



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 Testing on ALPOLIC™ NC/A1 Aluminium Composite Cladding

Independent ExcelPlas testing has shown that ALPOLIC™ NC/A1 has a non-combustible mineral core containing less than 5% polymer and greater than 95% inert filler (inert content) by mass.

ALPOLIC™ NC/A1 is a Codemark Certified non-combustible material fully complying with the DtS provisions as per NCC/BCA and can be used 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.

Independent Testing of ALPOLIC™ NC/A1 Aluminium Composite Cladding

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

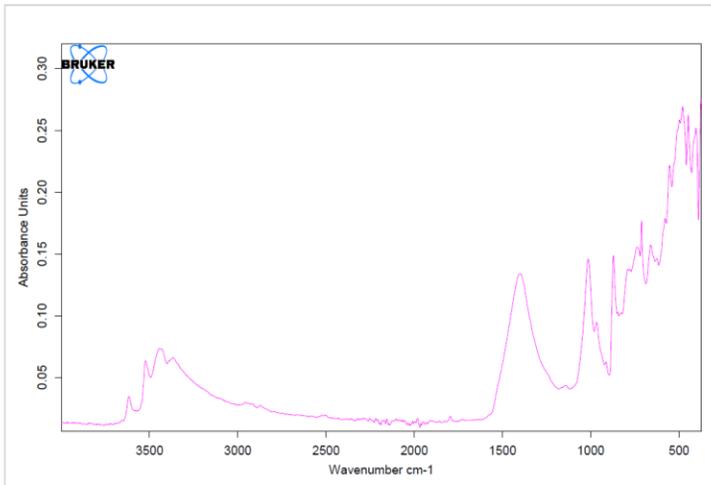


Figure 2. IR spectrum of the cladding core sample 9396/1.



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



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Independent Testing of ALPOLIC™ NC/A1 Aluminium Composite Cladding

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



Gibbsite – Aluminum Tri-hydrate
Calcite – Calcium Carbonate

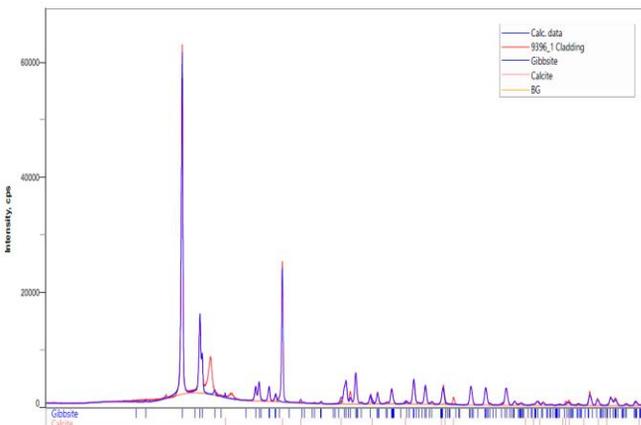
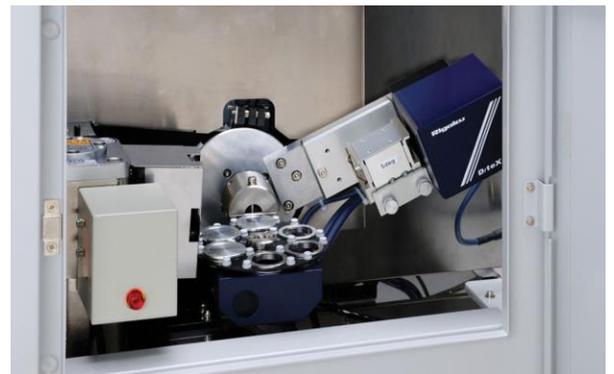
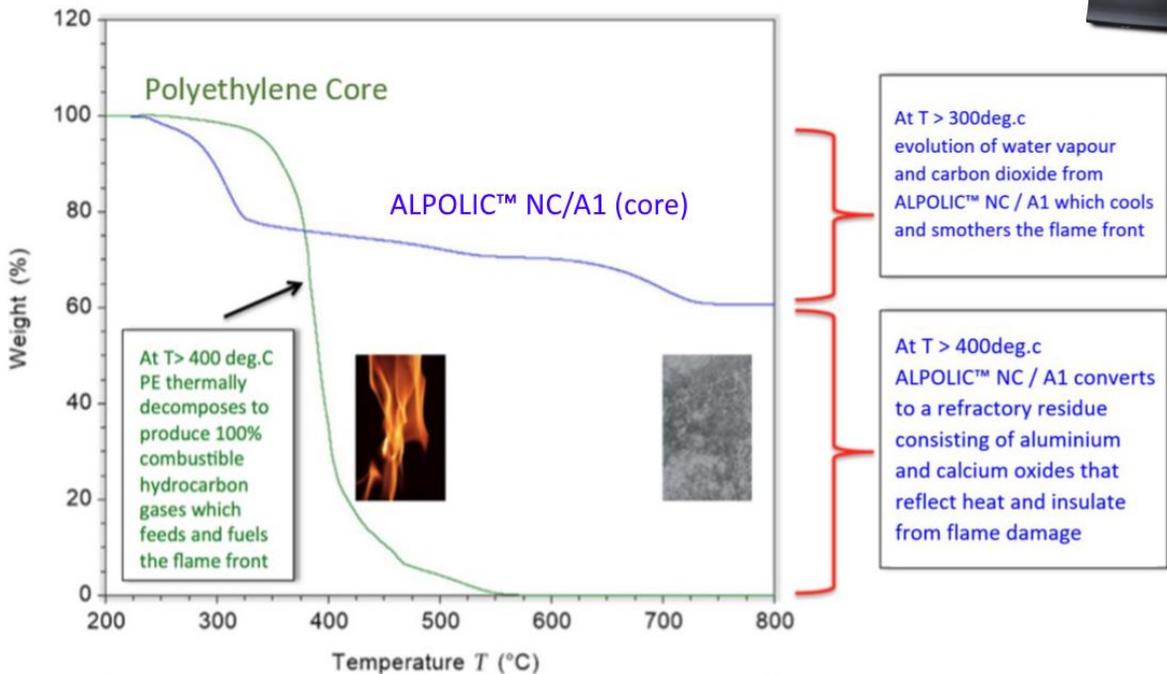


Figure 3. XRD pattern of the cladding core sample 9396/1.



Independent Testing of ALPOLIC™ NC/A1 Aluminium Composite Cladding

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 fully complies 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%
A	30-100% Polymer and 0-70% inert materials	30-100%	0-70%
B	8-29% Polymer and 71-92% inert materials	8-29%	71-92%
C	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%

Independent Evaluation of ALPOLIC™ NC / A1 Aluminium Composite Cladding



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.

Independent Evaluation of ALPOLIC™ NC / A1 Aluminium Composite Cladding

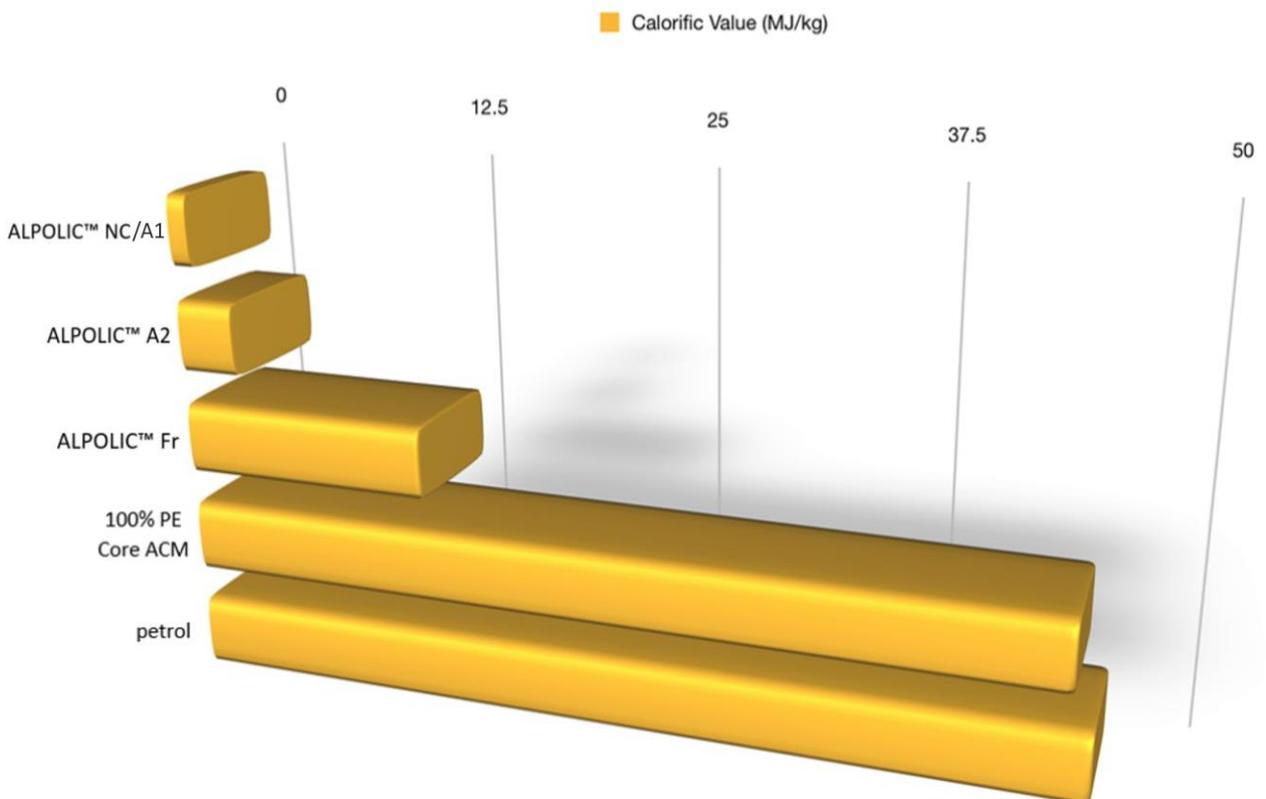


Mitsubishi ALPOLIC™ NC / A1 offers higher performance than solid aluminium cladding in the following ways:

- **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: ALPOLIC™ A1!

The Euroclass system

Euroclass	Contribution to fire
A1	Non Combustible
A2	Limited Combustible No Flashover
B	No Flashover
C	Flashover after 10 minutes
D	Flashover before 10 minutes
E	Flashover before 2 minutes
F	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%
					
Heat potential of the core material		≥ 46 MJ/kg	≤ 14 MJ/kg	≤ 3 MJ/kg	≤ 1 MJ/kg
Fire Classification	Europe	Euroclass C-D (EN 13501-1)	Euroclass B (EN 13501-1)	Euroclass A2 (EN 13501-1)	Euroclass A1 (EN 13501-1)
	Australia	-	-	-	AS1530.1 (Non-combustible core material)

CERTIFICATE

Material Fire Test Certificate

IGNL-4157-01C I01 R01

DATE OF TEST 01.12.2020
ISSUE DATE 04.12.2020
EXPIRY DATE 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



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

Version: 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 of using the information.

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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:	ΔTc	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

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 **NOT DEEMED COMBUSTIBLE** 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

Certificate of Test

Quote No.: NE8089

REPORT No.: FNE12292

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

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 specimen as an aluminium composite panel comprised of the following layers:

Layer 1: 28- μ m thick fluoropolymer coating;
Layer 2: 0.5-mm thick aluminium alloy skin;
Layer 3: 35- μ m thick adhesive film;
Layer 4: 3-mm thick core comprised of polymers, aluminium hydroxide (Al(OH)₃), calcium carbonate (CaCO₃) and additives.
Layer 5: 35- μ m thick adhesive film;
Layer 6: 0.5-mm thick aluminium alloy skin;
Layer 7: 5- μ m thick polyester coating.

The aluminium alloy skin was adhered onto the core with an adhesive film applied at an application rate of 0.057-m²/l.

Nominal total thickness: 4 mm
Nominal total mass: 8.6 kg/m²
Colour: silver (face)/ off-white (back)

TEST PROCEDURE: Six samples were tested in accordance with AS/NZS 1530, Method for fire tests on building components and structures, Part 3: Simultaneous determination of ignitability, flame propagation, heat release and smoke release, 1999. For the test, each sample was clamped to the specimen holder in four places.

RESULTS: The following means and standard errors were obtained:

Parameter	Mean	Standard Error
Ignition Time (min)	N/A	N/A
Flame Spread Time (s)	N/A	N/A
Heat Release Integral (kJ/m ²)	N/A	N/A
Smoke Release (log ₁₀ D)	-2.22	0.119

For regulatory purposes these figures correspond to the following indices:

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

The results of this fire test may be used to directly assess fire hazard, but it should be recognised that a single test method will not provide a full assessment of fire hazard under all fire conditions.

DATE OF TEST: 6 December 2018

Issued on the 12th day of December 2018 without alterations or additions.



Shaw Tran
Testing Officer



Brett Roddy
Team Leader, Fire Testing and Assessments

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NATA Accredited Laboratory
Number: 165
Corporate Site No 3625
Accredited for compliance with ISO/IEC 17025 – Testing.

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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.

www.excelplas.com



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