TECH TALK
Volume 20

ALLIANZ GLOBAL CORPORATE & SPECIALTY®

ALUMINUM COMPOSITE PANELS

ALLIANZ RISK CONSULTING


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This Tech Talk focuses on the fire hazards associated with aluminum composite panels (ACPs) and Allianz Risk Consulting (ARC) recommendations to reduce the hazards associated with this product.

AT-A-GLANCE

- ACPs are commonly used in building construction
- ACPs with combustible insulation have been involved in a number of major high-rise building fires within the past several years
- When mounted to the exterior of a building, ACPs with combustible insulation promote rapid vertical fire spread and should not be used

INTRODUCTION

Recent fire losses have drawn attention to ACPs. Fires involving these panels have been involved in major high-rise buildings in Dubai, Australia, France, South Korea, China and the United Kingdom. In each incident, the panels were found to have promoted rapid vertical fire spread leading to large losses. ACPs are part of a more general classification of construction materials known as sandwich panels, which are made of a wide variety of materials.

ACPs are comprised of an insulating material assembled between two thin aluminum facings. Panels generally range from 3 to 10 mm (0.12 to 0.39 in.) in total thickness and the aluminum facings are typically 0.2 to 0.8 mm (0.008 to 0.031 in.) thick.

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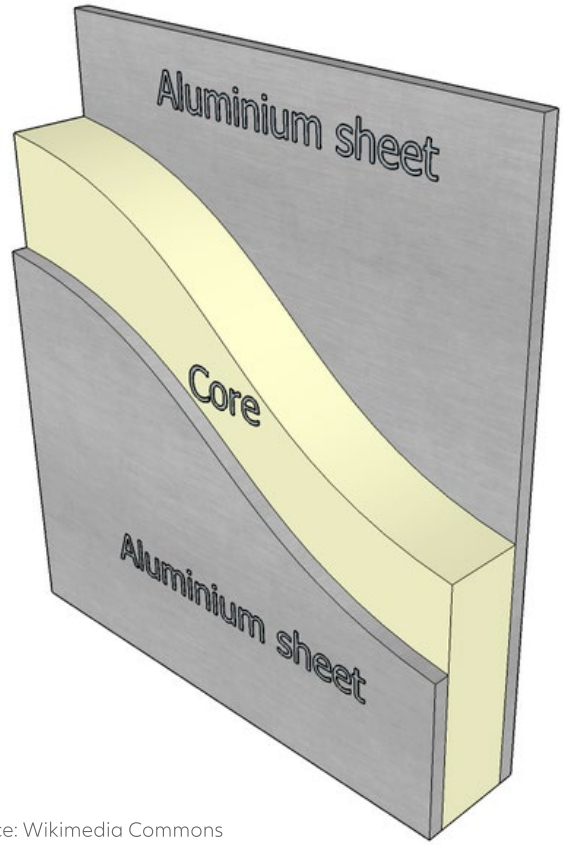
The insulation used between the panel facings can be made from a variety of materials:

- Polyethylene (PE) (combustible) – most commonly used core (insulation) material for ACPs
- Polyisocyanurate (PIR) (combustible)
- Polyurethane (PUR) (combustible)
- Expanded polystyrene (EPS) (combustible)
- Extruded polystyrene (XPS) (combustible)
- Modified phenolic foam (combustible)
- Glass wool / stone wool (noncombustible)



Source: Wikimedia Commons

Typical ACP Construction

ACPs have been manufactured since the 1970s, but they have been in widespread use as external cladding in building construction since the late 1980s. These panels have many positive qualities which make them desirable for building construction:

- Relatively low cost
- Superior insulation characteristics
- Ability to withstand the elements
- Light weight
- Easy to handle and install
- Good mechanical properties
- Easy to clean
- Available with virtually any finish
- Attractive

ACPs have been used even longer for interior applications such as refrigerated rooms, food processing plants and pharmaceutical plants. While not the focus of this **Tech Talk**, ACPs installed inside buildings have also contributed to industrial fire losses and should be evaluated.

FIRE HAZARD

There are several features associated with exterior mounted combustible ACPs which foster a fast spreading fire that is very difficult to extinguish. Most major high-rise building fires have involved ACPs in which the insulating material was polyethylene. Since polyethylene is a thermoplastic, it will tend to melt and drip, which promotes vertical fire spread. It also produces large quantities of dense, toxic, black smoke, which makes firefighting much more challenging.

Typically, ACPs are mounted to the exterior of a building with brackets, creating an air space or cavity between the panel and the exterior wall. This open cavity allows the fire to spread vertically, up the building exterior. In addition, the metal facings create a waterproof barrier, which makes it very difficult for hose streams to reach a fire located in the cavity.

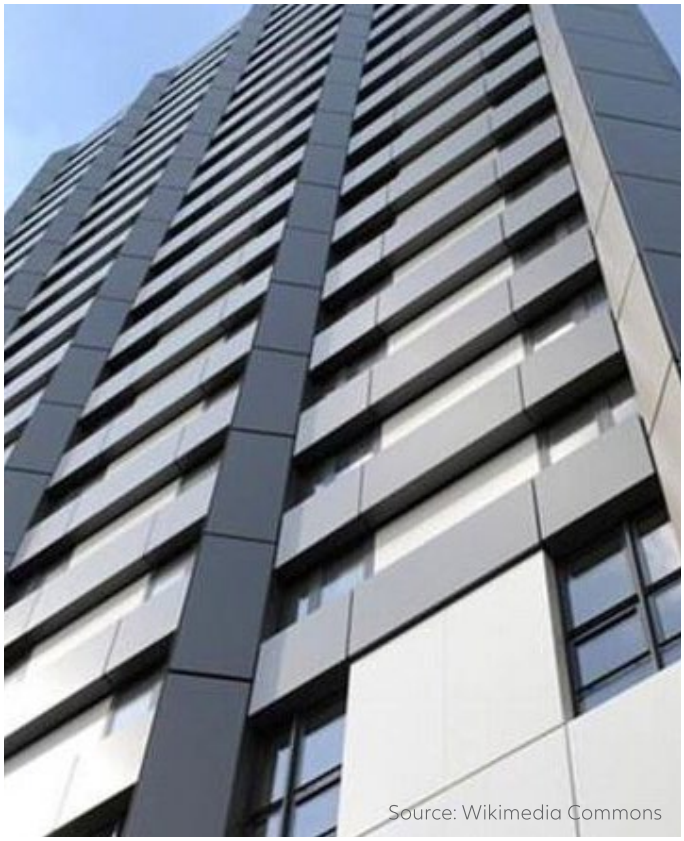
Building regulations in some countries require testing of components of an exterior cladding system rather than the entire system. Post-fire investigations have revealed that ACPs with combustible insulation behave very differently in an actual fire when compared to small scale testing. This has led to the acceptance of ACPs with combustible insulation in construction projects.

Fires involving exterior cladding systems can originate from electrical equipment, yard storage, vehicle fires, and fires in neighboring buildings, but many of the high-rise fires originated inside the building and then spread to the exterior by means of flashover or continuity of combustibles.

FIRES INVOLVING ACPs

GRENFELL TOWER, LONDON, UNITED KINGDOM – JUNE 14, 2017

This tragic fire has increased the focus on ACPs with combustible insulation. This 24-story residential high-rise building was constructed in 1974 of reinforced concrete and was retro-fitted with a "rain screen" of ACPs with polyethylene insulation. A rain screen includes an air space between the building and the panels whereby vertical fire stopping is not normally installed. One of the post-fire investigators indicated that this is "the equivalent of wrapping a concrete building in plastic." The fire originated on the 4th floor and spread to the top floors within eight minutes. This led to loss of life, numerous injuries and total loss of the building.



Grenfell Tower in London. Constructed in 1974 – Retro-fitted with ACPs in May 2016

Grenfell Tower - June 14, 2017

DUBAI TORCH TOWER FIRES – FEBRUARY 21, 2015 & AUGUST 4, 2017

This iconic structure, which is one of the tallest high-rise residential buildings in the world, has suffered two major fire incidents in less than three years involving ACPs with polyethylene insulation. The first fire on February 21, 2015 started in a grill on a balcony on the 50th floor and spread to the top of the 86-story tower. There was no structural damage, but the external cladding was charred from the 50th floor to the top of the tower.

The building was in the process of being refurbished following the 2015 fire when another fire occurred on August 4, 2017, resulting in damage to the exterior cladding on 40 floors. This fire was reported to be started by a discarded cigarette.

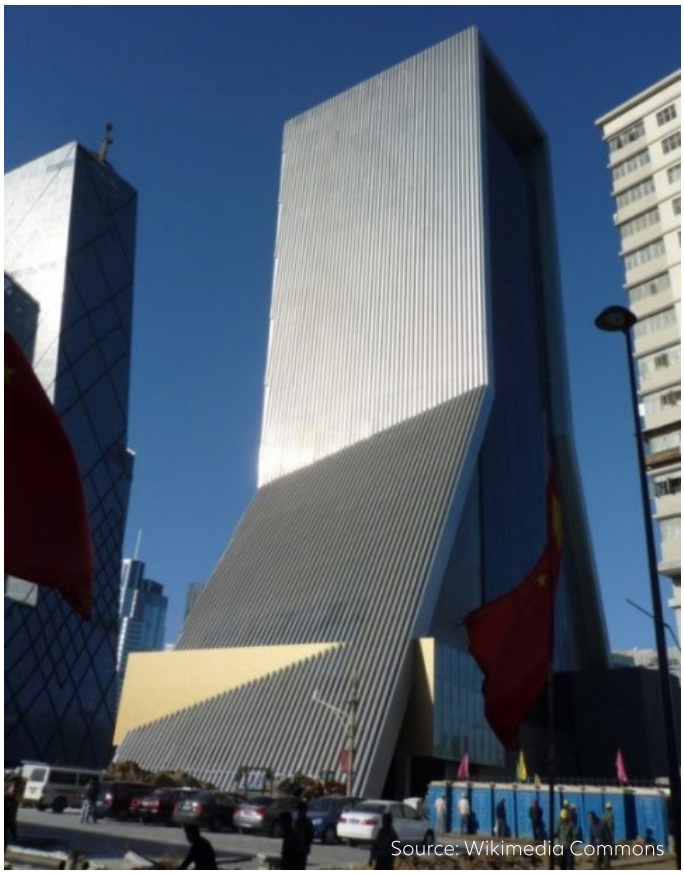
Dubai Torch Tower - July 2017 – being refurbished

Dubai Torch Tower – August 4, 2017

CCTV TOWER IN BEIJING, CHINA – FEBRUARY 9, 2009

A fire at this 44-story high-rise building that was under construction was caused by an illegal fireworks display that ignited the roof. The fire spread from the roof to the exterior panels causing the combustible insulating material to melt and drip, which resulted in the fire quickly spreading vertically to the lower floors.

Reports indicate that all floors of the building were fully involved within 13 minutes of ignition.



CCTV Tower Beijing under construction in 2007

CCTV Tower Beijing - February 9, 2009

BUILDING REGULATIONS

Recently constructed high-rise buildings with ACPs have been investigated in many countries, including in the United Arab Emirates, Saudi Arabia, the United Kingdom and China. Building and safety regulations are being reviewed critically and in some cases have been changed to address this fire and safety hazard.

- The United Arab Emirates has updated the Fire and Life Safety Code of Practice to require a fire-retardant insulating layer for all ACPs. They also require full scale fire testing for the facade system and separate testing for the insulating layer.
- Saudi Arabia requires the retrofitting of any high-rise buildings which have combustible exterior sandwich panels, including ACPs.
- Within weeks of the Grenfell Tower Fire, the UK required all registered owners to identify all buildings with ACPs more than 18 m (58 ft.) high. In 2019, the government announced it will fully fund the removal and replacement of unsafe ACM cladding on private sector residential buildings more than 18 m (58 ft.) high.
- Australia no longer accepts ACPs with combustible insulation in construction as a result of a residential high-rise building fire in 2015.
- Combustible ACPs have been banned as exterior cladding for several years in buildings constructed over 10 m (32 ft.) high in several countries, including the US. However, the panels are in common use in low-rise public, commercial and industrial buildings, such as gas stations and bank branch offices.

Their suitability is also being studied for installations on sports stadiums, hospitals and buildings occupied by persons with limited mobility.

- In Germany, ACPs with combustible insulation have been classified as "flammable" for several years. Germany has had some of the strictest building regulations in the world for decades and it does not have a significant loss history involving ACPs.

It is critical that the fire hazards presented by combustible ACPs continue to be recognized and addressed.

ARC RECOMMENDATIONS

While not all inclusive, the following recommendations will help reduce exposure to fires involving ACPs:

1. **Use ACPs with noncombustible insulation** (e.g. glass wool / stone wool, etc.), such as Euroclass A1 or A2 rated panels. When combustible insulation is required, the ACPs should be listed/approved in any of the following categories:
   a. Factory Mutual (FM) Approved Class I
   b. Underwriters Laboratories (UL) Listed (Category FWFX)
   c. Loss Prevention Certification Board (LPCB) Approved

   Please contact ARC before the installation of any ACPs to ensure the proper materials are selected.
2. **Identify any buildings that have ACPs** mounted on the exterior. Once ACPs are identified, gather available documentation to confirm whether the panels use noncombustible insulation or are listed/approved as indicated above. If no documentation is available or the documentation does not confirm it is listed/approved, one of the following should be completed:
   a. Remove and replace the ACPs with noncombustible materials.
   OR
   b. Submit samples of the exterior ACPs for combustibility testing per ANSI/NFPA 285, *Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.* Results of all testing should be submitted to ARC for review and comment.
3. **Where ACPs with combustible insulation cannot be immediately removed, implement comprehensive loss control programs** to help prevent and mitigate fires.
   a. Identify and promptly repair all impact damage to panels in accordance with the manufacturer's guidelines.
   b. Avoid penetrations if possible. When penetrations are necessary, they should be made with appropriate precautions including fire stopping.
   c. Implement and maintain the following human element programs: managing change, hot work, smoking, thermographic inspections, and housekeeping.
   d. Limit exterior fire exposures near ACPs, such as vehicles, electrical equipment, heating equipment, yard storage, etc.

REFERENCES

ARC Tech Talk Volume 17, *Sandwich Panels*

ARC Tech Talk Volume 14, *Managing Change*

ARC Hot Work Management

NFPA 285, *Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components*

NFPA 5000, *Building Construction and Safety Code*

FM Global Loss Prevention Data Sheet 1-57, *Plastics in Construction*

QUESTIONS OR COMMENTS?

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Tech Talk is a technical document developed by ARC to assist our clients in property loss prevention. ARC has an extensive global network of more than 100 property risk engineers that offers tailor made, customer focused risk engineering solutions.

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