CLADDING SAFETY Victoria

VBA VICTORIAN BUILDING AUTHORITY

Guide for Aluminium Composite Panels with Flame Retardant on Existing Buildings

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VICTORIA State Government

Aboriginal Acknowledgment

The CSV and VBA respectfully acknowledges the Traditional Owners and custodians of the land and water upon which we rely. We pay our respects to their Elders past, present, and emerging. We recognise and value the ongoing contribution of Aboriginal peoples and communities to Victorian life.

We embrace the spirit of reconciliation, working towards equality of outcomes and an equal voice.

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Guide for Aluminium Composite Panels with Flame Retardant on Existing Buildings

Introduction

This document provides Municipal Building Surveyors (MBS) a guidance framework to follow when reviewing and considering cancelling enforcement issued on external wall cladding in existing buildings (under Part 8 of the Building Act) that comprises Aluminium Composite Panels (ACP) with Flame Retardant. It also presents a general process to provide guidance to owners in providing show cause representation to the enforcement action by an MBS.

This Guide addresses ACP with Flame Retardant on existing buildings only. Where a building's external wall cladding includes other combustible products, including ACP without flame retardant minerals, or Expanded Polystyrene (EPS), the MBS will need to consider any additional risks posed by these products in determining appropriate action.

The framework comprises a 4-stage process:

- Stage 1: Investigation of ACP and wall construction on the building;
- Stage 2: Validation of ACP type via material characterisation testing;
- Stage 3: Assessment by an MBS, or an appropriate professional, as required; and
- Stage 4: Cancellation of enforcement.

Stages 1 and 2 are to be largely undertaken by the building owner if investigations have not already been completed by Statewide Cladding Audit (SCA) or Cladding Safety Victoria (CSV). Under the Cladding Remediation Partnership program, the MBS is also encouraged to be involved in these stages where Stages 1 & 2 are still active. Stages 3 and 4 are undertaken by the MBS. These stages are to ensure a consistent approach is taken to validate the presence and appropriateness of ACP with Flame Retardant when the owner intends to retain this cladding material.

Defining ACP with Flame Retardant

The core of ACP with Flame Retardant products comprises three main components, which can be present in varying ratios:

- A polymer, usually polyethylene (PE),
- A flame retardant mineral filler, usually aluminium hydroxide (Gibbsite) or magnesium hydroxide (Brucite) [see Appendix B for further information] and,
- a non-combustible organic filler (not an active flame retardant filler), such as calcium carbonate.

The 'Flame Retardant' type of ACP referred to in this guide is defined as when the ACP core has a greater part material composition of flame retardant mineral filler compared to the polymer.

For example, a core material of 46% flame retardant mineral filler (e.g., aluminium hydroxide), 44% PE and 10% non-combustible filler would be considered Flame Retardant ACP in this document. All the percentage and composition ratio figures in this Guide are referred to as weight percentage and weight ratio.

Most typically, the bulk of ACP products with Flame Retardant in Victoria have around 25-30% polymer and 55-75% flame retardant filler (aluminium or magnesium hydroxide), and the small remainder is non-combustible filler (like calcium carbonate). These are often referred to as Category B ACP via the original Insurance Council of Australia's (ICA) categorisation.

Less commonly, ACP with Flame Retardant products have been identified to have up to ~45% polymer, though with greater part flame retardant filler (45-50%) and the remainder inert fillers. These products are less commonly installed, and their performance has been discussed separately in the following section due to the limited testing available.

This Guide does not apply to products that have no flame retardant mineral filler (as described above) or have a greater part polymer or non-combustible filler compared to flame retardant filler.

NOTE:

- Many ACP products have been promoted under the term 'ACP-FR', as a marketing terminology. This is poorly defined "industry based nomenclature". The type and amount of flame retardants included in the core varies. Flame Retardant ACP has been defined as per this section for this reason.
- ACP products having very high mineral fillers (93-99%), and low polymer content (1-7%), which are typically known as ICA 'Category C' or 'A2', are considered low risk and out of the scope of this guide.

Background

a) Key findings of available research

Cladding Safety Victoria (CSV) has been engaged in research of ACP materials in order to better understand their performance in fire. Test reports and recordings can be found here.

In 2020, the Victorian Government engaged CSIRO to undertake a technical advice report on the fire performance of ACP based upon a review of available fire test reports and other information. The report can be found here.

The following findings are in reference to commonly identified ACP with Flame Retardant with 25-30% polymer. The research relating to most ACP with Flame Retardant is centred on these products.

The CSIRO review found that ACP with Flame Retardant can present a low likelihood of fire spread across the façade, and, in a review of building fires relating to ACP, no significant fire incidents involved ACP with Flame Retardant were identified.

They identified that, ACP with substrate and cavity materials of limited or no combustibility did not represent a risk of rapid vertical fire spread from the area of fire origin, and for installations on existing buildings, fire behaviour may be assessed as adequate, on a basis of the likelihood of fire spread across the facade.

Where ACP with flame retardant was combined with combustible insulation, such as phenolic foam or polyisocyanurate (PIR) insulation and installed without cassette panel system (installed as a flat panel) there was some enhancement of fire growth and fire spread beyond the fire test rig when subject to a large-scale fire. However, fire spread was still substantially less aggressive than Category A ACP (ICA categorisation) with mostly polymeric core, and the fire took significantly longer to spread from the panel of fire origin.

Subsequent fire testing by CSV has indicated that when ~30% PE type ACP with flame retardant was exposed to smaller fires in an intermediate scale test (similar to a fire from balcony contents) the fire also did not spread meaningfully beyond the area of fire origin.

The key findings at the time of writing highlight that 25-30% PE type ACP with flame retardant minerals would result in a low risk of rapid fire spread via the cladding.

The following findings are in reference to less commonly identified ACP with Flame Retardant comprising 30-45% polymer.

While undertaking the rectification work with cladding, CSV found a substantial existence of cladding with lower polymer content (up to 45%) and higher content of Flame Retardant and/or non-combustible filler. There is limited publicly available fire testing for this product type, therefore, CSV has undertaken a series of comparative intermediate scale tests to investigate this cohort of ACP where the ratio of Flame Retardant or non-combustible filler to polymer is approximately 1:1.

The intermediate testing demonstrated that this type of ACP with Flame Retardant has a resistance to fire spread which is significantly better than ~ 100% PE ACP but was slightly worse than the lower polymer cores (e.g., 20-30% polymer with 70-80% fire retardant filler). On the other hand, ACP with non-combustible, non-fire retardant filler of 1:1 ratio facilitates rapid fire spread via cladding which resembles the performance of ~ 100% PE ACP.

The following table outlines the ACP cores relevant to this Guide based on the research described, for which the testing parameters and details can be found here.

	Typical core composition	Evaluation Process
ACP WITH FLAME RETARDANT	• 71-92% mineral filler where there is greater part active flame retardant (magnesium or aluminium hydroxide) compared to the polymer. • 8-29% polymer.	**Refer to the following process in this guide and the CSV Protocols for Mitigating Cladding Risk (PMCR).**
	• The core has a greater part of active flame retardant filler than polymer (as defined in the Introduction). • i.e., ≥ 45 % active fire retardant being either magnesium or aluminium hydroxide and <45% polymer (and the remainder inert filler).	
ACP	• The core does not have a greater part of active flame retardant filler than polymer. • i.e., >45% polymer, or ≤ 45-30% polymer but significantly less than 45% active fire-retardant filler (e.g., the filler is mostly inert calcium carbonate).	**This material is out of scope this Guidance**

NOTE:

- All ACP with Flame Retardant installations should be reviewed by a competent person to confirm the extent of vertical connections, ACP core type, the wall-make up and substrates (such as insulation), barriers to fire spread, as well as other fire safety measures and risk factors in the building to form a holistic understanding of the building. A Fire Safety Engineer could be engaged at this stage to assist with the selection of the location and number of samples; however, this is engagement is not compulsory.
- As per all building stock and irrespective of combustible cladding, an examination is necessary for façade system arrangements that create substantial and continuous vertical cavities and use combustible insulation.
- Consideration should be given to combustible façade materials other than the combustible external cladding which interface with the combustible external cladding and may heighten the risk of cladding fire spread.

It is recommended that the MBS familiarise themselves with the CSIRO report and the CSV PMCR suite of documentation and associated fire tests that form the basis of this Guide.

CSV is furthering its suite of physical cladding testing and will release the results when undertaken. This will better inform the sector on a range of materials and their ability to propagate fire via the cladding.

b) Context in relation to existing buildings

Findings of the research and fire tests should be fully considered and applied to those buildings which were built prior to the 2021 Minister's prohibition as outlined in c) below. The MBS should have regard to the relatively robust fire performance of ACP with Flame Retardant, but also consider key factors that have been highlighted in this guide. These include: the quantity of flame retardant filler to polymer ratio in the ACP (the greater the ratio, the better performing within the definition of ACP with Flame Retardant) and the extent of the ACP (and the connections between storeys).

Conversely, positive building or site specific factors (such as setbacks, low SOU cladding connectivity and the like) may also alleviate factors that may worsen the fire performance characteristics. It is to be recognised that even ACP with Flame Retardant with negative factors (listed above) is still unlikely to rapidly spread fire in the same way as an ACP without Flame Retardant with the same % polymer content. On this basis, there should be consideration of proportionality for the risk assessment of existing buildings as defined in the Minister's Guideline 15 Cladding Risk Mitigation Framework.

c) Minister's prohibition of high-risk cladding products

In 2021, the Minister for Planning banned ACP products having less than 93% inert content in Victoria. This includes Category A and B ACP. This ban does not apply retrospectively to ACP with Fire Retardant already installed on existing buildings and does not include any applications for a building permit made prior to 1 February 2021. The decision to ban these products was to prevent any future inappropriate use. Where Category A or B ACP is installed inappropriately, these products may not be suitable for consideration to remain, in part or full, on buildings.

In the context of existing buildings, the assessment by an MBS is to form an opinion that the building is not a danger to life or safety. Where ACP with Flame Retardant is installed appropriately, it may be considered adequately safe to retain.

Process

Stage 1 – Preliminary Investigation

a) Desktop review

It is recommended to review the available documentation, such as the Building Permit endorsed documents for the building, to determine the extent and reported type of ACP usage on the building. Other documentation may also be used for the review, such as technical investigation and audit reports from appropriate professionals.

Where documentation indicates that ACP could have been used, adequate sampling from these locations should be investigated on site (see Stage 1b).

Due to the potential for undocumented product substitution during the construction phase, product confirmation of areas of interest are recommended rather than relying solely on the building permit endorsed documentation.

b) Building inspection and visual identification

It is recommended that an inspection of the building be undertaken to conduct a series of minimally invasive inspections of the ACP. Minimally invasive inspection is recommended to be undertaken prior to core sampling to quickly identify the likely type of ACP. The extent of this preliminary inspection may depend on the extent of ACP, what ACP types are initially found, and what is proposed to be sampled, as required in Stage 2a.

The visual determination can be achieved by inspecting the panel's core (where possible, without drilling), or via drilling small pilot holes to reveal the core colour to understand the likely type of ACP.

Visually, ACP with Flame Retardant is usually a light grey colour, whereas ACP with high percentages of polymer core is usually black. Generally, the lighter the core, the lesser the PE content and higher the percentage of fire retardant or organic fillers. However, the ACP is to be validated by laboratory testing due to the variance in core colours, which can change due to age and weathering.

NOTE:

- Pilot holes can be taken without penetrating the full depth of the panel. A small pilot hole can be drilled (~3 mm), which can reveal the core colour as a drill shaving, while not penetrating the back layer of aluminium.
- If the ACP is penetrated, any holes should be appropriately sealed to prevent moisture ingress and to protect the core material.
- It is recommended to avoid taking larger laboratory test samples from areas with high exposure to moisture to mitigate the risk of future moisture penetration of the building.

As general guidance, it is recommended prioritising reviewing the following locations:

- Areas that may represent a high fire safety risk, such as directly along exit paths, near ignition sources, such as air conditioning units, or where there may be a significant fire spread pathway.
- Where there is different styles, colours, or thicknesses of the ACP.

Stage 2 – Material Characterisation Testing

a) Sampling

Where the ACP core visually matches the characteristics of ACP with Flame Retardant, it is recommended that samples also be taken of the cladding for laboratory testing to confirm the combustible content of the core.

The number of samples required should be considered carefully based on the extent of ACP on the building. The Queensland Government has published a guide (refer Section 12.1) for assessing buildings with combustible cladding and outlines a set of requirements for cladding material sample collection based on height, floor area and other variables. The relevant extract of the guide is provided in Appendix A. The recommended sampling locations listed in Stage 1b also apply to this Stage.

The MBS should work with the Owners Corporation (OC) to determine and agree on the extent and the locations of proposed minimally invasive sampling and core holes. As every building is unique, the MBS should use their judgement to guide owners.

The locations of sampling taken during the inspection should be clearly documented on plans with relevant supporting information of the tests carried out and samples taken. The MBS should be satisfied that sufficient evidence of material type is provided.

Recommended core samples of ~40 mm should be taken. Laboratory testing to determine the material composition in terms of combustible content by mass (or non-combustible filler content) should be identified. The following section should be referred to as best practice to obtain the most accurate result of the core material.

NOTE:

- Laboratory test holes should be sealed with a non-combustible patch and sealed with fire resisting silicon or mastic.
- It is recommended to avoid taking larger laboratory test samples from areas with high exposure to moisture to mitigate the risk of future moisture penetration of the building.

b) Laboratory test guidance

Testing of the ACP core material is a critical and mandatory aspect of this guideline.

It is strongly recommended that all ACP laboratory testing is to use Thermogravimetric Analysis (TGA) in addition to other methods. TGA is recommended as it is one of the more accurate methods to identify the ratios of polymer to filler materials, particularly when the ratio of Flame Retardant and polymer is close to 1:1.

TGA should be used in conjunction with testing regimes that are currently available and commonly used by laboratories to test ACP product, including: Fourier-Transform Infrared Spectroscopy (FTIR), X-ray Diffraction (XRD), X-ray Fluorescence (XRF) and Ash test. Using TGA is important as XRF or XRD alone may not be able to accurately interpret the polymer/filler ratio/content of a panel.

Refer to Appendix B for guidance on reviewing laboratory testing of ACP.

c) Investigation of wall construction

Review of the wall build up is recommended to be undertaken during the sampling of ACP at locations where core samples are drilled. Investigation of the walls should be done as much as practical to develop a level of confidence in different wall-types (as relevant). Specific characteristics of the wall system to aid in the MBS's review should include: the size of cavities created by the wall system, how the ACP system is fixed, and any substrates behind the ACP.

Stage 3 – Assessment by the MBS

The guidance in this document should provide an MBS with the confidence to assess the associated risk of ACP with Flame Retardant in many instances, and the installations should be able to be directly considered by an MBS.

There may be circumstances where the MBS may require the assistance of a Fire Safety Engineer to evaluate the fire safety of buildings with ACP with Flame Retardant.

This may be particularly important in certain circumstances, such as: if there is a substantial volume or vertical connections of the ACP Flame Retardant external cladding (particularly if the building is not sprinkler protected), or there is a unique or complex wall-build-up.

Additional fire safety interventions (such as those specified in the PMCR) may be needed as part of the overall solution where use of ACP with Flame Retardant, and the holistic fire safety of the building, is assessed to be inappropriate. It is important that the MBS recognise the installation of ACP and wall detail is often bespoke to each building.

Stage 4 – Consideration of the cancelation of enforcement

Where the MBS, after reviewing the evidence supported by Stages 1 and 2 of this document and carrying out the assessment in Stage 3 is satisfied the cladding meets the definition of Acceptable Cladding Risk in accordance with the Minister's Guideline 15, and/or, is satisfied the cladding is no longer a danger to life or safety, the MBS should cancel enforcement relating to cladding.

NOTE:

The intention is to provide this guidance as a tool to support an MBS in their decision-making process. It remains with the MBS in their function and powers under the Act to be satisfied in any decision they make for each individual building and record their decision basis, when using this guidance or any other relevant and available tools and information at their disposal.

Appendix A Suggested sampling

The following table has been taken from the Queensland Government's 'Guideline for assessing buildings with combustible cladding'. It provides a suggested number of samples for different building sizes to provide confidence of the type of ACP installed on a building.

Building Grouping	Sample Collection Requirement	Suggested Samples	Sample Range
Height 1-2 levels Floor area <2000m²	Lowest and highest points (low sample to be diagonally opposed to high sample point)	2 (minimum requirement)	2 to 6 samples
	Colour variations (are more than 20 panels of the same colour used?)	1 - 2 per colour variation	
	Cladding volume (is the use of cladding product/s extensive?)	1 extra if extensive	
	Staged construction work (if yes, collect samples from lowest and highest points)	2 per stage (minimum requirement)	
Height 3-9 levels Floor area >2000m² and <10,000m²	Lowest, mid and highest points (low sample to be diagonally opposed to high sample point)	3 (taken from 1-2 sides of building)	6 to 10 samples
	Colour variations (are more than 20 panels of the same colour used?)	1 - 2 per colour variation	
	Cladding volume (is the use of cladding product/s extensive?)	3 additional samples if extensive product use	
	Staged construction work (if yes, collect samples from lowest and highest points)	2 per stage (minimum requirement)	
Height 10 or more levels Floor area >10,000m²	Lowest, mid and highest points (low sample to be diagonally opposed to high sample point)	3 (taken from 2 sides of building)	10 to 15 samples
	Colour variations (are more than 20 panels of the same colour used?)	1 - 2 per colour variation	
	Cladding volume (is the use of cladding product/s extensive?)	3 additional samples if extensive product use	
	Staged construction work (if yes, collect samples from lowest and highest points)	2 per stage (minimum requirement)	

Table 2. Recommended Sampling (source: Queensland Government).

Appendix B Laboratory Testing Guidance

Laboratory testing of the ACP is to be reviewed to understand the core material make up. Importantly, the type of flame retardant filler, and the quantity compared to the polymer should be closely reviewed.

Refer to Stage 2b of this guide when undertaking or commissioning laboratory testing.

When commissioning the test data, it is important to require the laboratory to provide a clear list and quantity of the core material make-up.

For an ACP to form part of the guide, the core material must include a fire retardant mineral filler listed below:

Common Name	Chemical formula	Other names
Aluminium hydroxide	$AL(OH)_3$	‘‘Gibbsite’, ATH – aluminium trihydroxide
Magnesium hydroxide	$Mg(OH)_2$	‘Brucite’, MDH – magnesium dihydroxide

For further information on fire retardant minerals, please refer to the CSIRO ACP report Section 2.2.2.

For example, the laboratory test result should identify the primary core materials, as follows:

‘The core sample (ACP SAMPLE 1) consisted of 57.5% magnesium hydroxide, 2.0% calcium carbonate and 4.6% other mineral matter and approximately 35.9% PE/EVA copolymer’

From the above, importantly, we can see magnesium hydroxide is in a greater ratio than the polymer (PE/EVA).

Following the determination of the core material make up, the MBS can then consider the risk posed by the ACP based on guidance in this document, in conjunction with the specific building’s façade characteristics.

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