₃) and additives.		
	Laver 6: 0).5-mm thick alun	ninium allov skii	n:	
	Layer 7: 5	5-μm thick polyes	ter coating.		
	The aluminium alloy 0.057-m²/l.	skin was adhere	d onto the core	with an adhe	sive film applied at an application rate of
	Nominal total thickne	ess: 4 m	nm		
	Nominal total mass:	8.6 silv	kg/m ²	hite (back)	
TEST PROCEDURE:	Six samples were tes structures, Part 3: Si release, 1999. For the	ted in accordance imultaneous dete e test, each samp	e with AS/NZS 1 ermination of ig le was clamped	530, Method gnitability, flan to the specim	for fire tests on building components and me propagation, heat release and smoke ten holder in four places.
RESULTS:	The following means	and standard err	ors were obtain	ed:	
	Para	ameter	a	Mean	Standard Error
	Ignition Time (min)			N/A	N/A
	Flame Spread Time (s)			N/A	N/A
	Heat Release Integral (kJ/m²)		N/A	N/A
	Smoke Release (log ₁₀ D)	1	8	-2.22	0.119
	For regulatory purpo	ses these figures	correspond to t	he following i	ndices:
	Ignitability Index	Spread o Inde	f Flame ex	Heat Evolved Index	Smoke Developed Index
	(0-20)	(0-1	.0)	(0-10)	(0-10)
The results of this fire provide a full assessm	U e test may be used to d nent of fire hazard under	0 irectly assess fire all fire condition	hazard, but it : is.	u should be reco	0 - 1 ognised that a single test method will not
DATE OF TEST:	6 December 2018				
Issued on the 12 th day	y of December 2018 with	nout alterations o	or additions.		
Show		B. K	lod	7	
Shaw Iran Testing Officer		Team Leader	Fire Testing and	Assessments	
Copyright CS	IRO 2018 ©. Copying or	alteration of this	report without	written autho	prisation from CSIRO is forbidden.
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14 Julius Avenue, Riverside Corporate Park, North Ryde NSW 2113 AUSTRALIA Telephone: 61 2 9490 5444 Facsimile: 61 2 9490 5555 www.csiro.au CSIRC

Glossary of Terms

- ACM = Aluminium Composite Material
- AS = Australian Standard
- ATH = Aluminium Tri Hydrate
- BCA = Building Code of Australia
- CC = Calcium Carbonate
- CV = Calorific Value
- DtS = Deemed-to-Satisfy
- FTIR = Fourier Transform Infra-red
- ICA = Insurance Council of Australia
- MJ = Mega Joules
- NC = non-combustible
- NCC = National Construction Code
- PE = Polyethylene
- SDI = Smoke Developed Index
- SFI = Spread Flame Index
- XRD = X-Ray Diffraction



About ExcelPlas: With more than 25 years' experience, ExcelPlas is acknowledged as a leading provider of specialist analytical and technical capabilities for the building and construction industry in the area of polymer analysis. ExcelPlas Labs use a range of analytical techniques to assist building owners, building managers, building insurers, fire engineers and other stakeholders to provide advice relating to the flammability potential, composition and toxicity of cladding materials. ExcelPlas is a NATA-accredited laboratory and is ISO/IEC 17025 compliant.

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