ALUMINIUM CLADDING
UNDERSTANDING FLAMMABILITY

INTRODUCTION

Flammable cladding is a topical concern of both the construction industry and the general public, thanks to high-profile incidents such as the recent Grenfell Tower tragedy. In Australia, the key event that thrust the issue into the limelight was the November 2014 Lacrosse tower fire, which ripped through an apartment complex in Docklands, Melbourne. Causing over $2 million in damage but thankfully no loss of life, the fire led to a Victorian Building Authority (VBA) enquiry into the use of non-compliant building products in Melbourne.

The results of the enquiry were disheartening, with 51% of the 170 high rise residential buildings evaluated in Melbourne CBD and surrounds found to be non-compliant.[1] The matter was referred to the Senate Economics References Committee, who in September 2017 released an interim report into aluminium composite cladding. This type of cladding has come under particular scrutiny due to its use in both Lacrosse and Grenfell, and in numerous high-rises around the world that have suffered similar fates.

Generally speaking, aluminium is a non-combustible material. However, the two main types of aluminium cladding– aluminium composite panels and solid, powder-coated aluminium cladding– offer vastly different flammability properties. Architects searching for a cost-effective, high performance solution that effectively manages flammability concerns should be mindful of the difference between the two types of product.

UNDERSTANDING THE DIFFERENCE BETWEEN TYPES OF ALUMINIUM CLADDING

As the CEO of Fire Protection Association Australia, Scott Williams, told the ABC, it is virtually impossible to tell the difference between safe and unsafe aluminium cladding simply by looking at it.[2] Aluminium composite panels have an aluminium outer layer, which makes them appear identical to solid aluminium sheets when installed. In spite of appearances, there are a number of key characteristics that distinguish the two types of aluminium cladding from one another.

Aluminium Composite Panels

As mentioned above, Lacrosse and Grenfell, as well as other high rises subject to similar fires in Dubai, China, France, the US, and South Korea, featured aluminium composite panels.[3] In each case, flames spread rapidly up the building façade- in its report on the Lacrosse fire, the Metropolitan Fire Brigade found that "is evident… [that]… the rapid and extensive vertical spread up and down the buildings [is] in direct correlation with the fire".[4] A 3-5mm thick laminate, aluminium composite panel comprises a mineral or synthetic polyethylene/plastic core sandwiched and glued between aluminium sheets. The panels burst onto the Australian market during the 1990s, immediately rising to popularity due to their affordability, lightweight nature, and ease of manufacture.

In Australia and New Zealand, the panels are classified as 'Attachments', with both countries' building codes requiring them to be attached to fire rated walls. Panels must also demonstrate that they will not contribute to the spread of flame.[5] A number of factors contribute to combustibility, the first of these being the core material of the panel. Panels with a mineral core tend to withstand fire better than their synthetic-core counterparts, though are still outperformed by solid aluminium powder coated sheets. Other factors affecting combustibility include attachment method, location and orientation of the panel, and the presence of other control measures such as sprinkler systems.

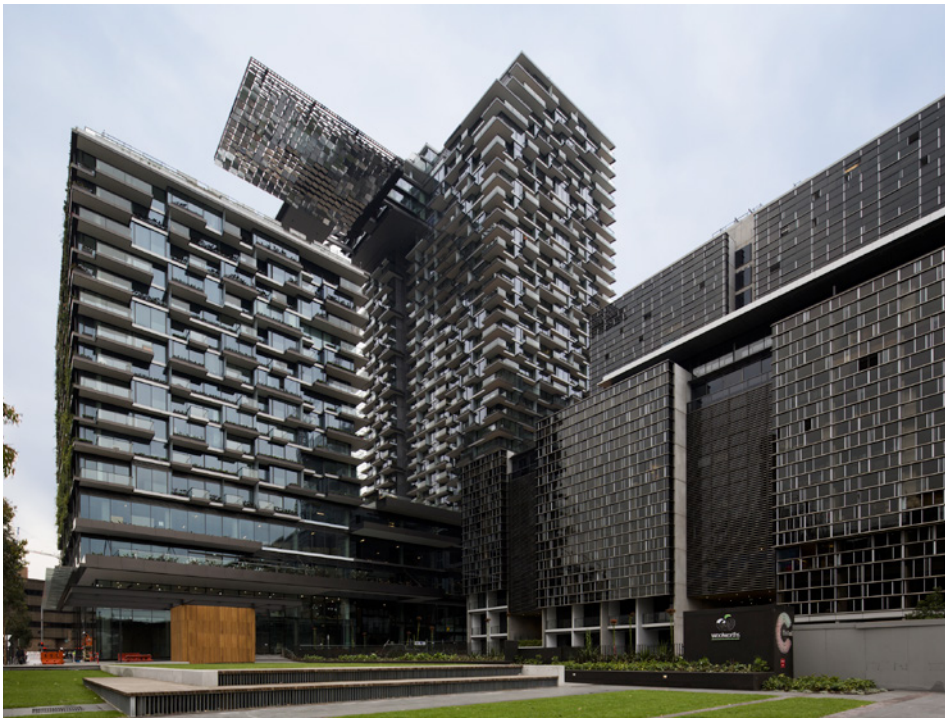
TYPES OF ALUMINIUM COMPOSITE PANELS

When it comes to flammability ratings, aluminium composite panels are divided into four broad categories: PE, FR, A2, and Aluminium-Core Composite Panel. PE panels are composite panels with a polyethylene core. They are fire rated as 'flammable', and their use is restricted to Type C construction. In practice, this means that they are only suitable for use as signage and in low-rise developments, warehouses, and factories. FR panels are fire resistant panels that have been tested to EN 13501:B-s1,d0 and assigned a fire rating of 'Difficult to ignite'. FR panels will not contribute to the spread of flame and can be attached to a fire rated wall for use on high-rise constructions. A2 panels have a fire rating of 'Classified as Non-combustible', and are acceptable for use on high-rise conjunctions. However, they must be attached to a fire rated wall. A1 panels, with a fire rating of 'Non-combustible', are the highest performing aluminium composite panels. They may be used on high-rise buildings, but only where they are paired with a fire rated wall.

Aluminium Powder Coated Sheets

Unlike aluminium composite panels, aluminium powder coated sheets are comprised of solid architectural grade aluminium. In place of conventional liquid paint, they are finished with a dry coating that is cured to form a 'skin' that protects against the elements and ensures high gloss and colour retention. This smooth, durable finish is easier to apply than plaint and does not affect aluminium's non-combustible nature.

Though aluminium powder coated sheets are typically low maintenance, care must be taken at the installation stage to ensure sheets are adequately protected. Oxidisation and other contaminants must be removed prior to powder coating, and a conversion pre-treatment applied prior to application to ensure maximum performance. The heat-intensive curing process requires an oven, which means that on-site application is not possible.



REASONS FOR USE

Although powder coated solid aluminium sheets are more expensive than composites, they offer numerous benefits, including their fire resistance, which may offset costs. The corrosion-resistant sheets offer lower whole of life costs than composite aluminium panels, as they are unlikely to require premature repair or replacement during early- or mid-stages of their life cycle. They are also sustainable: where the plastic core of composite panels is not recyclable, solid aluminium sheets can be re-smelted and re-purposed.

CONSIDERATIONS WHEN USING ALUMINIUM CLADDING IN AUSTRALIA

Flammability

When set alight, a kilo of polyethylene-core cladding "release[s] the same amount of energy as a kilogram of petrol".[6] CSIRO tests of composite cladding found that panels caught fire in less than a minute, further highlighting the material's highly flammable nature.[7]

Conversely, solid powder coated aluminium sheets will not catch fire when exposed to flame. When tested for flame propagation according to AS/NZS 1530.3, powder coated aluminium performed extremely well, scoring right on the low end of the scale for indices of ignitability, spread of flame, heat evolved, and smoke developed. Polyester powder coated aluminium is suitable for internal and external cladding, but should not be installed in fire 'control room' environments. When considering aluminium cladding, it is advisable to request flammability reports from the powder coating manufacturers. Such reports will outline the results of flame propagation testing in line with AS/NZS1530.3-1999 Part 3 and provide four key regulatory indices: ignitability index, spread of flame index, heat evolved index, and smoke developed index.

Code Compliance

It is important to note that while the Building Code of Australia (BCA) establishes limits on the use of combustible materials on external walls in high rises, it does not ban it. Rather, it restricts the attachment of the materials in contexts in which this would be dangerous.
Performance requirement CP2 of volume 1 of the National Construction Code requires buildings to have appropriate elements that prevent the spread of fire in a building and between buildings. This requirement should be read in conjunction with Advisory Note 2016-3: Fire Performance of External Walls and Cladding, which provides further explanation of the specific means through which this requirement can be met.

Where cladding, including aluminium composite, is not deemed to satisfy requirements, the Performance Solutions (formerly 'Alternative Solutions') process of the BCA must be followed. In other words, a performance-based approach within the context of the specific project should be taken in order to satisfy the requirements of CP2.

Aluminium cladding products must also meet the requirements of AS/NZS1530.3 – Flame Propagation Testing. Further, for powder coated sheets, there is one Australian Standard (for domestic residential applications) (AS3715) and three Architectural Aluminium Manufacturer's Association (AAMA) standards for commercial applications that provide an indication of weathering performance quality. AAMA 2603, AAMA 2604, and AAMA 2605 are measured in 'yr Allunga' and 'Year Florida'.

The two measures are named for Allunga, Queensland, and South Florida, USA, respectively – two test locations selected or having the highest average exposure to UV, humidity, rainfall, and sea salts anywhere in the world. For both measures, the higher the number, the longer the cladding can be expected to resist UV damage.

CONCLUSION

Proper consideration of cladding options is crucial to ensuring the optimum fire safety performance of a building. This is particularly important in high-rise residential and commercial buildings, where long, flammable facades can prove devastating in the case of fire. When it comes to aluminium cladding, the two main product categories differ vastly in their ability to resist flames. Though suitable for certain applications in low-rise, industrial projects, aluminium composite panels perform poorly in fire situations. Aluminium powder coated sheets are in this regard more suitable for high-rise projects, or other circumstances in which flame resistance is of peak importance.

Interpon Powder Coatings

Interpon Powder Coatings is a division of AkzoNobel Powder Coatings (“AkzoNobel”), a name synonymous with high quality, long lasting powder coatings for architectural use. With over 29 factories globally, AkzoNobel is committed to developing sustainable solutions that are durable, fit for purpose, and cost effective.

Interpon’s aluminium powder coatings are set apart from the pack by their lack of VOCs or heavy metals, their Global certified EPD, LEED & GBCA status, and the potential savings they offer in terms of whole of life costs. Their coatings contain no combustible materials, and meet all relevant global and local standards. Available in a wide range of colours, Interpon powder coating products are designed for maximum film integrity, colour retention, mechanical performance, and resistance to corrosion and UV or chemical exposure. As a result, they are suitable for multi-residential, marine, domestic, and commercial/mixed use projects alike. To ensure maximum performance, it is important to specify the correct grade of architectural powder coat for your class of building. Interpon understand how crucial this is and offers free consultation with their in-house team of experts in powder coating specifications for commercial projects. Local supply and warranty between 10 and 30 years may also be provided on Interpon D products, subject to the standard terms and conditions of AkzoNobel.

REFERENCES

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