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Fire Performance Guide for Fibre Cement Cladding

White Paper

JUNE 2019

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INTRODUCTION

Cemintel fibre cement is a non-combustible solution for safe and compliant construction under the Deemed-to-Satisfy requirements of the BCA.

The purpose of this document is to provide an understanding of the market situation regarding the fire performance of building products used in facades, and to help define some of the terminology that has emanated in the last few months relating to fire performance. With increased knowledge, more informed discussions can be had on the topic and a better understanding as to why fibre cement is a safe option for non-combustible facades and cladding.

The globally documented Grenfell Tower fire on 14th June 2017 has caused significant focus on the Australian façade/cladding market. It begs the question as to what has happened locally since the Melbourne apartment fire (Lacrosse) in 2014, and the more recent Spencer Street Melbourne apartment fire in February 2019.

The Lacrosse fire was the basis for greater scrutiny of the Australian construction industry, however, in truth, it wasn't until the Grenfell fire that a deeper review of building practices including compliance sign off processes was undertaken with legislative actions an outcome. While often referenced as a comparison, it is important to understand that the tragedy of Grenfell fire was not solely due to the façade material used, but a combination of factors. For your information, Appendix A is an overview of this event to help be better informed of those circumstances.

Grenfell received global focus. In reality however, there have been a number of other fires around the world that reiterates the core issue with the debate – combustible aluminium cladding. Some examples of these are at Appendix B.

This document provides some of the basic language associated with fire performance relative to façades and cladding and more particularly, the AS 5113 Fire Test.

It identifies the National Construction Code (NCC), a performance based code containing all Performance Requirements for the construction of buildings. It is built around a hierarchy of guidance and code compliance levels, with the Performance Requirements being the minimum level that buildings and building elements must meet.

This document is not meant to be exhaustive but rather a basic reference guide.

WHAT IS A WALL?

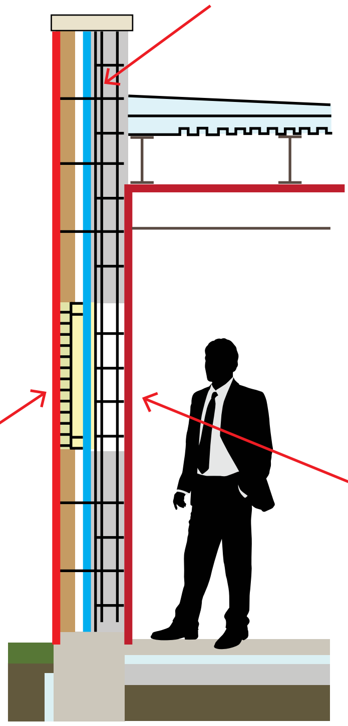
Components of a Basic Wall

Structural building element/non-loadbearing wall building element / timber or steel frame/concrete or masonry

Outside

- Insulation
- Acoustic treatment
- Weatherproofing/sarking
- Termite protection
- Decorative lining (eg. cladding)

External Attachment



Inside

- Insulation
- Acoustic treatment
- Plasterboard
- Decorative lining

Internal Lining

Other Internal/External Interactions

- Condensation
- Energy Efficiency
- Noise amelioration

Some challenges relating to the wall?

- Acoustics, weatherproofing and fire resistance – these are supposed to be identical to the tested prototype
- Energy efficiency of the total wall system
- BCA DtS wall to be non-combustible
- Minimum performance levels must be achieved
- No DtS for weatherproofing
- Full performance options

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External Wall or Attachment?

For buildings requiring Type A and B construction, the BCA DtS provisions addresses two common cases relating to fire performance of external walls:

- The cladding is the exterior wall or part of the wall (BCA Specification C1.1, Sections 3.1(b) and 4.1(b) apply).
- The cladding is an attachment to an exterior wall having the required FRL (BCA specification C1.1 Clause 2.4 applies).

The term "external wall" is defined in the BCA as "...an outer wall of a building which is not a common wall".

The term "attachment" or the difference between an attachment and an external wall is not defined in the BCA.

When a term is not specifically defined in the Code, the common usage governs. The following definitions are from the Macquarie dictionary:

- Wall – an upright work or structure of stone, brick or similar material, serving for enclosure, division, support, protection etc. as one of the upright enclosing sides of a building; or anything which resembles or suggests a wall.
- Attachment – an adjunct or supplementary device.

The CSIRO applies the following reasoning to determine when a building element should be assessed as an external wall (or integral part of external wall) or an attachment:

- If the cladding/lining/other item is removed and the remaining structure no longer functions suitably as an external wall (eg. the remaining structure has no fire resistance level, is unable to prevent the penetration of water, is unable to resist wind loads or in certain applications cannot meet acoustic requirements), then it is considered an integral part of the external wall. BCA Specification C1.1 Sections 3.1(b) and 4.1(b) applied.
- If the cladding/lining/other item is removed and the remaining wall still functions as an external wall then Specification C1.1 Clause 2.4 applied.

External Wall DtS Provisions

There are three groups of requirements in the BCA Volume One Deemed-to-Satisfy provisions related to reducing the impact of fire on external walls (or elements which are an integral part of an external wall).

1. A tested Fire Resistance Level (FRL)
2. Requirements for the building elements to be non-combustible
3. Requirements to meet certain fire hazard properties for linings, materials and assemblies.

These requirements are independent of each other and must all be considered.

The following BCA DtS provisions apply for combustibility of external walls:

- BCA Specification C1.1 Section 3.1(b) and 4.1(b) state that for buildings required to have Type A or Type B fire resisting construction, external walls must be non-combustible.

All external walls are required to be non-combustible for buildings greater than two or three storeys in height (depending on classification) or deemed non-combustible in accordance with BCA Clause C1.9. The BCA defines combustible as:

- Applied to a material – combustible as determined by AS 1530.1
- Applied to construction or part of a building – constructed wholly or in part of

A GENERAL OVERVIEW OF BUILDING AND COMPLIANCE REQUIREMENTS

Fire Performance Requirements of the NCC

Section C Volume 1 - refers to Fire Resistance and contains the Performance Requirements and Deemed-to-Satisfy provisions for **Classes 2 to 9** constructions.

The Performance Requirements for fire resistance have the following objectives:

- Maintaining structural stability during a fire
- Avoiding the spread of fire
- Protecting the building from the spread of fire and smoke to allow sufficient time for evacuation in an emergency
- Maintain tenable conditions during occupant evacuation
- Protection of service equipment and hazardous substances
- Protection of emergency equipment
- Maintaining fire resistance performance at penetrations, joints and attachments
- Access to the building for emergency vehicles and personnel.

Additionally, Section 2.3 – Volume 2 refers to Fire Safety and contains the Performance Requirements for **Classes 1 and 10**. The DtS provisions for wall cladding are contained in Section 3.5 (not in this document).

Due to the lower complexity of Classes 1 and 10 construction, the fire performance requirements and objectives are more simplistic:

- Protection from the spread of fire
- Fire detection and early warning
- Protection from heating appliances
- Resistance to bushfires.

The Builder/Architect/Designer can choose to follow the DtS provisions provided in the NCC to achieve compliance to the relevant Performance Requirements. Where the design application does not fit with standard DtS solutions, a Performance Solution must be developed in collaboration with the project stakeholders (ie. Architect, Engineer, Surveyor, local authorities for fire etc.)

Combustible or Non-Combustible

The BCA definition:
Combustible means:

(a) applied to a material – combustible as determined by AS 1530.1 and;
(b) applied to a construction or part of a building – constructed wholly or in in part of combustible materials

Where are Non-Combustible Materials Required?

This is specifically defined in BCA Clause 1.9, however, as a general guide:

- Depends on both ‘Building Class’ and ‘Construction Type’
- Bonding walls around a unit (party wall and corridor wall); and
- The exterior of a high rise project.

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FIRE PERFORMANCE COMPLIANCE

There are 2 pathways for compliance under the BCA:

PERFORMANCE REQUIREMENTS
"...avoid the spread of fire..."

PERFORMANCE SOLUTION
Alternative Solution

and/or

PERFORMANCE SOLUTION
Deemed-to-Satisfy Provisions

Limited combustibility
AS 5113

Non-combustible
AS 1530.1

NOTE: DtS provisions allow building materials to be used in certain ways without the need for further verification. For example, fibre cement or plasterboard may be used where a non-combustible material is required without any further need to demonstrate compliance. All Cemintel panels are fibre cement and there is no need to illustrate suitability. Instead reference can be made to BCA Clause C1.9.
To assist with specifications, Fire Certificates are available for downloading from the website at **cemintel.com.au**

This is the general testing apparatus for compliance testing.

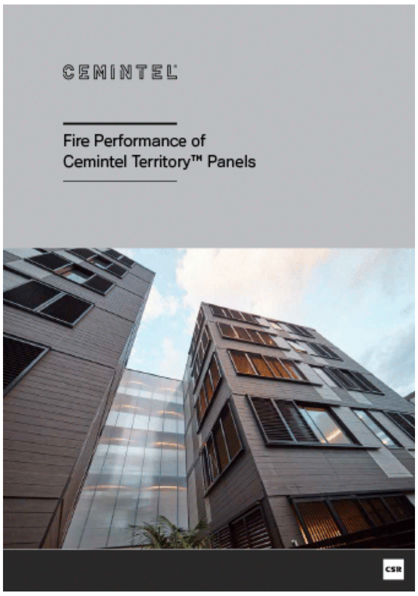
AS 5113

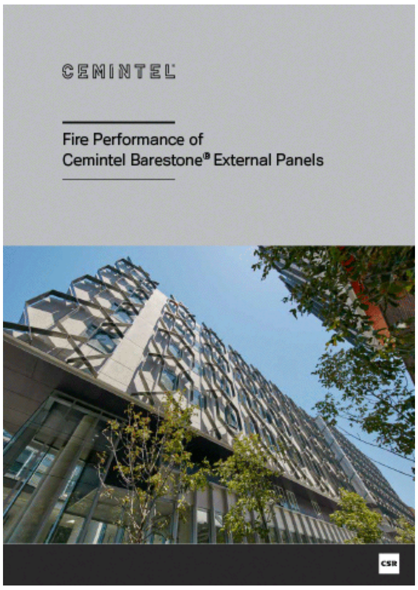
This is the test rig for AS 5113, based on the rig used for BRE testing in Europe. The test time is 30 minutes.

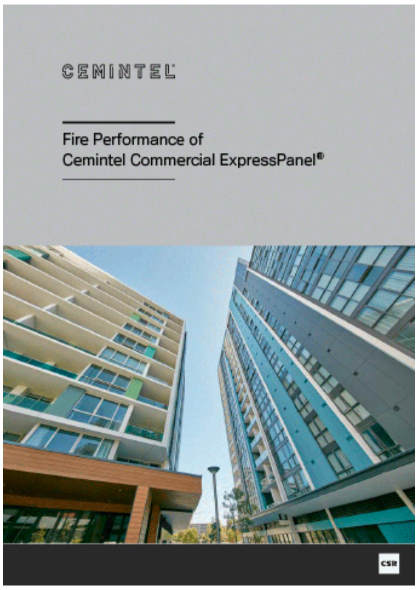
AS1530

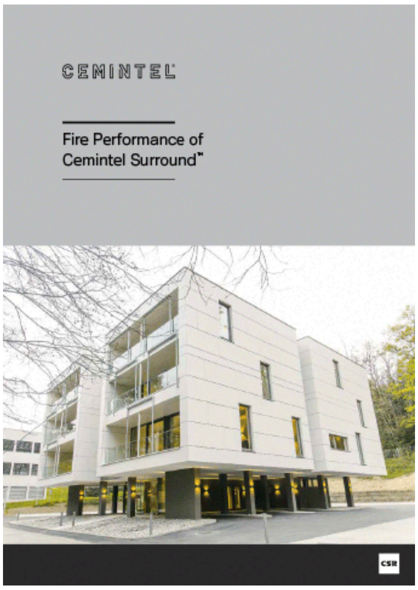
This is a furnace for AS1530.1 testing. A 45mm (d) x 50mm (t) piece of material is dropped into the furnace at a temperature of 750°C for 30 minutes.

Cemintel panels are fibre cement and there is no need to illustrate suitability. Instead reference can be made to BCA Clause C1.9. To assist with specifications, Fire Certificates are available for downloading from the website: cemintel.com.au. The testing report will identify each component used withing the tested configuration and nothing can be changed from the tested configuration to achieve an AS 5113 compliance rating.









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Classification Summary of Buildings and Structures

This list provides the definitions of Building Classes as set out in the Building Code of Australia.

Classes of Building – BCA Clause A3.2		
Class 1	**Class 1a**	A single dwelling being a detached house, or one or more attached dwellings, each being a building, separated by a fire-resisting wall, including a row house, terrace house, town house or villa unit.
	Class 1b	A boarding house, guest house, hostel or the like with a total area of all floors not exceeding 300m^2, and where not more than 12 reside, and is not located above or below another dwelling or another Class of building other than a private garage.
Class 2	A building containing 2 or more sole-occupancy units each being a separate dwelling.	
Class 3	A residential building, other than a Class 1 or 2 building, which is a common place of long term or transient living for a number of unrelated persons. Example: boarding-house, hostel, backpackers accommodation or residential part of a hotel, motel, school or detention centre.	
Class 4	A dwelling in a building that is Class 5, 6, 7, 8 or 9 if it is the only dwelling in the building.	
Class 5	An office building used for professional or commercial purposes, excluding buildings of Class 6, 7, 8 or 9.	
Class 6	A shop or other building for the sale of goods by retail or the supply of services direct to the public. Example: café, restaurant, kiosk, hairdressers, showroom or service station.	
Class 7	**Class 7a**	A building which is a car park.
	Class 7b	A building which is for storage or display of goods or produce for sale by wholesale.
Class 8	A laboratory, or a building in which a handicraft or process for the production, assembling, altering, repairing, packing, finishing, or cleaning of goods or produce is carried on for trade, sale or gain.	
Class 9	A building of a public nature.	
	Class 9a	A health care building, including those parts of the building set aside as a laboratory.
	Class 9b	An assembly building, including a trade workshop, laboratory or the like, in a primary or secondary school, but excluding any other parts of the building that are of another class.
	Class 9c	An aged care building.
Class 10	A non-habitable building or structure.	
	Class 10a	A private garage, carport, shed or the like.
	Class 10b	A structure being a fence, mast, antenna, retaining or free standing wall, swimming pool or the like.
	Class 10c	A private bushfire shelter
Mixed use buildings		– mainly relates to multi-residential where they may be a basement carpark (Class 7a) with ground floor retail spaces (Class 6) and residential apartments above (Class 2)

Construction Type

Type of Construction Required – BCA Clause C1.1		
Rise in storeys	**Class of building 2, 3, 9**	**Class of building 5, 6, 7, 8**
4 or more	A	A
3	A	B
2	B	C
1	C	C

Note: The classification of buildings and the type of construction can vary from the standard model depicted in the tables. Concessions can be provided that change the type of construction. The concessions can relate to the design of the building, its size, and the number of escapes.

Types of Construction Required

The Construction Type is determined by the Class of Building (see above) and the rise in storeys above and including ground level. Type A is the most fire resistant and Type C is the least. Type of Construction is determined using the table below:

Classes 2-9 Construction

NCC Volume 1: Section C – Fire Resistance provides the following DtS:

The DtS provisions of C1 which are relevant to material selection for internal and external wall and ceiling linings are in the table below. C2 and C3 focus on application design and not material selection (refer to the NCC Volume 1).

C1.1 Type of Construction	This section allocates a Fire Construction Type (A, B or C) to the building. Refer to 'C1.1 and C1.5 Type of Construction Required' below. Specification C1.1 defines non-combustibility requirements according to these construction types. Refer to 'Specification C1.1 Non-combustibility Requirements' section below including concessions for combustible products. Specification C1,1 also lists Fire Resistance Levels (FRL) requirements of the components. Refer to 'Specification C1.1 Fire Resistance of Building Elements' below.
C1.5 Two Storey Construction	For buildings of Classes 2, 3 and 9C only – the construction can be classified as Type C Fire Construction Type if it satisfies the conditions listed in the 'C1.1 and C1.5 Type of Construction Required' below
C1.10 Fire Hazard Properties	This section specifies the material property requirements for the floor coverings, ceiling linings, internal wall linings and external wall cladding. Specification C1.10 details the material testing requirements depending on if a sprinkler system is installed or not. Refer to 'C1.10 Fire Hazard Properties' below.
Part G5 Bushfire Areas	References to AS 3959 designate the requirements for each Bushfire Attack Level (BAL) including Flame Zone (FZ). Refer to section below.

Specification C1.1 Fire Resistance of Building Elements

In addition to identifying the applications where combustible cladding may be used, Specification C1.1 lists the minimum Fire Resistance Level (FRL) for several building elements (including internal and external walls).

Fire Resistance refers to the graded ability in minutes of a construction element to resist a fully developed fire, as determined by AS 1530.4 (see page 19).

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Part G5 Bushfire Areas

Bushfire Attack Level (BAL) Rating

A BAL rating is a means of measuring the severity of a building's potential exposure to ember attack, radiant heat and direct flame contact. It's measured in increments of radiant heat (expressed in kilowatts/m²).

A BAL is the basis for establishing the requirements for construction (under the Australian Standard AS 3959-2009 Construction of Buildings in Bushfire Prone Areas), to improve protection of building elements from bushfire attack.

Once assessed, your site/property/asset will be defined to one of six BAL ratings:

BAL-FZ	BAL-40	BAL-29	BAL-19	BAL-12.5	BAL-Low
Direct exposure to flames from the fire front in addition to heat flux of greater than **40kW/m²** and ember attack.	Increasing levels of ember attack and ignition of debris with an increasing heat flux of up to **40kW/m²** and increased likelihood of exposure to flames	Increasing levels of ember attack and ignition of debris with an increasing heat flux of up to **29kW/m²**	Increasing levels of ember attack and ignition of debris with an increasing heat flux of up to **19kW/m²**	Ember attack with heat flux of up to **12.5kW/m²**	There is insufficient risk to warrant specific construction requirements

The image above shows the various BAL ratings and the radiant heat flux for each rating. The greater the distance from the fire the lower the heat flux and therefore the construction standard is lower.

Where your building is greater than 100m from any classified vegetation the BAL rating will be BAL–LOW and will not require any special construction requirements. Where there is a risk or potential that ember attack could affect your home we recommend that BAL – 12.5 is applied.

BAL ratings for all Cemintel® products are available for download at cemintel.com.au/technical

WHAT IS AS 5113?

AS 5113:2016

Fire propagation testing and classification of external walls of buildings
This is a published Australian Standard that sets procedures for testing and classification of external wall according to their tendency to limit the spread of fire across their surface and between neighbouring buildings. It can be applied to external vertical surfaces and external wall systems. AS 5113 also integrates international standard test methods where practicable^. AS 5113 refers to test methods BS8414 part 1 and 2 2015, ISO 13785-2 and AS1530.4-2005 Appendix B7.

The test assesses the fire safety of an **overall external cladding system** used on an external wall, rather than looking at individual components. The testing report will identify each component used within the tested configuration and nothing can be changed from the tested configuration to achieve an AS 5113 compliant rating.

Note: AS 5113 is NOT compulsory in order for a material or system to be used in a façade. It is a verification method under the Performance Requirements of the BCA.

Fibre cement is an acceptable material for use under Deemed-to-Satisfy requirements.

Remember, AS 5113 is nominated as a 'Verification Method within the BCA, Clause CV3, but AS 5113 compliance is not necessarily required. Compliance can be illustrated simply by using a non-combustible façade system.

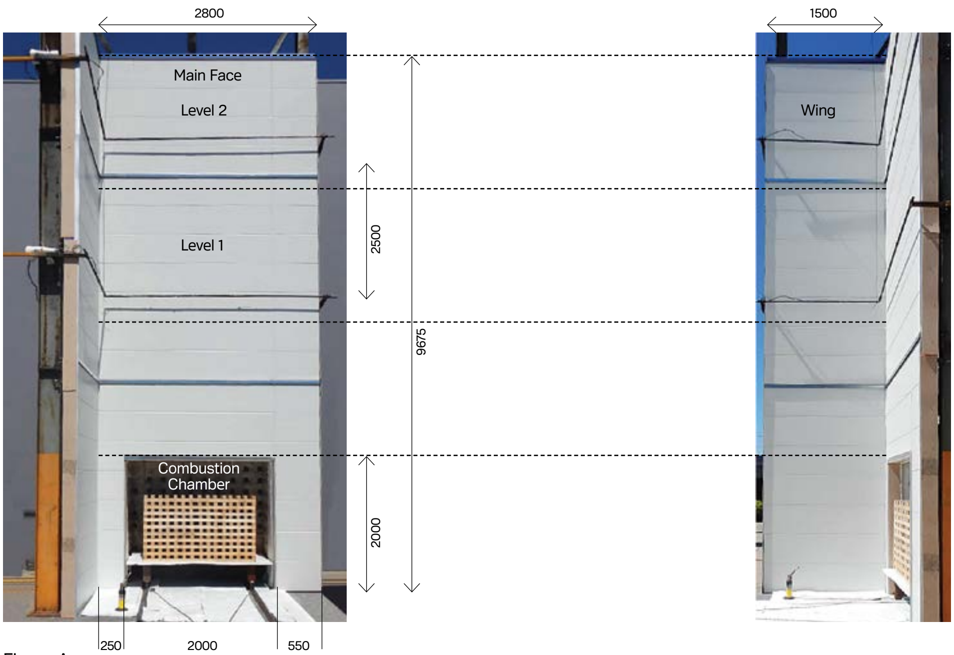


Figure A

Figure A shows the test structure required for AS 5113 testing.

The structure must be building in accordance with the recommended installation instructions of the system being tested.

The testing effectively lasts for 1 hour - a 30 minute burn period and a further 30 minutes where the rig is monitored after the fire is extinguished.The test requires the pass/fail of a number of criteria as in Table 1.

^ Standards Australia

How AS 5113 has evolved

AS 5113: 2016

- Sets out procedure for the testing and classification of combustible facades
- Draws on recognized IS (ISO 13785-2) and British (BS 8414) Polymer %
- Pass/Fail criteria are not set out in either the ISO or BS Standards
- AS 5113 sets out pass/fail criteria consistent with the NCC
- The referencing of AS 5113 as an additional compliance path is part of the 2018 NCC out of cycle amendment
- Testing authorities in Australia have been undertaking tests with systems meeting AS 5113 criteria
- Industry have a range of views on AS 5113-2016 (generally positive)
- Technical Committee continue to meet to review the debris criteria
- CP4 (risk to occupants) and CP9 (risk to fire fighter safety) are key considerations
- The debris criteria in the Standard is being reviewed ahead of referencing in the NCC (but there is no view it should be removed)

Table 1: Criteria for AS 5113

Classification Criteria	Related Classification Measurement
T w5m	≤ 600°C
T cavity5m, Panels	≤ 250°C
T cavity5m, Glasswool/Steel Framing	≤ 250°C
T unexposedside0.9m	≤ 180°C Rise
Flaming	No flaming
Openings	No openings
Spread	No spread
Debris flaming	≤ 20 seconds
Debris mass	≤ 2kg

The cost of the testing for a supplier is significant when all elements are factored in, for example material cost, testing authority fee, engineering fee for the test wall design and build costs.

Companies and materials have failed the test for various reasons, but commonly because of the debris criteria. The criteria requires that no more than 2kg of debris is allowed (all debris is swept up and weighed), otherwise it is a fail.

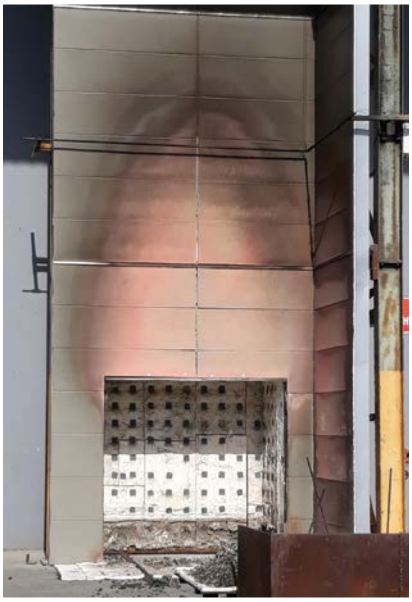
TERRITORY AS 5113 FIRE TEST

The images below illustrate the AS 5113 test for Territory. Territory is a unique product in that it satisfies the DtS requirements of the BCA, and additionally has passed the AS 5113 test with an EW rating.

9min

22mins

30mins - crib removed



60mins

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ALUMINIUM COMPOSITE PANELS (ACP)

What are Aluminium Composite Panels?

ACP is made of 3 layers – a core material which is bonded to a thin skin-layer on each side. They are also referred to as sandwich panels.

Their usage is not restricted to facades, other industries such as signage printing use ACP.

Figure 2: ACP

It has been a popular facade material because:

- it is lightweight
- there is a large choice of colours and finishes
- it is straight
- it has good bending strength
- it is durable
- it is relatively easy to install

There are different kinds of ACP.

Figure 3 shows the 3 Classes that are used in construction.

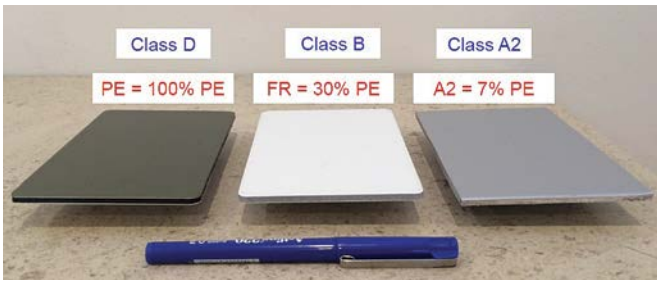


Figure 3: Classification of ACP products (Source: Tony Enright, December 2017)

The following table is a classification guide for ACP:

	Polymer %		
Classification	50-100	~30	Up to 7
AKA (Australia)	PE	FR	A2
Euroclass	D	B	A2
BRE Cat	3	2	1

Some states are calling for a ban on some classes of ACP product. QLD has a call for banning ALL PE products, VIC have instituted a ban on ACP's with a PE core of >30% on all multi-storey buildings, and NSW has issued a ban on ACP panels with a PE core of >30%. VIC have also banned EPS (polystyrene).

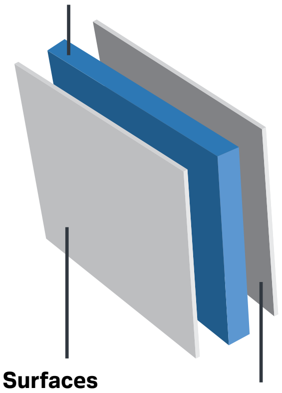
ACP has a number of fire hazards including:

- upward flame spread
- lateral flame spread
- burning drips falling
- burning sheets falling

These hazards can lead to the following issues:

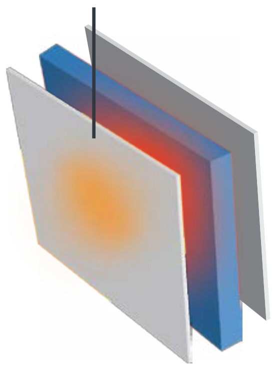
- fire spread circumvents safety systems
- can overwhelm the system
- block exits and fire rescue teams which can lead to loss of life.
- fire can spread up and down

Insulating core 2-5mm thick, 100% polyethylene



Surfaces
0.5mm thick100% aluminium skin

Heat from a fire will conduct quickly to the core through thin aluminium



Core loses ability to bind, causing outer skins to deform and delaminate.

Core melts and can ignite

Notes:

- Aluminium melts at 660 degrees celsius and is a good conductor. At 380 degrees celsius H^2O and Co^2 start to be produced – give off energy/heat
- $1m^2$ of PE cladding = approx. 4 hours petrol

Reference:

https://www.api.org.au/sites/default/files/uploaded-content/website-content/curll_matt_aluminium_composite_cladding_brochure_v5.pdf

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OTHER TEST STANDARDS

While AS 5113 is gaining a lot of focus, there are a number of other testing standards that can be referred in relation to Fire Performance.

AS 1530

Methods for fire tests on building materials, components and structures

As more talk and conjecture occurs in the industry, things that existed quietly previously come to the fore. This is the case of AS1530 as more requests are being made for proof of AS1530.1

This Standard provides methods for determining the performance of external construction elements when exposed to radiant heat, burning embers and burning debris.

- The methods do not simulate engulfment by flames from the fire front or large burning items such as other burning buildings or adjacent isolated trees and shrubs (see AS 1530.8.2).
- The peak level of radiant heat exposure is dependent upon the distance of the building from the potential fire front, the fire severity and the extent of shielding. The peak level can be based on an analysis of the specific site from first principles or from the classification of the site in accordance with the simple methods specified in AS 3959.
- The results of the fire tests may be used to directly assess fire hazard, but it should be recognized that a single test method would not provide a full assessment of fire hazard under all fire conditions.
- These fire tests provide data relating to the performance of the particular element and building system and do not provide a general assessment of the performance of a specific type of material.

AS 1530.1

Combustibility test for materials

There are 3 main materials that pass this Standard: stone, glass and metal/steel.

Fibre cement along with a number of other materials (eg. timber) does not pass this criteria.

If the materials flames or if it loses a prescribed mass, it fails.

AS 1530.2

Test for flammability of materials

Does not relate to fibre cement, mainly for sarking/wall wraps.

AS 1530.3

Simultaneous determination of ignitability, flame propagation, heat release and smoke release

These are the early fire hazard indices and fibre cement generally rates 0/0/0/1 (which is very good).

AS1530.4

Fire-resistance test of elements of construction (FRL)

The fire rating of systems is laboratory tested to determine the time to failure of 3 performance measurements which combine to give a Fire Resistance Level (FRL). They are:

Structure Adequacy: failure occurs when the specimen collapses under load.

Integrity: failure occurs when the specimen develops cracks or openings through which flames or hot gases can pass.

Insulation: failure occurs when the average temperature of the unexposed surface of the specimen increases by more than 140°C above the initial temperature, or the temperature at any point of the unexposed surface increases by more than 180°C above the reference temperature.

The test performance of the specimen is expressed as an FRL which indicates the number of minutes for which the specimen fulfils the requirements of the three criteria. These numbers are then rounded down to the nearest regulatory requirement.

The common regulatory FRL requirements are:

Non-Loadbearing	Loadbearing
-/30/30	30/30/30
-/60/60	60/60/60
-/90/90	90/90/90
-/120/120	120/120/120
-/180/180	180/180/180

As an example: FRL -/120/120

The dash indicates no requirement for Structural Adequacy, which applies to all non-loadbearing systems.

The first 120 indicates integrity for 120 minutes.

The second 120 indicates Insulation for 120 minutes.

CV3

CV3 is a reference point for suitable cladding material.

CV3 is a verification method that calls up AS 5113. Like AS 5113, this is a verification method to measure vertical spread. A DtS requirement must be used to measure horizontal spread.

CODEMARK™
30041

Codemark

A Certificate of Conformity can be issued under the ABCB's voluntary Codemark of Australia or Codemark scheme as evidence that a building material, method of construction or design fulfils specific requirements of the BCA.

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INDUSTRY DISCUSSION POINTS

Flame Spread

Much of the discussion regarding what is a suitable facade material is centreing on those that do not spread flame. This is good news for fibre cement.

Flame spread varies due to the following:

- size of ignition
- heat release rate
- density, heat capacity, thickness
- orientation
- geometry - reentry at corners and cavities
- fixing detail
- melting - thermoplastic or thermoset
- charring and fire retardants
- wind

Heat Release Rate of Fire

According to Fire Engineer, Tony Enright† of Enright Consulting, evaluation of the heat release rate of fire is a key consideration. The lower the power rating, the less likely the material will add energy to keep the fire going/fire spreading.

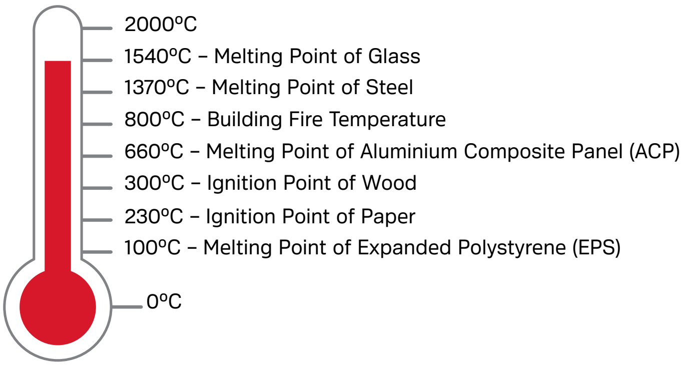
The below table shows the heat consumption scale for some materials as identified by Enright Consulting:

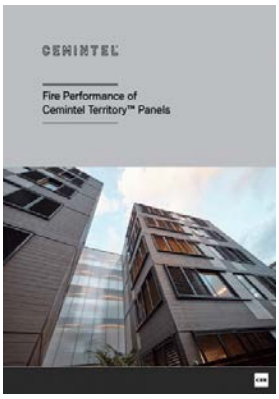
Table 1: Power (kW) = Burning Rate (kg/sec) x Energy (mj/kg)	
Product/Material	Heat of Consumption (mj/kg)
Stone, glass, metal	~ 0.0
Fibre cement	~ 1
A2	2.5
FR ACP	4
Wood	16
PVC (poly vinyl chloride)	16.4
Wood composites – HPL (high pressure laminate)	18.4
Fibreglass	21.0
EPS (expanded polystyrene)	38.1
PE (polyethylene)	43.3
Petrol	43.7

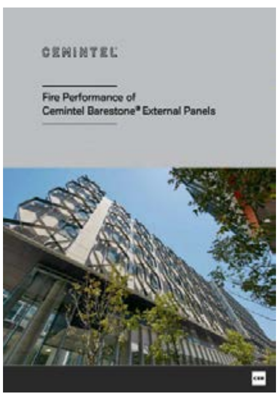
† Tony Enright appeared in the ABC Four Corners documentary 'Combustible', www.abc.net.au/4corners/combustible, 31 August 2017

The Melbourne Fire Brigade have the following guide on material behaviour in fires. The Melbourne Fire Brigade (MFB) have had significant input into the discussion given the risk to its employees when attending combustible cladding fires.

The categories are (top to bottom):







What is Cemintel’s Position for Fire Performance?

All products in the Cemintel portfolio are deemed as a non-combustible material in accordance with C1.9 and part 3.7.1.2 of the BCA. They are suitable for use where non-combustible building materials are required.

For residential buildings covered by Volume 2 of the NCC, clause 3.7.1.2 specifically indicates that fibre cement is suitable for use where non-combustible materials are required.

For residential and commercial buildings covered by Volume 1 of the NCC, Clause C1.9 similarly indicates that fibre cement is suitable for use where non-combustible materials are required.

Fire Certificates have been produced to cover off specification requirements for fire performance. They are currently available for Territory, Surround, Barestone and Commercial Express Panel and are on our website under “Technical”.

Cemintel’s Territory range has achieved an EW rating after passing all criteria of the AS 5113 test. It also qualifies as a non-combustible material under the DtS requirements of the BCA.

Why is glass considered a suitable façade material?

Glass (curtain walling/façade) is an interesting material in the debate given its extensive use in facades. Light is a key factor in designing buildings and architects love using it for this reason, as well as it having a concealed fixing option.

Glass passes AS1530.1 and therefore it is not required to perform the AS 5113 test to be classified as a suitable non-combustible material.

However, consider this – a 3500mm x 1500mm x 16mm glass panel can weigh around 210kg*. When used in a façade, it generally sits within an aluminium box frame (approximately 100-150mm) held in place by a rubber seal. In the case of a fire in a glass façade building, as the temperature increased the seal would fail, the aluminium frame would start to fail at about between 600-700°C and the glass would start to change composition between 700-900ºC. Whether the glass shattered or stayed in one piece – think about the impact of 210kg falling from height. Given one of the key criteria of AS 5113 that most materials are failing is the debris (ie. no more than a total of 2kg) there is seemingly a contradiction within the BCA. Noteworthy is that even without fire, glass panes fall out of high rise buildings.

European Classification

With more products being imported for use in facades, it is important to understand that there will be different classifications.

European Classification A1 – non combustible (ie. Cemintel Surround)

European Classification A2 – limited combustibility

* Capral Aluminium, CW150 Curtain Wall, www.capral.com.au

Ongoing Discussion

The following is a list of themes and issues that keep recurring regarding the non-combustible facade discussions:

- Average time for flame to spread has been reduced as a result of changes to Building Standards and materials used – from 25 mins down to 7 mins (ref: Fire Brigade). The Fire Brigade has been very active in lobbying for change.
- Adhesive/tape fixing is not a safe option. Example: Lacrosse panels fell off. The amount of pressure required to fix it with just tape is not physically possible on site (vs IBM mechanical fix) and it will fail in a fire.
- Testing product vs system can give different results. Testing of systems to get an indication of fire behaviour is better than no testing.
- The Qld Government has called for a national ban on PE. There have also been changes to state legislation to improve compliance, and in October 2017 they released the 'Non-Conforming Building Products Code of Practice', followed by Building and Construction Legislation (Non-Conforming Building Products – Chain of Responsibility and Other Matters) Amendment Act 2017 in November 2017.
- The NSW Dept of Fair Trading issued a ban on ACP panels with a PE core of greater than 30%, commencing 15/8/18.
- Victoria's State Government has introduced a ban on PE products (>30%) in March 2018. See Guideline in Appendix C.
- Laminated core honeycombs ignite due to glue however, the product is still being used in facades.
- Debris Debate – 250kg double glazed window vs 2kg debris. Note: Poland & Eastern Europe have a 5kg maximum, however, the concept of debris being considered is a good one (Grenfell firefighters had to use riot shields).
- AS 5113 testing must be as per supplier installation manual. There have been reports through a number of industry bodies that some AS 5113 tests have been conducted with a different system from their recommended system in order to pass the test. As an example, fire retardant sealants have been used in lieu of standard sealants that have been specified in installation instructions.
  The system tested must be that reflected in installation information, otherwise this is misleading.

CEMINTEL®

CONCLUSION

The information in this bulletin is designed to increase the knowledge that helps us have more informed discussions around the issue of fire performance and the suitability of fibre cement.

With so much hype in the industry regarding fire performance, people from all areas of industry are asking for more information to meet compliance requirements. It is possible that on occasions they do not fully understand the situation and why they are asking for information. With the information provided here, you can be more confident to engage in discussions regarding fire performance.

So what is the solution? Unfortunately, there is no silver bullet with such a complex issue. It is complex because of the number of stakeholders that are involved in reaching a resolution and the huge costs of admission of liability to existing buildings alone. It is unlikely that there will be a national resolution to the situation. State Governments and industry bodies are taking a local approach as to how they deal with the situation and change is slow. Insurance companies are also weighing in on the debate.

What is the best façade product? Ultimately, there is still no clear recommendation being provided by any authority or Government body on what is the preferred façade material, rather it is by exclusion ie. banning ACP that has >30% PE content.
The introduction of testing such as the AS 5113 will assist, and it will also make way for more material options. Importantly, fibre cement continues to be a suitable material for facades/cladding. Cemintel has a range of fibre cement products that comply with the BCA requirements for non-combustible materials, and one range has also passed AS 5113.

Will ACP products be totally banned? This is a common question in the market.
It would be reasonable to suggest that should there be another apartment tower fire involving combustible cladding, there would be increased pressure from the many key stakeholders to consider this as an option, as it was after Grenfell.

This document is not meant to be exhaustive but a snapshot in time of the overall situation.

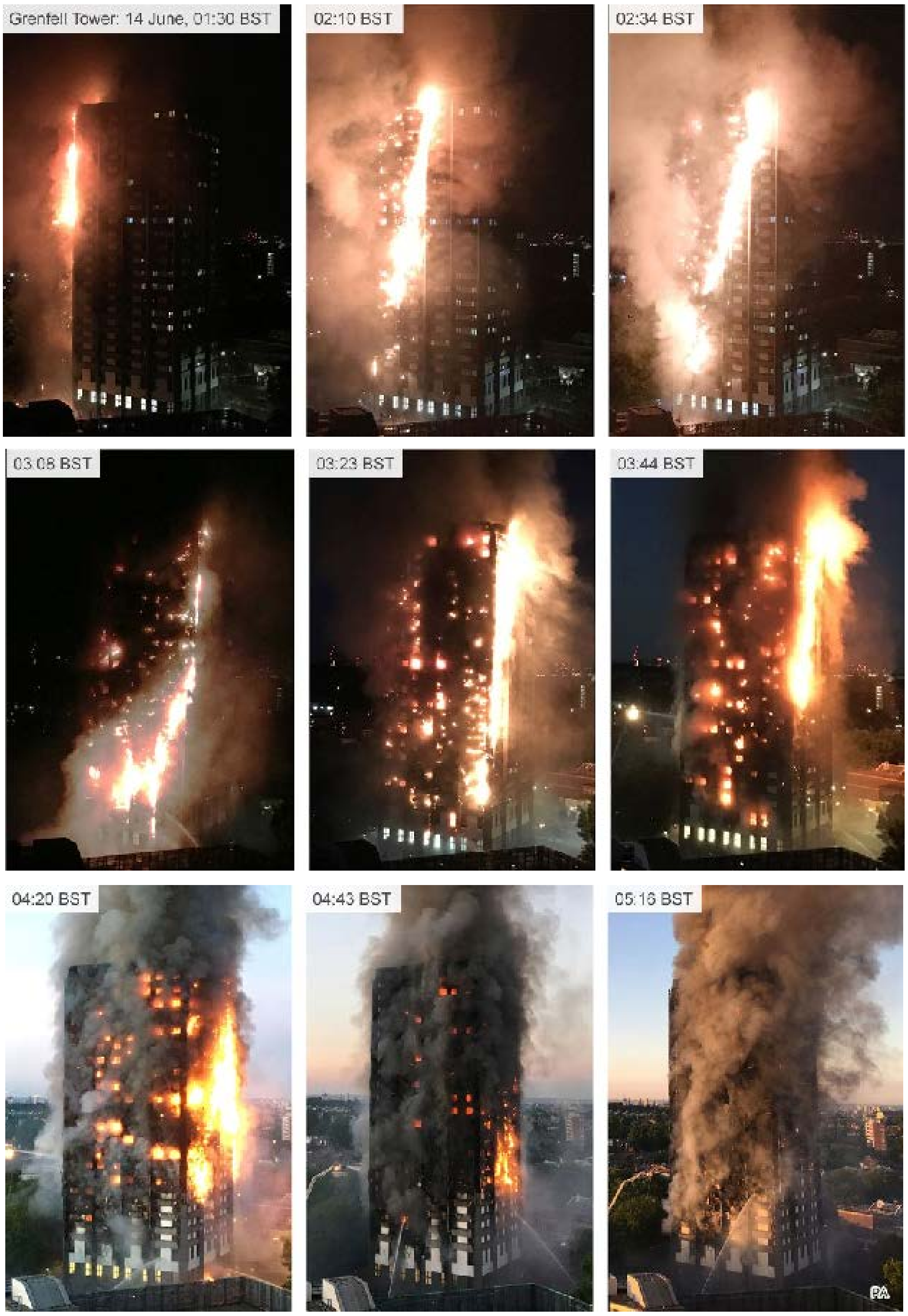
Article obtained from
bbc.com.au dated 18 June 2018 https://www.bbc.com/news/uk-40301289

The fire which destroyed Grenfell Tower in June 2017 was one of the UK's worst modern disasters.

Just before 01:00 on 14 June, fire broke out in the kitchen of a fourth floor flat at the 23 storey tower block in North Kensington, West London.

Within minutes, the fire had raced up the exterior of the building and then spread to all four sides. By 03:00, most of the upper floors were well alight.

Seventy-two people died. Here is how events unfolded that night.



Appendix A

Article obtained from
bbc.com.au dated 18 June 2018 https://www.bbc.com/news/uk-40301289

How the fire started

The fire began "in or around" a Hotpoint fridge-freezer in flat 16 on the fourth floor, according to a provisional report by Dr Niamh Nic Daéid, director of the Leverhulme Research Centre for Forensic Science at Dundee University.

Her report contains extracts from a witness statement by flat occupant Behailu Kebede, who described being woken by the sound of a smoke alarm.

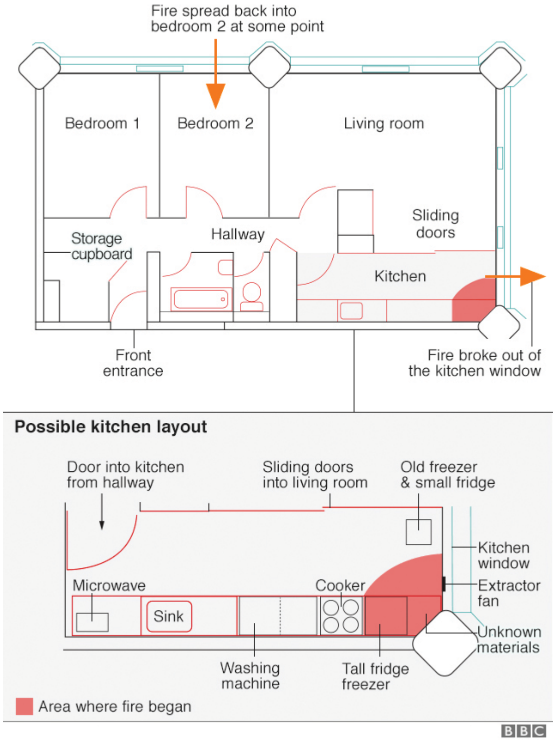
He went into the kitchen and saw smoke in the area of the fridge-freezer and near the kitchen window.

Mr Kebede immediately called the fire brigade, which logged the call at 00:54. Four fire engines were sent to the scene, the first arriving at 00:59.

The first fire crew entered the flat at 01:07 - an approximate timing taken from a thermal imaging camera. They initially searched the bedrooms and did not enter the kitchen until 01:14.

In the kitchen, firefighter Daniel Brown described seeing an "isolated curtain of flame from about 2-3 feet in the air to the ceiling".

Thermal images captured by the fire crew appear to show that "hot fire gases and flames had spread across the window space".



As the fire crew dealt with the fire in the fridge-freezer, their thermal images also appear to show falling embers outside the kitchen window.

Mobile phone images taken by Mr Kebede from outside Grenfell Tower approximately 11 minutes after his first 999 call show an orange glow of flames around the kitchen window, and later a fire burning more intensely in the area of the window filler panel and extractor fan.

Subsequent photos by Mr Kebede suggest that the "fire was continuing to develop and grow", Dr Nic Daéid reports, by 01:09 becoming "external to the building".

Although the timings provided are approximate, it appears that the fire had spread to the cladding before the firefighters had entered the kitchen.

Dr Nic Daéid's provisional report also identifies "unknown materials" stored between the freezer and wall which "may have become involved in the fire in the early stages of its development".

Among these materials was an item described as an "electric cooking device" or "large hot plate".

In another report, fire expert Professor Luke Bisby expressed his view that the likely reason for the fire spreading beyond the kitchen was that flame and hot gases penetrated the internal window frame.

Images from the kitchen of flat 16 show the positioning of the kitchen appliances and the window.

How the fire spread

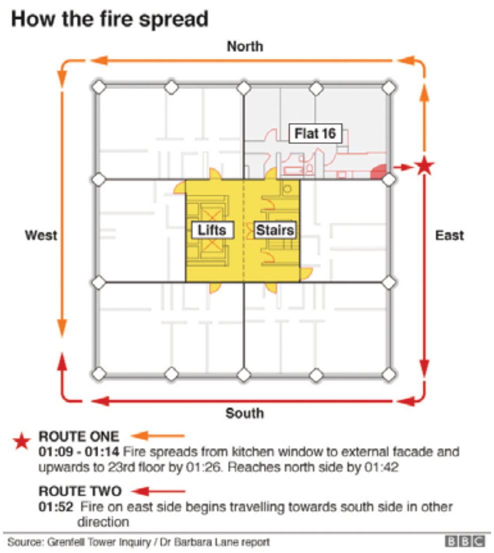
From the fourth floor, the fire spread rapidly upwards and across the eastern side of the building. From there, it spread across the north face of the tower.

Mobile phone videos show the blaze reaching the top floor on the east side of Grenfell Tower by about 01:26, less than 30 minutes after firefighters had arrived.

In a report to the Grenfell Public Inquiry, fire safety engineer Dr Barbara Lane identified the fire spreading vertically up the tower columns, and "laterally along the cladding above and below the window lines (and) the panels between windows."

The fire had spread to the north side of the tower by 01:42, Dr Lane recorded.

At 01:52, the fire also began travelling across the eastern side towards the south in the other direction.



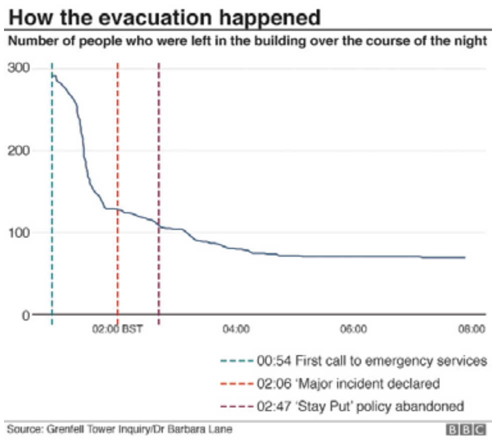
At 02:06, London Fire Brigade declared the fire a "major incident". At this point, some 40 fire engines were either at or en route to the scene.

Grenfell Tower had a 'stay put' fire policy - essentially, the building design would contain a fire in a single flat for as long as it took fire crews to bring it under control.

So on the night, many residents were told to remain in their flats by the emergency services, only to become trapped as the fire blazed out of control and thick poisonous smoke spread up the single narrow stairwell.

Dr Lane said that the stay put policy had "substantially failed" by 01:26 - less than 30 minutes after the first firefighters were at the scene.

Some people people ignored the stay put advice and made it down the stairs to safety.



A total of 65 people were rescued from the building by firefighters.

But in desperation, other residents went upwards and sought refuge in flats of friends and neighbours on the upper floors. Twenty-four people died on the top floor of the tower block.

By 02:10, multiple internal fires could be seen burning inside the building.

At 02:22 fire had spread to the south side of the tower and by 02:30 it was reported that the eastern side of the building was "fully involved in fire".

The stay put advice was finally abandoned at 02:47, when the incident commander gave the order to "advise people to make efforts to leave the building."

Counsel to the Grenfell inquiry Richard Millet QC told the 4 June hearing that 144 people managed to evacuate before 01:38, but only 36 after the stay put guidance was abandoned.

By 02:51, the fire had reached the western side. At this point, some 63 flats were on fire and more than 100 people remained in the building.

At 04:30 the whole building was engulfed, with more than 100 flats on fire.

The blaze did not burn itself out until 01:14 BST on Thursday - 24 hours later.

Article obtained from
bbc.com.au dated 18 June 2018 https://www.bbc.com/news/uk-40301289

What caused the fire to spread so quickly?

The most significant part of the renovation of Grenfell Tower was the addition of external cladding. This consisted of aluminium sheets bonded to a central plastic (polyethylene) core.

In his report to the public inquiry, Professor Luke Bisby said evidence “strongly supports” the theory that the polyethylene material in the cladding was the primary cause of the fire’s spread.

“The ACM (aluminium composite material) product on Grenfell Tower incorporates a highly combustible polyethylene polymer filler which melts, drips, and flows at elevated temperature. The polyethylene filler material is expected to release large amounts of energy during combustion”.

Images after the fire show evidence of melted cladding on the tower’s columns

His report also suggests that vertical cavities within the cladding structure played a role in the spread of the fire, as did the insulation, although evidence was inconclusive.

A number of other flammable materials, including a polyurethane polymer foam insulation board which pre-dated the refurbishment were also present and may have contributed, Prof. Bisby found.

In her report, fire expert Dr Barbara Lane identifies combustible materials used in the refurbishment of the tower’s windows as another factor in allowing the fire to spread.

The Grenfell Inquiry has also heard that the building’s smoke extraction system was not working, and that firefighters experienced problems with the water supply because there was no ‘wet riser’ - a water-filled pipe running up the building to be used in the event of fire.

Giving evidence to the inquiry, Dr Lane said exposed gas pipes installed in 2016 were another contributory factor, while none of the flat doors met current fire resistance standards.

Work done on the lifts in 2005 and 2012-16 left them unfit for evacuating vulnerable residents and aiding the emergency response, Dr Lane said.

Who were the victims?

The final death toll from the blaze is now recorded as 72 people.

They include six members of the Choucair Family and five members of the Hashim Family, who lived on the 22nd floor.

Five members of the El-Wahabi family died on the 21st floor.

The youngest victim was six-month old baby Leena Belkadi, who died in her mother’s arms as she tried to escape.

Other young victims included Jeremiah Deen, 2, Isaac Paulos, 5, Hania Hassan, 5, and her sister Fethia, 3, and twelve-year olds Biruk Haftom and Jessica Urbano-Ramirez.

Article obtained from
bbc.com.au dated 18 June 2018 https://www.bbc.com/news/uk-40301289

The oldest victim is believed to be 84-year-old Sheila from the 16th floor, who had lived in Grenfell Tower for 34 years.

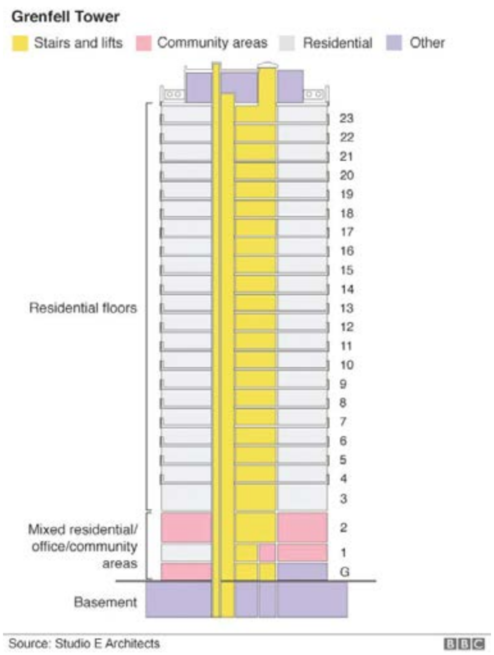
Baby Logan Gomes, who was stillborn in hospital on 14 June the morning after the fire, is also included in the toll.

The final victim was Maria Del Pilar Burton, who suffered from serious long-term health issues, and died in hospital in January 2018.

What kind of building was Grenfell Tower?

Grenfell Tower was part of the Lancaster West Estate, a social housing complex of almost 1,000 homes.

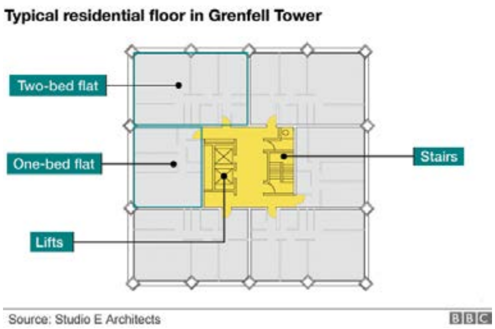
The tower was built in the 1970s, but recently renovated.



An £8.6m refurbishment - part of a wider transformation of the estate - was completed by Rydon Construction in May 2016.

Work included new exterior cladding, replacement windows and a communal heating system.

The bottom four floors were also remodelled, creating seven additional homes and



There were 129 flats across 21 residential floors and three levels of mixed use.

The tower was managed by the Kensington and Chelsea Tenant Management Organisation (KCTMO) on behalf of the council.

Article obtained from
bbc.com.au dated 18 June 2018 https://www.bbc.com/news/uk-40301289

How is the fire and its causes being investigated?

Specially trained officers from the Met, City of London Police and British Transport Police have been involved in the search and recovery operation, thoroughly searching every single flat on every single floor.

Officers have examined 15.5 tonnes of debris on each floor, helped by forensic anthropologists, archaeologists and forensic dentists or odontologists.

A public inquiry, ordered by Prime Minister Theresa May, is under way.

Lawyers representing survivors and relatives of the victims began giving evidence to the public inquiry into the tragedy on Monday 11 December 2017.

The Metropolitan Police are looking into offences including manslaughter, corporate manslaughter, misconduct in public office and breaches of fire safety regulations in relation to the fire, the inquiry has been told.

The force has already gathered 31 million documents and 2,500 physical exhibits. Some 1,144 witnesses have given statements and 383 companies are part of the investigation.

The public inquiry plans to deliver an interim report into the fire's causes and the emergency response by next autumn.

2 MAJOR FAÇADE FIRES

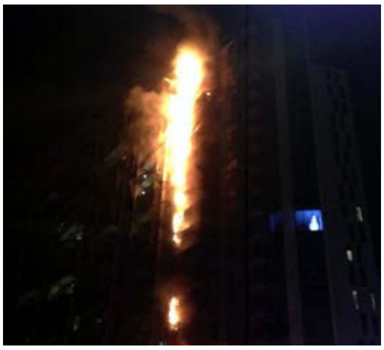
Table 2.1 gives a summary of the recent major façade fire incidents that took place around the world. In all cases, it was evident that there has been a rapid fire spread along the exterior cladding due to the combustibility of the materials used. Although sprinklers were installed, external fire spread was not prevented that considerably reduced the evacuation time for occupants. The cases of apartment buildings where the occupancy is relatively high throughout the day turned out to be catastrophic events, which ultimately resulted to loss of human lives.

There are examples where authorities have stepped up to strengthen their guidelines in order to prevent such incidents from happening again in the future.

Table 2.1 A summary of recent major facade fire incident

Building	Location	Year	Description	Damage
Grenfell Tower (Kirkpatrick et al. 2017) (24 stories)	London, UK	2017	Fire started at 4th floor and spread rapidly through the external cladding which consisted of ACM panels with PE core	79 dead 70 injured
The Address Downtown Dubai (302m tall) (Associated Press 2017; Schreck and Gambrell 2016)	Dubai, UAE	2016	Fire started at the parking level while the construction works were ongoing	16 minor injuries
Marina torch (352m) (Austin and Williams 2015)	Dubai, UAE	2015 & 2017	Fire initiated in the 52nd floor and spread quickly due to high winds	No injuries
Tamweel Tower (160m tall) (Miers 2016)	Dubai, UAE	2012	A fire ignited which burned two separate broad vertical bands of exterior cladding from ground to roof level. ACM panels with PE core	Repair works have begun after 3 years
Saif Belhasa Building (13 stories) (Miers 2016)	Dubai, UAE	2012	Fire started at the 4th floor and spread rapidly to the roof level. Cladding consisted of ACM panels with PE core	9 flats destroyed 2 injured Debris damaged 5 vehicles
16 Storey apartment building(Reuters 2015)	Baku, Azerbaijan	2015	Rapid fire spread along the cladding which were fitted after a renovation. 'Polyurethane panels' according to reports.	17 dead 60 injured
Lacrosse Building (Toscano and Spooner 2015)	Melbourne, Australia	2014	Fire started on the 6th floor and Fast-running flames soon ignited external wall cladding and aided by combustible material located within the wall structure quickly spread to the top of the building	No injuries
18 storey building(FPA 2012)	Roubaix, France	2012	Dramatic upwards spread of the fire from its origin to the top of the 18-floor building, apparently fuelled by its highly flammable outer cladding	1 dead 1 injured
28 storey building (Barboza 2010)	Shanghai, China	2010	Building was undergoing renovations which involved installing energy saving insulation. Fire was believed to have spread on polyurethane insulation to external walls	53 dead 90 injured
Monte Carlo Hotel (32 stories) (Duval 2008)	Las Vegas, US	2008	Fire was burning along the combustible components of the building's architectural trim and the exterior insulation and finish system which consists of a layer of expanded polystyrene foam adhered to gypsum sheathing	13 minor injuries
Marco Polo Apartments (36 stories) (Farrer and Barney 2017)	Honolulu, US	2017	Fire started on the 26th floor and blaze rapidly spread higher. The building did not have a sprinkler system	3 dead 12 injured

Appendix B



Lacrosse Apartment Fire, Melbourne.
November 2014. No casualties
16 floors engulfed in about 15 mins

The Address Hotel, Dubai.
January 2016. 14 people injured Minutes to leap 40 storeys – the cause of the fire was a short circuit

Baku Residence, Azerbaijan.
May 2015. 15 people died – 5 children, 63 injured. 16 storeys went up in seconds according to witnesses

Lacrosse Apartment Fire, Melbourne.
November 2014. No casualties
16 floors engulfed in about 15 mins

The Saif Belhasa, Dubai.
October 2012. 2 injuries.
9 of the 13 storeys burnt out

Haeundae Busan, South Korea.
October 2010. No casualties
33 floors engulfed in less than 30 minutes

Jing An District, Shanghai.
November 2010. 58 people killed, more than 70 injured. 28 storeys

Television Cultural Centre, Beijing.
February 2009. 1 person killed, 7 injured. Although illegal pyrotechnics were the cause of the fire, the 44-floor building was engulfed in about 13 mins

5-star Hotel Shenyang, China.
February 2011. No casualties. Fireworks were said to cause the fire. The fire travelled across 37 floors in 20 mins.

Spencer St, Melbourne.
February 2019. No casualties. 150 evacuated.

Macquarie St, Sydney. May 2018.
No casualties. 20 people evacuated. Scaffolding set up to remove cladding, catches fire.

Marina Torch, Dubai.
February 2015 & August 2017. 79 storeys.

Hon Richard Wynne MP

Minister for Planning

Minister's Guideline MG-14: Issue of building permits where building work involves the use of certain cladding products

This is a guideline issued by the Minister pursuant to section 188(1)(c) of the Building Act 1993 (Act). Municipal building surveyors and private building surveyors must have regard to this guideline pursuant to section 188(7) of the Act.

Purpose

This Guideline has been issued to reduce the risks to life and property which can arise from the inappropriate use of products containing combustible materials in external wall cladding systems in some multi-storey buildings in Victoria.

This is a guideline relating to the functions of municipal building surveyors and private building surveyors when considering an application for a building permit which proposes the use of combustible materials in external wall systems.

This Guideline takes effect from 22 March 2018.

Issue of building permits for the use of certain cladding products on Type A and B Construction

When considering whether to issue a building permit in relation to a building of Type A or Type B Construction, the relevant building surveyor should not be satisfied that proposed building work which includes the installation of a Prescribed Combustible Product as part of an External Wall (including as an attachment) would comply with the Act and Regulations **unless** the application for the building permit includes a determination of the Building Appeals Board that the installation of the Prescribed Combustible Product in relation to that application complies with the Act and Regulations.

Definitions

For the purposes of this Guideline:

BCA Volume One means Volume One of the National Construction Code Series including any variations or additions in the Appendix Victoria set out in the Appendices to that Volume.

External Wall has the meaning given to it in Part A1 of the BCA Volume One.

Prescribed Combustible Products means:

- a panel that comprises a polyethylene core or lamina bonded to one or more sheets of metal panels including an aluminium composite panel (also sometimes referred to as aluminium composite material); or
- an expanded polystyrene product used in an external insulation and finish (rendered) system.

Polyethylene core means a core or lamina that is comprised of 30% or more polyethylene by mass.

Type A Construction has the meaning given to it in Part C1 of the BCA Volume One.

Type B Construction has the meaning given to it in Part C1 of the BCA Volume One.

I have issued this guideline pursuant to section 188(1)(c) of the Building Act 1993 (Vic).

The Hon Richard Wynne MP

Minister for Planning

Issued: 13 March 2018

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