



THE TRUTH & SAFETY OF WORLD CLASS ALUMINIUM COMPOSITE PANELS



“With two layers of aluminium sheeting and a non-combustible mineral core, aluminium composite cladding is deemed non-combustible, and produced and warranted by a globally respected manufacturer.”



Introduction

Across the global architecture and design industries, there has been much discussion about the fire safety of exterior facade cladding, particularly in high rise building applications. Following a streak of cladding fires, such as Lacrosse in Melbourne¹ and Grenfell² in London, the spotlight was turned sharply onto the aluminium composite cladding that was present in both cases. But what the resulting media fallout failed to clarify is that 'aluminium composite cladding' is an umbrella term for a range of cladding products, and that the flammable component in both fires was the 100% polyethylene core at the centre of the cladding.

Core material composed of 100% polyethylene is categorised as highly combustible³ and when ignited creates a range of additional hazards such as irritating or toxic fumes, and finely dispersed particles which can form explosive mixtures in air.⁴ However, not all aluminium composite cladding products contain 100% polyethylene cores. The term 'Aluminium composite' refers to a bonded laminate product in which a material core is bound on the outside by aluminium sheeting.

Aluminium Composite Panel (ACP) cladding originally gained favour in the construction industry as it offered the beneficial material properties of aluminium - light weight, strength, and durability against the elements - and combined that with the thermal resistance of a polymer core. This created a product that provided excellent heat transfer performance, was easy to install and maintain and had a long lifespan expectancy.

It is estimated that roughly 3,400 buildings in Australia will need to be re-clad because their existing panels have greater than 30% polyethylene content within the core.⁵ As a result, many builders and building owners are turning to solid aluminium as a non-combustible alternative for existing polyethylene-based cladding products. But while it may be non-combustible, solid aluminium cladding provides less thermal performance, has inherent oil-canning issues and performs poorly in a real life fire tests which makes it sub-standard as a cladding option.

For a cladding product that provides excellent thermal performance, along with a host of other desirable characteristics such as high rigidity, lightweight and high durability - while also being non-combustible - designers and specifiers should opt for a mineral core aluminium composite cladding solution.

This whitepaper will take a detailed look at the beneficial material properties of non-combustible, mineral-core aluminium composite cladding as well as the considerations for designers and specifiers in selecting a product.



Compliance

When it comes to cladding, it is fair to say that in the current climate the first consideration for any designer or specifier is the product's compliance with Australian standards and codes. Part C1.9 of the National Construction Code sets out the Deemed-to-Satisfy requirements for non-combustibility of bonded laminated products⁶ as follows:

C1.9 (e): The following materials may be used wherever a non-combustible material is required:

- (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.*
- (vii) 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.*

With two layers of aluminium sheeting and a core consisting of non-combustible mineral core aluminium composite cladding is deemed non-combustible. Its adhesive layers are 0.05mm, resulting in a total thickness of 0.1mm, and the product also achieves 0 Spread-of-Flame Index and Smoke-Developed Index, making it a very safe cladding choice.

These results have been determined in accordance with *AS1530.1-1994 - Combustibility Test for Materials* and *AS1530.3-1999 - Simultaneous Determination of Ignitability, Flame Propagation, Heat Release and Smoke Release*. By being deemed non-combustible in accordance with these tests, mineral core aluminium composite cladding is also able to attain the safest possible rating in the Insurance Council of Australia Hazard Identification and Category Rating Guide.⁷

AS 5113 - Fire Propagation Test of External Walls is a recent standard which uses a large-scale test to determine a wall's ability to spread fire. The standard assesses flame spread and temperature increases surrounding the site of the blaze, but it also looks at the debris that is produced as a result of fire. The testing for the standard requires that debris mass weighing no more than 2kg falls from the specimen, and that any debris which falls to the ground is not flaming for more than 20 seconds.⁸

With a melting point of 660 degrees celsius, solid aluminium cladding will quickly become molten when exposed to fire which leads to the panels opening up, and large pieces of molten debris that can cause a serious safety issue. Mineral core aluminium composite cladding uses significantly less aluminium than solid panels and with a non-combustible core, the largest piece of debris falling from one of these panels is 180 grams as opposed to solid aluminium, which is significantly higher (23kg).

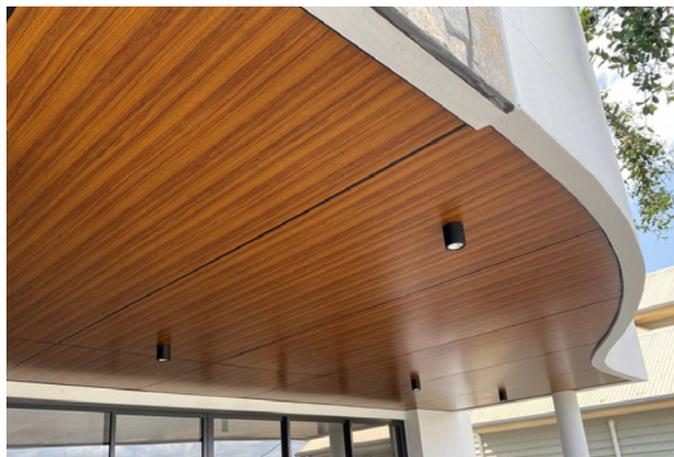


Thermal Conductivity

Apart from any aesthetic concerns, the main purpose of facade cladding is to provide an additional layer of insulation for a building. This means that low thermal conductivity is essential when choosing a cladding material. The thermal conductivity of solid aluminium is 205 W/m-K,⁹ placing it at the higher end of the spectrum for common building materials and rendering it undesirable for use as a cladding material - or, indeed, any other application where the minimisation of heat transfer is a concern. By contrast, mineral core aluminium composite offers a thermal conductivity of just 0.4 W/m-K. This allows it to provide an excellent temperature barrier between the interior and exterior of a building, whether the weather outside is hot or cold.

Flatness

With the vast majority of building facades requiring flat paneling, structural rigidity of the chosen material is very important. When fabricated and installed onto the building, solid aluminium is prone to oil canning due to the high rates of thermal expansion that occurs regardless of what size of panel is being installed. Oil canning is the deformation or buckling of the sheet metal material, and is most commonly seen in facade applications as waviness in areas that should otherwise be flat. This can cause issues at the panel joints which, in turn, can affect weathertightness and the overall integrity of the facade as a whole. Mineral core aluminium composite utilises only thin sheets of aluminium which are tightly bonded to the core material. This means the cladding is less subject to the material instabilities of 3mm thick, solid aluminium, and provides excellent flatness and rigidity by contrast.



Ease of Installation

When dealing with high-rise installations, the weight of chosen materials is of significant consideration. Heavy building materials require more manpower, more machinery and precise attention to detail to ensure safety and compliance in installation. Common cladding materials such as concrete or glass are comparatively heavy, so while they may be favoured for certain aesthetics they can be problematic from a practical standpoint. Aluminium Composite Panels that are BCA compliant are a safe, superior performing, lightweight cladding option in this regard.

Durability

Durability concerns have to do with materials, but also with paints, coats and finishes. This means that in many cases suppliers offer certain products which, despite being of predominantly similar material, significantly outperform similar products from a durability standpoint. Die coated cladding provides excellent durability as well as significantly improved colour control throughout the lifespan of the product. This 3-coat coil-coating process allows precise control of paint thicknesses and consistency throughout the application process. Suppliers should be able to offer warranties that attest to the durability of their products and for a composite cladding product, a warranty for lifespan in excess of 20 years would be appropriate.

Warranty

Warranties are a key consideration when specifying cladding of any kind, and to that end there are a number of questions designers and specifiers should consider.

- Ask who is backing the warranty. Is the warranty from a local distributor with no significant backing, or is it from a reputable manufacturer?
- What is the warranty covering? Is it simply the supply of new material or does it also cover rectification costs?
- Are there any hidden clauses in the warranty that will leave you empty handed? Such as maintenance records and invoices to show you have cleaned your façade twice a year just to maintain the warranty?
- What are the credentials of the manufacturer and how long have they been producing façade solutions for the Australian Construction sector?



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Mitsubishi ALPOLIC NC Non-Combustible Cladding

Mitsubishi ALPOLIC NC Non-combustible mineral core aluminium composite cladding is an ideal choice for designers and specifiers who are looking for a balance of excellent fire safety, functionality, and versatile aesthetic. Mitsubishi ALPOLIC NC panels are manufactured in Japan and have zero polyethylene in the panel (a fact certified by ExcelPlas NATA Lab in Victoria). Mitsubishi ALPOLIC panels come with a 20 year full cover warranty, including rectification costs, guaranteed by the globally trusted Mitsubishi with no maintenance requirements built in.

Due to their polyethylene-free mineral core, Mitsubishi ALPOLIC panels are easier on tooling and quicker to fabricate than solid aluminium. They offer high rigidity and

excellent flatness which means they are not prone to oil canning, which is a well-known issue with solid aluminium. They offer far superior thermal performance than solid aluminium cladding and their 3-coat die-coated finish has proven durability for over 25 years in Australian conditions.

The Mitsubishi ALPOLIC panels are supplied exclusively throughout Australia by Network Architectural, who specialise in high-performance architectural facade solutions. Network Architectural offers a highly trained team of specialists who are able to digest complex project-specific requirements from designers and specifiers and suggest the best possible solutions for the job.

REFERENCES

- ¹ City of Melbourne. "Lacrosse Building Fire". 25 November 2014. Accessed 8 October 2020. <https://www.melbourne.vic.gov.au/sitecollectiondocuments/mbs-report-lacrosse-fire.pdf>
- ² ABC. "London's Grenfell Tower blaze spread by faulty building materials, lawsuit claims". 12 June 2019. Accessed 8 October 2020. <https://www.abc.net.au/news/2019-06-12/grenfell-tower-fire-spread-by-building-materials-lawsuit-claims/11202856>
- ³ Whitely, M. & Wei-Ping, P. "A study of the flammability of chlorinated polyethylene under pyrolysis conditions". *Thermochimica Acta*. 15 September 1990. Vol 166, pp27-39. Accessed 9 October 2020. [https://www.sciencedirect.com/science/article/abs/pii/004060319080167W#:~:text=High%20density%20polyethylene%20\(HDPE\)%20is%20highly%20flammable%2C%20and%20it,the%20flammability%20of%20the%20polymer](https://www.sciencedirect.com/science/article/abs/pii/004060319080167W#:~:text=High%20density%20polyethylene%20(HDPE)%20is%20highly%20flammable%2C%20and%20it,the%20flammability%20of%20the%20polymer)
- ⁴ World Health Organisation International Program on Chemical Safety. "Polyethylene". Accessed 9 October 2020. <http://www.inchem.org/documents/icsc/icsc/eics1488.htm>
- ⁵ Gorrey, M. & Saulwick, J. "Australia's building crisis fix will cost \$6.2 billion: report". *Sydney Morning Herald*. 19 August 2019. Accessed 9 October 2020. <https://www.smh.com.au/national/nsw/australia-s-building-crisis-fix-will-cost-6-2-billion-report-20190730-p52c9x.html>
- ⁶ Australian Building Codes Board. "National Construction Code Part C1 Fire resistance and stability". Accessed 9 October 2020. <https://ncc.abcb.gov.au/ncc-online/NCC/2019/NCC-2019-Volume-One/Section-C-Fire-Resistance/Part-C1-Fire-Resistance-And-Stability/C10-DeemedToSatisfy-Provisions?inlineLink=%7B4F8424AB-2A8B-45CC-9A43-BF58CAECD53C%7D>
- ⁷ Insurance Council of Australia. "Insurance industry aluminium composite panels residual hazard / reporting protocol". Accessed 9 October 2020. <https://www.insurancecouncil.com.au/issues-submissions/issues/insurance-industry-aluminium-composite-panels-residual-hazard-identificationreporting-protocol>
- ⁸ Engineers Australia. "Combustible Facades & AS5113 Amendment". Accessed 9 October 2020. <https://www.engineersaustralia.org.au/sites/default/files/Learned%20Society/April%202018%20-%20Combustible%20Facades%20%26%20AS5113%20Amd%201.pdf>
- ⁹ Georgia State University Department of Physics and Astronomy. "Thermal Conductivity". Accessed 9 October 2020. <http://hyperphysics.phy-astr.gsu.edu/hbase/Tables/thrcn.html>

All information provided correct as of October 2020