AUSTRALIAN MODERN BUILDING ALLIANCE

Safe and sustainable construction with polymers

Information Sheet 3:

Grenfell Tower, Neo 200, Lacrosse and the fire safety of facades

This information sheet explores insulated rainscreen facade systems in the context of the Grenfell Tower (2017), Lacrosse (2014) and Neo 200 (2019) building fires, and the role of product specification, enforcement of building codes, and the testing and performance of building systems in managing fire risk in buildings.

Insulated rainscreen facades

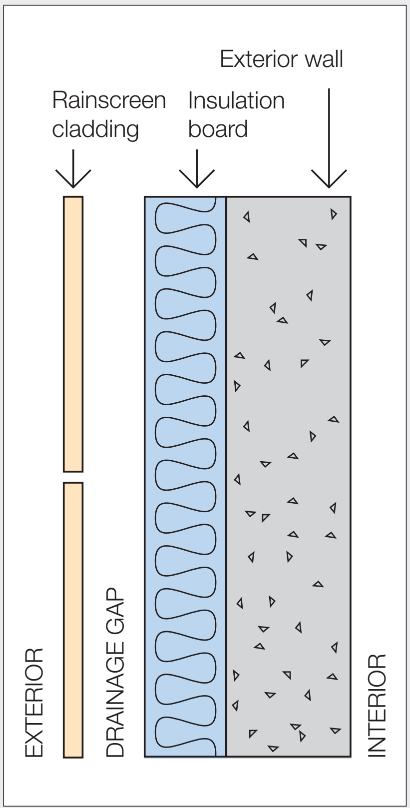

***Figure 1:** Simplified schematic diagram of an insulated rainscreen facade system (supporting frame for cladding and cavity barriers not depicted).*

In an insulated rainscreen facade system the cladding provides the outer protective layer that shields the exterior wall from direct rain, while thermal insulation forms an underlying separate layer against the exterior building wall (see Figure 1).

The insulation board is typically polyisocyanurate (PIR), phenolic foam or mineral wool (MW) – although the use of MW adds significant weight to the building.[1] Typically, given a constant R-value of 2.86, MW at 100mm thickness adds 6kg/m^2 to a building, versus 1.9kg/m^2 for 60mm of PIR board insulation.

Aluminium composite panel (ACP) cladding (Figure 2), which has been used extensively in Australia and the UK, is a composite of two metal skins (typically aluminium at 2–5mm thickness) with a polymer core.

If the core is 100 per cent polyethylene, as in the cheaper products typically used for signage, the panels are highly combustible.

Heat from a fire is conducted rapidly through the aluminium to the thermoplastic polyethylene core, which melts and can ignite, causing the metal skins to delaminate and deform.

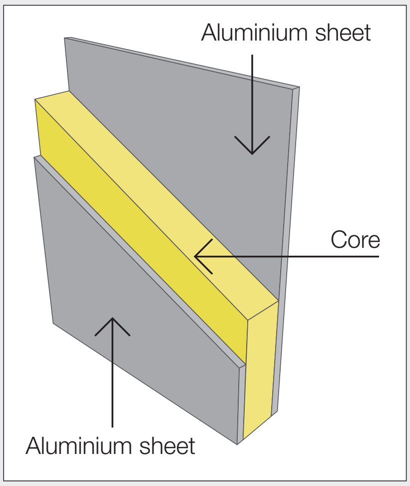

***Figure 2:** Schematic diagram of an aluminium composite panel (ACP).*

Chemistry Australia
The Business of Chemistry
Essential for Life

Grenfell Tower (2017)

The Grenfell Tower (Grenfell) fire was found to be the direct result of the improper installation and use of an ACP which contained a 100 per cent polyethylene core and did not meet the local building codes.[2] Polymer insulation (phenolic and PIR) used behind the rainscreen was also incorrectly installed as part of the rainscreen facade system, and for this reason contributed to the spread of the fire.

More broadly, this reflected a failure to enforce the existing fire regulations (e.g. non-compliant ACP installed on the tower[2]), unintended consequences of deregulation (e.g. there was only one fire escape stair in the tower[3]) and poor procedural policy (e.g. for residents to stay in their flats[4]).

As noted by Fulvia Raffaelli in her 2018 update to the European Commission – "The fact that serious fire accidents in the EU (Grenfell, Bucharest disco) were caused by non-compliance with existing fire regulations points rather at the need to enforce existing Member States regulations than at the need for new regulation at EU level."[5]

Although the fire was caused by a failure to enforce local building codes, the government banned the use of combustible materials in walls of high-rise buildings over 18m such as residential flats, care homes, shelter-housing or hospitals from 21 December 2018.[6]

Prior to the Grenfell tragedy, fire fatalities in the United Kingdom had been declining (Figure 3). Although this trend was associated with the introduction of regulations aimed to improve fire safety, none of these regulations related directly to building products or building codes.

Instead, regulations targeted the most common causes of fires (smoking, cooking, electrical faults) and the household materials most often initially involved in building fires (Figure 4). All regulations focused on either prevention (e.g. furnishings and electrical standards), early detection (e.g. smoke alarms), escape or suppression (e.g. sprinklers) of fires.

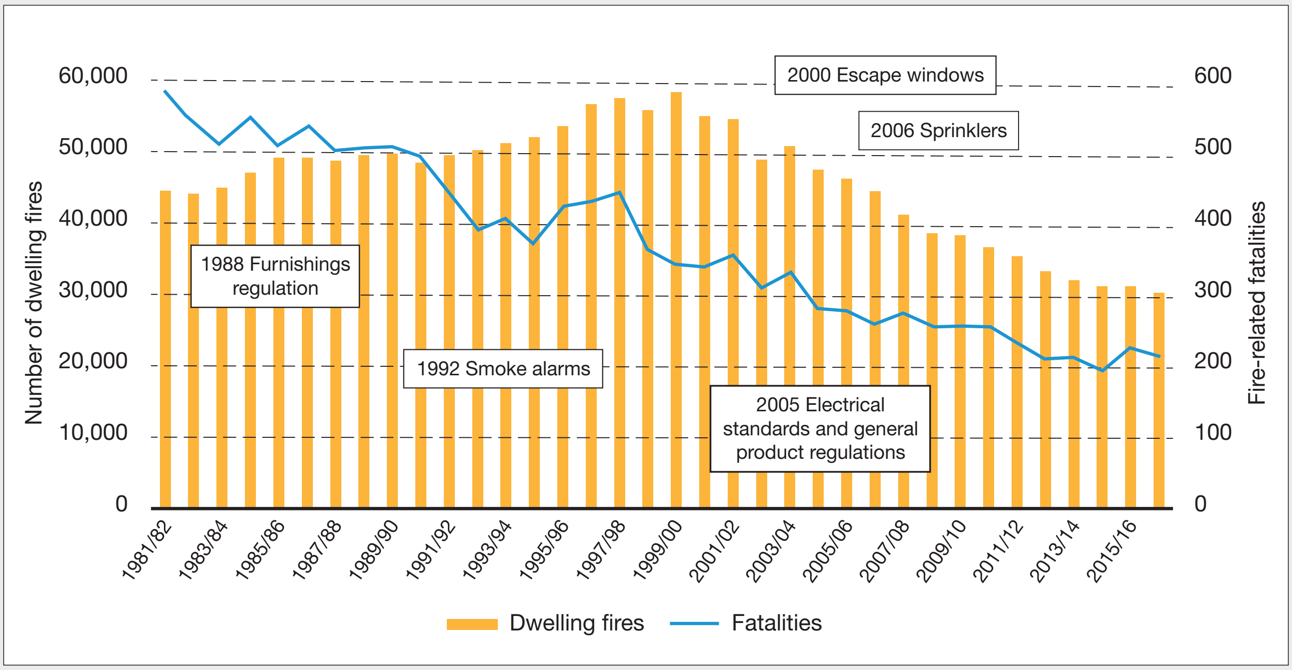

***Figure 3:** Dwelling fires and fire-related fatalities, shown against regulations aimed to increase fire safety, IRS, England: 1981/82 to 2016/2017.[7]*

Finally, there is no correlation between fatality rates due to building fires in the European Union (EU) and whether the insulation was combustible or non-combustible.[9]

For example, from 2008–2010 the fatality rate was higher in Denmark, which uses more non-combustible stone wool insulation, than in Germany, which uses more polymer insulation.[9]

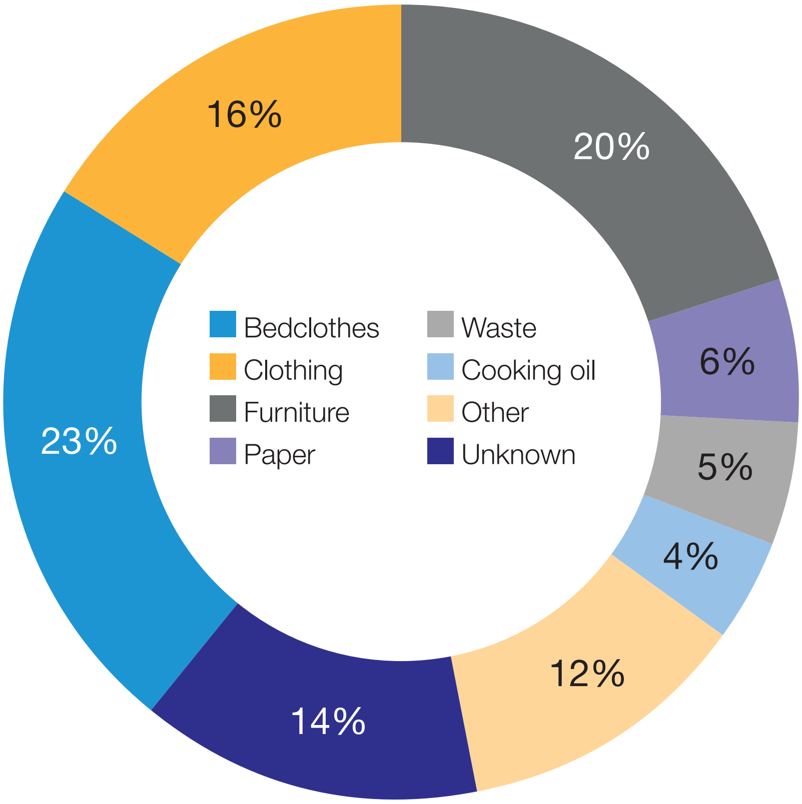

***Figure 4:** First materials involved in building fires.*[8]

Australian high-rise fires: Lacrosse (2014) and Neo 200 (2019)

The common denominator in the Lacrosse and Neo 200 building fires was the use of ACP with a 100 per cent polyethylene core.

In the case of Lacrosse, the fire was started by a cigarette butt on the balcony, which then spread and raced up the building's ACP cladding.[10]

The Lacrosse general construction was suspended reinforced concrete floor slabs and reinforced concrete load bearing walls covered with ACP.

However, the area affected by the fire (a wall between an external facing bedroom and a balcony), had ACP directly attached to a lightweight steel frame construction with fiberglass batts (ca 9kg/m^3) as cavity wall insulation (Figure 5).

The Metropolitan Fire and Emergency Services Board (MFB) subsequently tested the ACP under AS1530.1:1994 – Combustibility Test for Materials and found it was "combustible" and therefore a product that is not compliant under the Australian building codes.[11]

As a result of the investigations into the Grenfell, Lacrosse and Neo 200 fires, Victoria banned the use of ACP with a core of more than 30 per cent polyethylene to be used as an external wall system.

Victoria also banned the use of expanded polystyrene (EPS) products used in a rendered external wall system for all Type A or Type B construction including Class 2, 3 and 9 buildings of two or more storeys, and Class 4, 5, 6, 7 and 8 buildings of three storeys or more. These changes did not impact residential Class 1 and 10 buildings.[12]

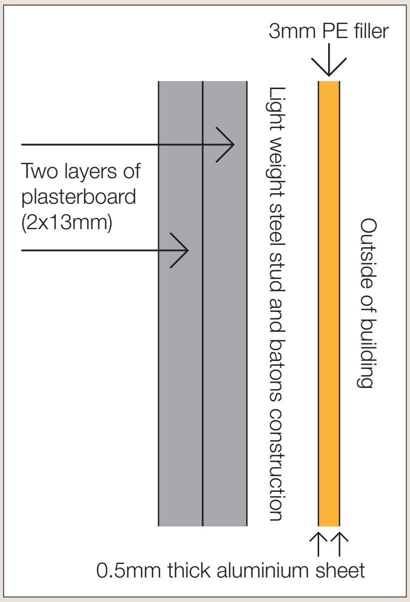

***Figure 5:** Schematic of Lacrosse building wall construction.*

Fire prevention to reduce fatalities

Fire prevention is a complex subject involving many factors such as building design, construction, services maintenance (e.g. gas and electrical appliances), strict enforcement of laws that govern fire prevention and social issues related to fire risks.

Building design includes passive and active fire prevention systems (e.g. sprinklers and smoke alarms, means of escape, compartmentation). Provisions for early warning of fires are essential.

For example, while there is limited data for Australia,[13] approximately half of fire-related fatalities in Melbourne from 2004–2005 occurred in houses without working smoke alarms – despite smoke alarms being mandatory under the Building Code of Australia (BCA) since 1996.[14]

AMBA fully supports the work of the Modern Building Alliance (MBA) in promoting the seven layers of fire safety in buildings[15] and the building, installation and organisational (BIO) regulatory framework to ensure that national building codes and product standards work together in the EU to address all relevant factors in relation to the prevention of building fires.

The BIO is a comprehensive proposed regulatory framework for fire safe buildings which starts with prevention (refer to the MBA for more information).

In addition, Australia should note that following the Grenfell tragedy, the EU established the Fire Information Exchange Platform (FIEP) to facilitate the exchange of fire safety information and best practice among member states.[16]

Such a platform is missing in Australia and further fire policy decisions are currently being inhibited by the absence of more granular data related to fires in Australian buildings.

Large-scale fire testing

The compliance and fire safety of building systems is governed by the NCC 2019. This requires approved construction materials that have been installed correctly and maintained in accordance with manufacturer guidelines and all related building and construction codes and standards.

The fire performance of a facade system cannot be predicted purely based on small-scale fire tests such as combustibility of individual components. Rather, it depends on the interaction of all components within a system.

For this reason, AMBA supports the focus of the NCC 2019 on performance-based solutions and large-scale fire testing of facades in line with AS 5113: Fire Propagation Testing and Certification of External Walls of Buildings and Verification Method CV3.

This test requires the large-scale evaluation of the fire performance of the full facade system including the rainscreen, insulation and cavity barriers.

PIR insulation boards do not melt or drip when exposed to heat and can achieve an EW classification under AS 5113:2016 when tested with a non-combustible cladding in a full facade system with cavity barriers.

The role of product specification

Following the Lacrosse and Neo 200 fires, it has become clear that architects need to take the time to research the products they specify and ensure these comply with the BCA.

In the case of the Lacrosse fire, the architect had recently had an appeal rejected after it was found liable for damages caused by its specification of an ACP with a 100 per cent polyethylene core that did not comply with the BCA.[17]

In her analysis of that failed appeal, Bronwyn Weir summarised that the decision "confirms that courts will expect architects to prepare documents that demonstrate BCA compliance. The involvement of other specialist consultants does not relieve the architect from its obligation to understand and apply the BCA to its design."[18]

If an architect is looking to specify insulation, it needs to be tested in accordance with AS 4859.1:2018. Similarly, if the insulation is to be used as part of an insulated rainscreen system, that system should be tested to AS 5113:2016 – regardless of the combustibility of individual components – and the applicability of the test results in terms of allowed variations in thickness must be unambiguous.

All facade system components must also be clearly identified – especially cavity barriers, which are essential in ventilated facade systems (there were no cavity barriers installed on the Lacrosse or Neo 200 buildings, with many cavity barriers incorrectly installed on the Grenfell Tower).

Finally, to eliminate variations in formulations and test conditions, and ensure accurate and compliant results, all individual product fire tests should be conducted locally, rather than offshore by individual companies.

Safety is our priority

AMBA's priority is to foster a safe built environment for Australians – ensuring our buildings are designed and constructed to protect the people that construct, live and work in them.

We are committed to working with industry, government, authorities and fire safety professionals to share knowledge and best practice in further advancing the safety of Australian buildings.

References

[1] 75mm Rockwool Rainscreen Duo Slab. Retrieved 26 April 2021 from https://www.insulationshop.co/75mm_rockwool_rainscreen_duo_slab.html

[2] Moore-Bick, M. (2019). *Grenfell Tower Inquiry: Phase 1 Report*. Grenfell Tower Inquiry. Retrieved 26 April 2021 from https://www.grenfelltowerinquiry.org.uk/phase-1-report

[3] Marshall, J. (2018). *Grenfell was not designed to provide a safe escape route, say fire services*. Retrieved 26 April 2021 from https://www.building.co.uk/news/grenfell-was-not-designed-to-provide-a-safe-escape-route-say-fire-services/5093975.article

[4] Gayle, D. (2018). *Grenfell survivors tell how they ignored advice to 'stay put'*. Retrieved 26 April 2021 from https://www.theguardian.com/uk-news/2018/oct/04/grenfell-tower-survivors-tell-how-they-ignored-advice-to-stay-put

[5] Raffaelli, F. (2018). *Report on FIEP Progress – Update from DG Grow.C.1.* European Commission. Retrieved 26 April 2021 from https://www.modernbuildingalliance.eu/assets/uploads/2018/11/DG-Grow_presentation.pdf

[6] CIBSE Journal. (November, 2018). *Technical note: the government ban on combustible materials in high-rise residential buildings*. Retrieved 26 April 2021 from https://www.cibsejournal.com/technical/technical-note-the-government-ban-on-combustible-materials-in-high-rise-residential-buildings/

[7] Bryant, S. and Preston, I. (2017). *Focus on trends in fires and fire-related fatalities*. UK Home Office. Retrieved 22 April 2021 from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/650869/focus-trends-fires-fatalities-oct17.pdf

[8] Kobes, M. and Groenewegen, K. (2009). *Consumer fire safety: European statistics and potential fire safety measures – Version 3*. Nederlands Instituut Fysieke Veiligheid. Arnhem, Netherlands.

[9] Modern Building Alliance. (2021). *Fire Safety Statistics*. Retrieved 26 April 2021 from https://www.modernbuildingalliance.eu/fire-safety-statistics/

[10] Victorian Cladding Taskforce. (November, 2017). *Victorian Cladding Taskforce – Interim Report*. The State of Victoria Department of Environment, Land, Water and Planning. Retrieved 26 April 2021 from https://www.planning.vic.gov.au/__data/assets/pdf_file/0012/110316/Victorian-Cladding-Taskforce-Interim-Report-November-2017.pdf

[11] Badrock, G. (2016). *Post incident analysis report: Lacrosse Docklands, 25 November 2014*. Metropolitan Fire and Emergency Services Board, Melbourne, Australia.

[12] State Government of Victoria. (2021). *Banning dangerous cladding and keeping Victorians safe*. Retrieved 22 April 2021 from https://www.vic.gov.au/banning-dangerous-cladding-and-keeping-victorians-safe

[13] Coates, L. et al. (2019). *Preventable residential fire fatalities in Australia: July 2003 to June 2017*. Bushfire and Natural Hazards CRC. East Melbourne, VIC. Retrieved 26 April 2021 from https://www.bnhcrc.com.au/sites/default/files/managed/downloads/preventable_residential_fire_fatalities_july_2003_to_june_2017_bushfire_and_natural_hazards_crc.pdf

[14] Senate Legal and Constitutional Affairs Committee secretariat. (2015). *Use of smoke alarms to prevent smoke and fire related deaths*. Department of the Senate, Parliament House, Canberra.

[15] Modern Building Alliance. (2021). *EU Fire Information Exchange program (FIEP)*. Retrieved 22 April 2021from https://www.modernbuildingalliance.eu/EU-fire-safety-guide

[16] Modern Building Alliance. (2021). *EU Fire Safety Guide – The 7 Layers of Fire Safety in Buildings*. Retrieved 22 April 2021 from https://www.modernbuildingalliance.eu/eu-fire-information-exchange-platform/

[17] Cheng, L. (2021). *Architect and other consultants lose appeal in cladding fire case*. Retrieved 22 April 2021 from https://architectureau.com/articles/Lacrosse-appeal/

[18] Weir, B. (2021). *Room for (in)novation: Responsibilities of and liabilities for architects*. Retrieved 22 April 2021 from https://architectureau.com/articles/responsibilities-of-and-liabilities-for-architects/