RED FIRE ENGINEERS

BUILDING REGULATORY REFORM SUMMIT 2018

Lessons Learned from the Façade Fiasco

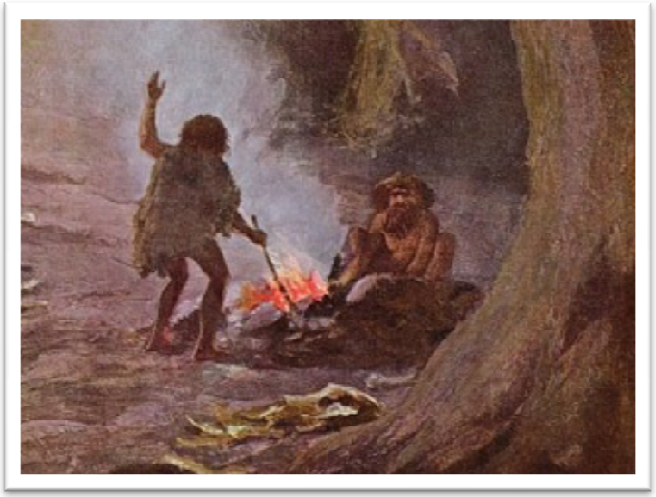
Dr. Jonathan Barnett

Technical Director, RED Fire Engineers

- How did we arrive at the façade compliance problem and who is responsible?
- Who should cover rectification costs?
- Why is the system making it so hard to fix the problem?
- When do we have to get on top of it?

How did we get here?

- What is the problem?
- Learning from history (the great colosseum collapse of 25 AD, Lacrosse, Grenfell, others).



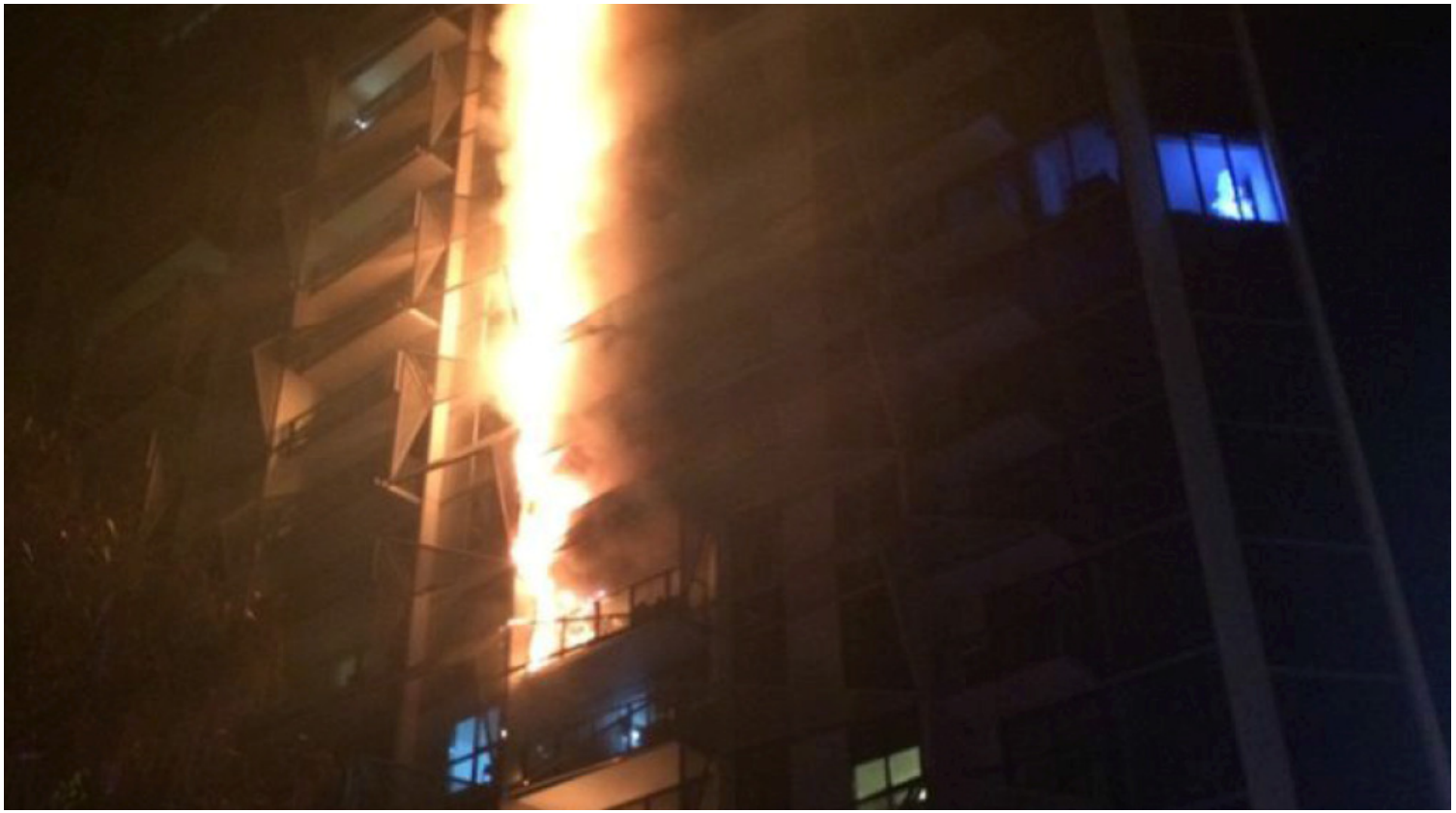
Major façade fires

- London, UK, 2017, 24 storey class 2, over 70 dead
- Baku, Azerbaijan, 2015, 16 storey class 2, 15 dead, 63 injured
- Shanghai, China, 2010, 28 storey class 2, 58 dead, 70 injured
- Major façade fires in UAE
- Lacrosse tower in Melbourne

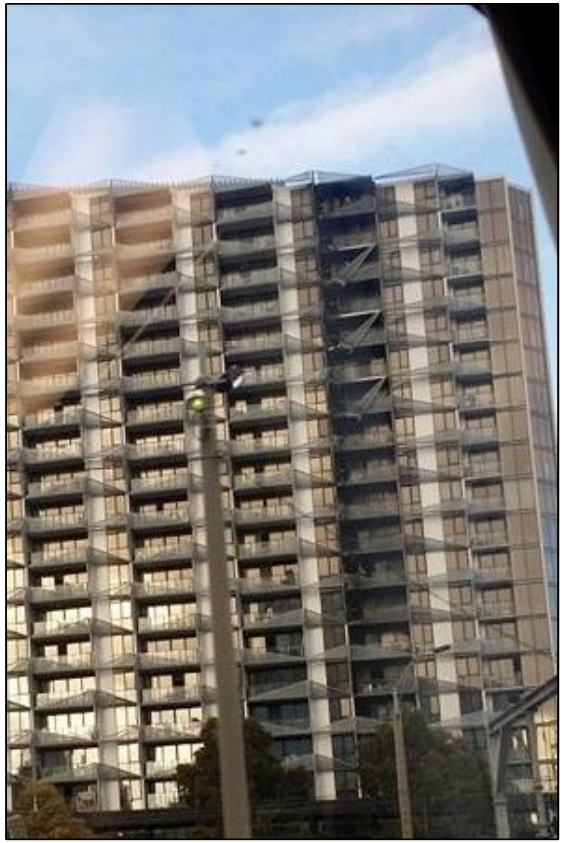
It’s a scary problem

Ajman - UAE

What can go wrong



Lacrosse Docklands



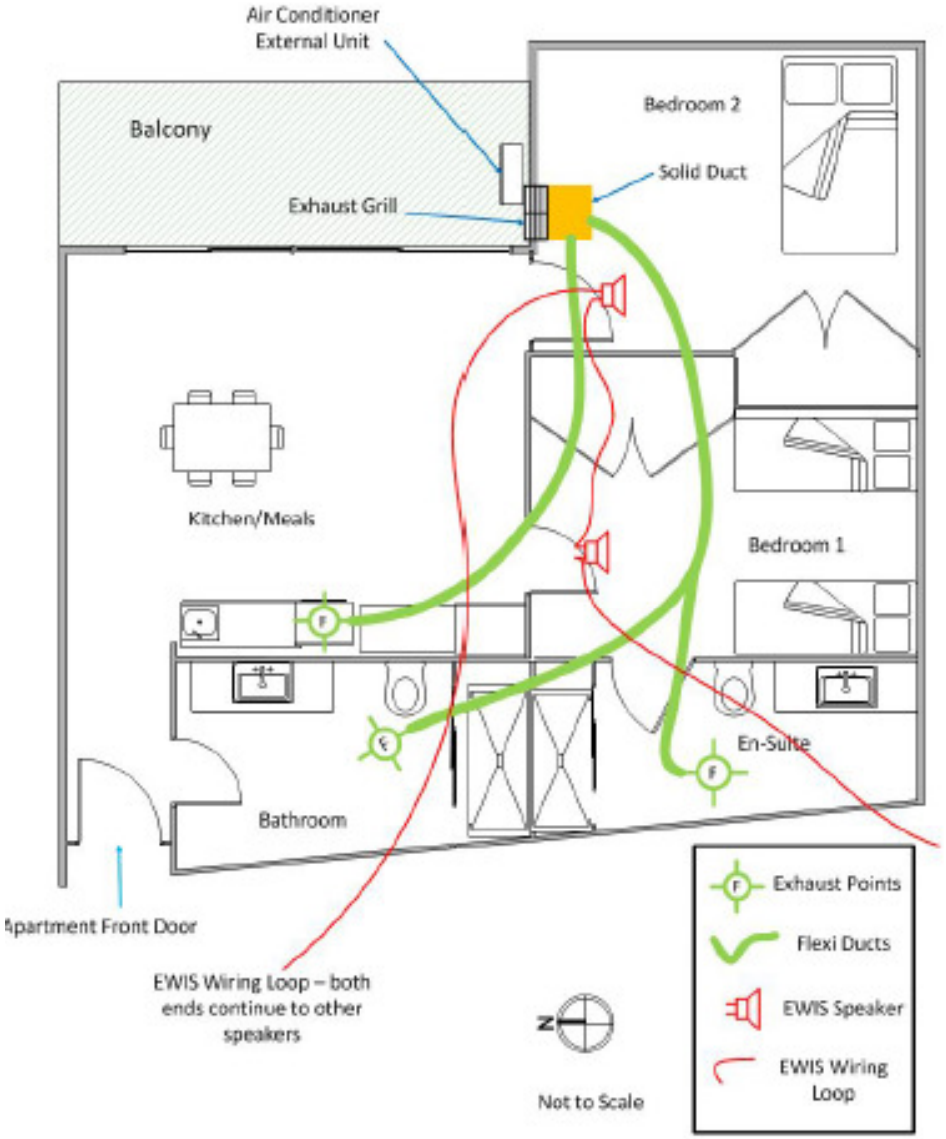
- 673-675 La Trobe Street, Melbourne
- 25 Nov 2014
- 400-500 Occupants
- 23 storeys
- $25M + loss
- 122 fire fighters involved

The brigade response

Balcony of origin

Vertical path of fire spread

Spread up this panel


Air Conditioner
External Unit
Balcony
Exhaust Grill
Bedroom 2
Solid Duct
Kitchen/Meals
Bedroom 1
En-Suite
Bathroom
Apartment Front Door
EWIS Wiring Loop – both ends continue to other speakers
N
Not to Scale
Exhaust Points
Flexi Ducts
EWIS Speaker
EWIS Wiring Loop

After the fire

Cost (AUD)

- $6.5M (fire damage)
  - 26 sprinkler heads operated, which along with water from hose streams resulted in $700,000 damage
- $8.6M (cladding) – Replace non-fire damaged cladding with Vitracore G2

Combustible Product that is DtS for this use

Certificate of Test

Quote No.: NC7442 **REPORT No.: FNC11476**

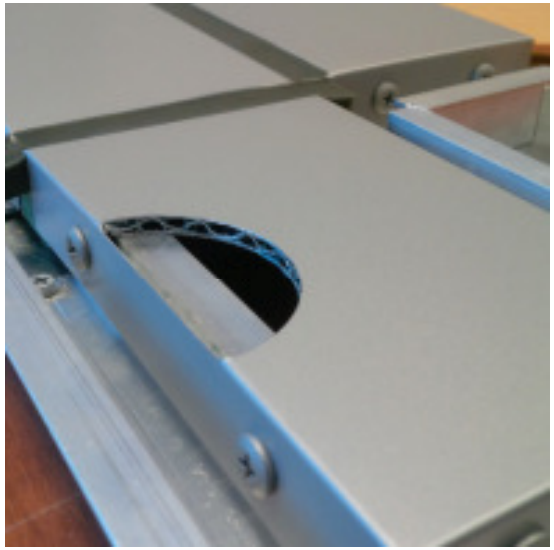
COMBUSTIBILITY TEST FOR MATERIALS IN ACCORDANCE WITH AS 1530.1-1994

TRADE NAME: Vitracore G2 – Corrugated honeycomb aluminium core

SPONSOR: Fairview Architectural Pty Ltd
18-20 Donald Street,
LITHGOW NSW 2790
AUSTRALIA

DESCRIPTION OF TEST SAMPLE: The sponsor described the tested specimen as the corrugated honeycomb core of the Vitracore G2 aluminium composite sandwich panel.

Nominal thickness: 0.3-mm to 0.5-mm
Nominal mass: 4 kg/m²
Colour: silver



Vitracore G2 aluminium panel with aluminium core

FAIRVIEW
DEFINING ARCHITECTURE SINCE 1963

Cost (AUD)

- $1M lost rent and cost of emergency accommodation
- Insurance premium increase of $130,000 since 2014
- Rectification of non-compliant cladding $15,000,000?

Concerns

- The building is now re-occupied
- What strategy is needed to keep it safe to occupy?

Lacrosse

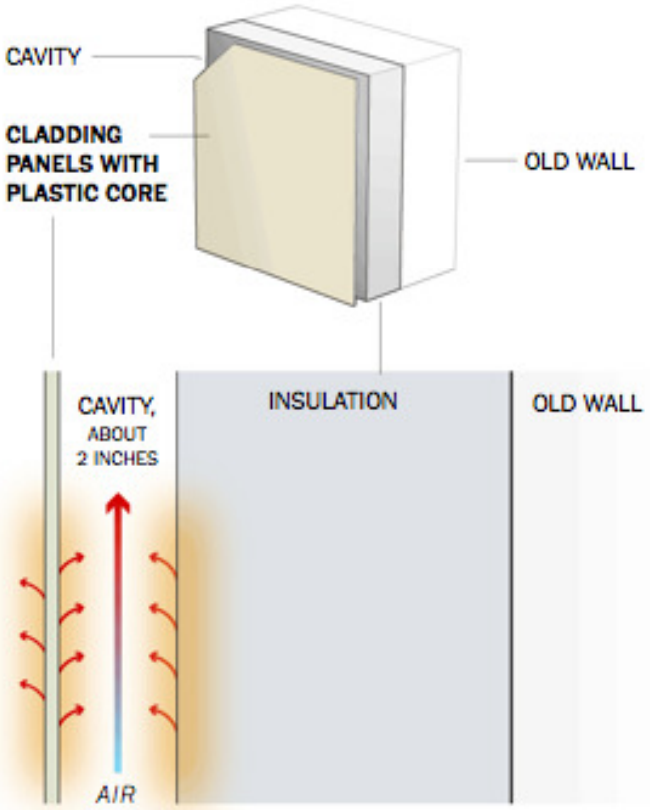
- Reinstatement of ESM
- Reduced over crowding
- Limited storage on balconies
- Enhanced MFB response

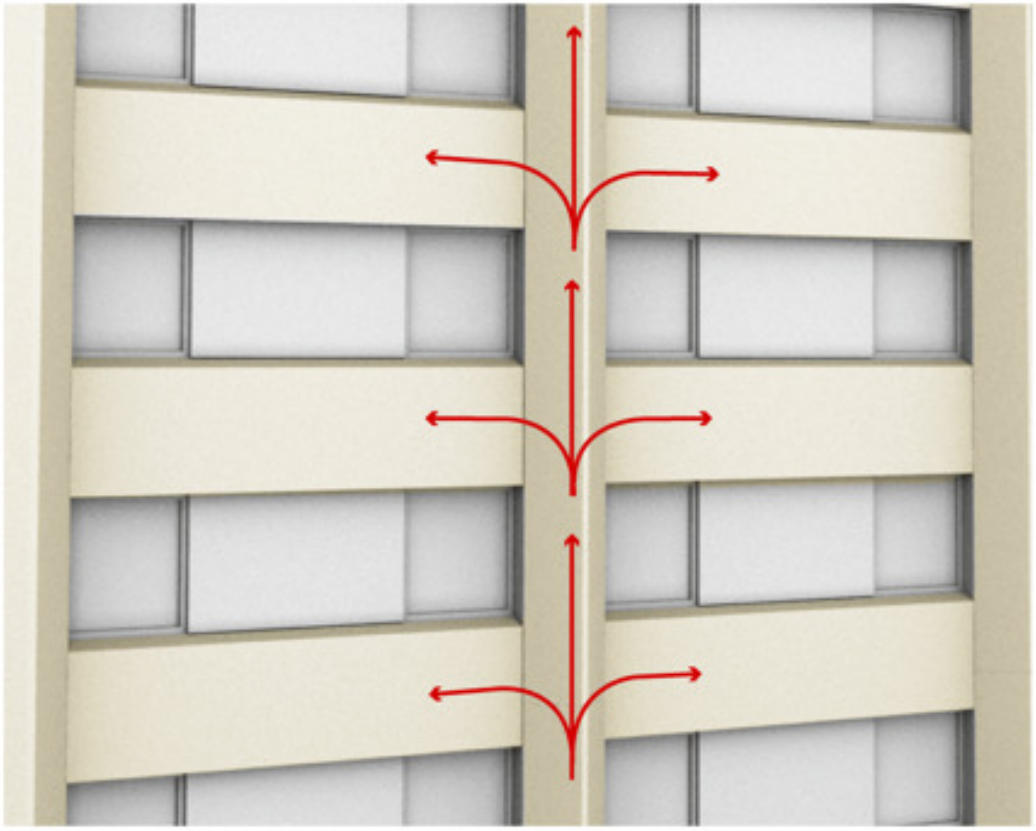
Is it enough?

Grenfell Tower

Probable construction

(From the NY Times)





Could it happen here?

- Yes, it could happen here!
- We were warned by the Lacrosse fire
  - The wind blew the right way
  - The sprinkler system was designed for use with the hydrants; which weren't used
  - The brigade had access to an elevated roadway
  - Excellent water supply infrastructure
  - The fire happened at the right time of the night

Have we been doing anything?

- Initial VBA audit of 170 buildings in the CBD
- 51 % non-compliant
  - Are these unsafe?
  - Do they meet the performance requirements of the BCA?

The Problem

- This is not simply due to ‘cheap Chinese imports’
- It is not due to builders/developers just trying to save money
- It is not a product problem

The Problem

- It is a design problem
- It is an enforcement problem
- It is due to a market driven approach which ignores safety
  - These fires are low frequency potentially high consequence events
- It is due to failure to use design professionals who understand fire safety, fire protection and construction technologies

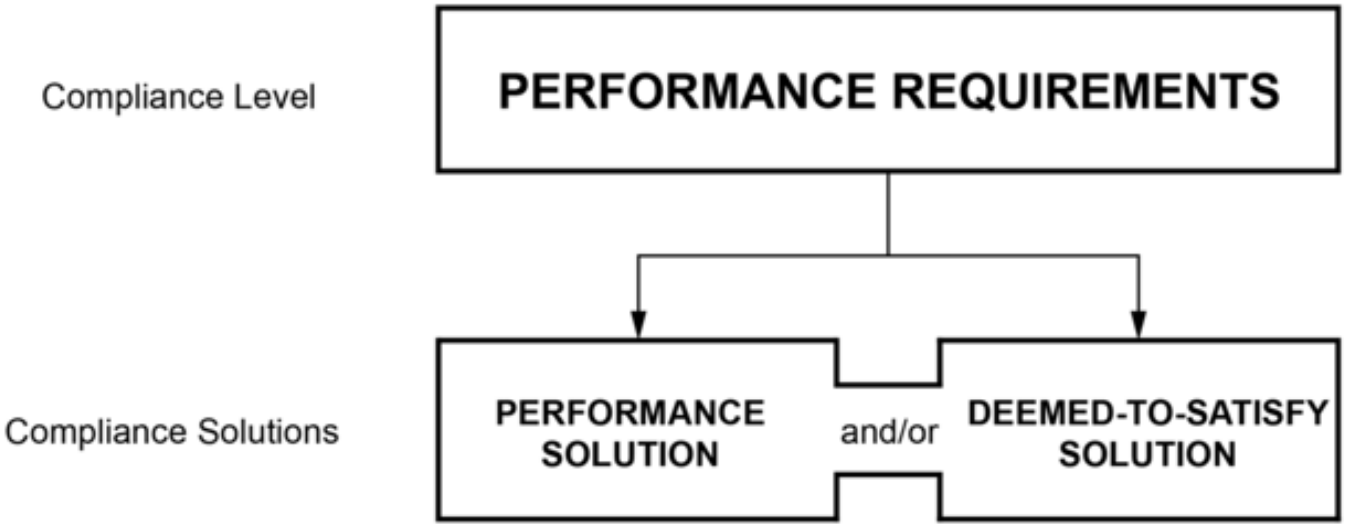
How do we become compliant

- We need to understand and apply the BCA
- We need to go beyond self certification
- We need to add more vigor to our inspection processes

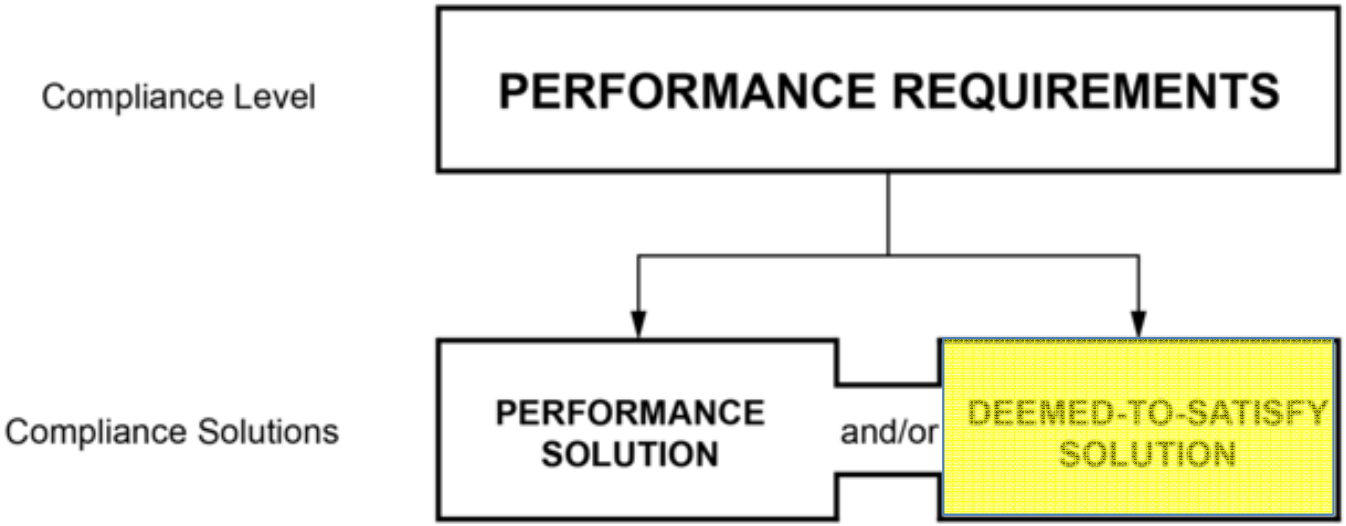
What BCA?

- Which year?
- Which amendment?
- “They changed the rules so its not my fault”

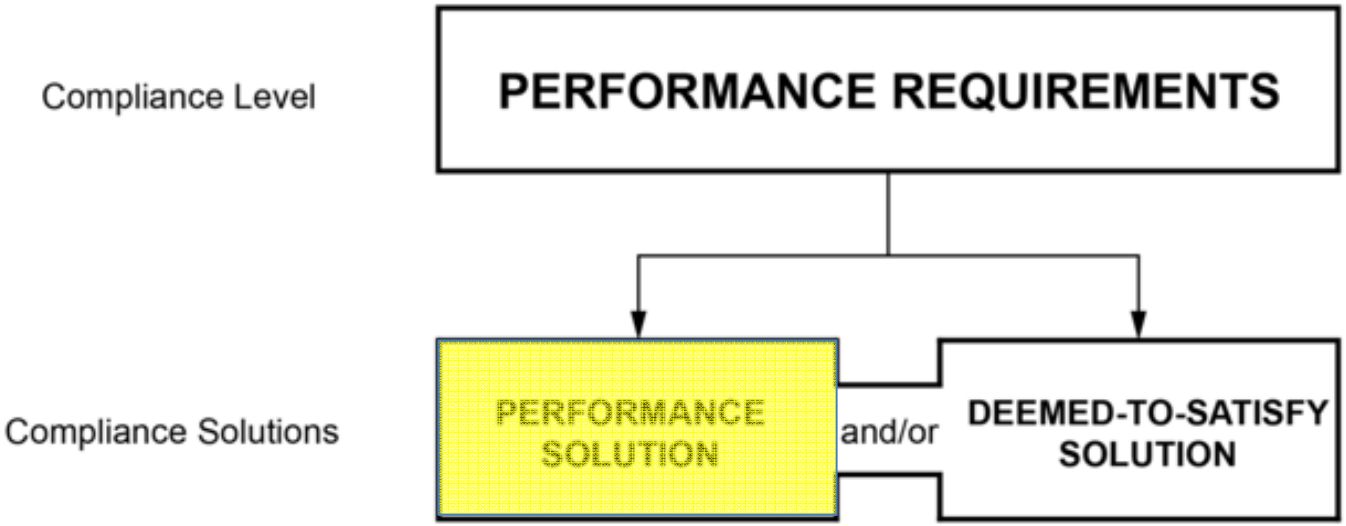
The BCA


Compliance Level
PERFORMANCE REQUIREMENTS
Compliance Solutions
PERFORMANCE SOLUTION
and/or
DEEMED-TO-SATISFY SOLUTION

The BCA

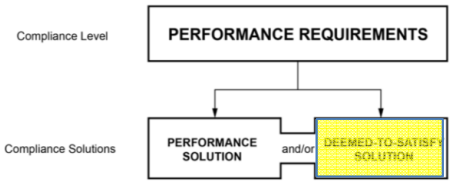

Compliance Level
PERFORMANCE REQUIREMENTS
Compliance Solutions
PERFORMANCE SOLUTION
and/or
DEEMED-TO-SATISFY SOLUTION

The BCA


Compliance Level
PERFORMANCE REQUIREMENTS
Compliance Solutions
PERFORMANCE SOLUTION
and/or
DEEMED-TO-SATISFY SOLUTION

Facade

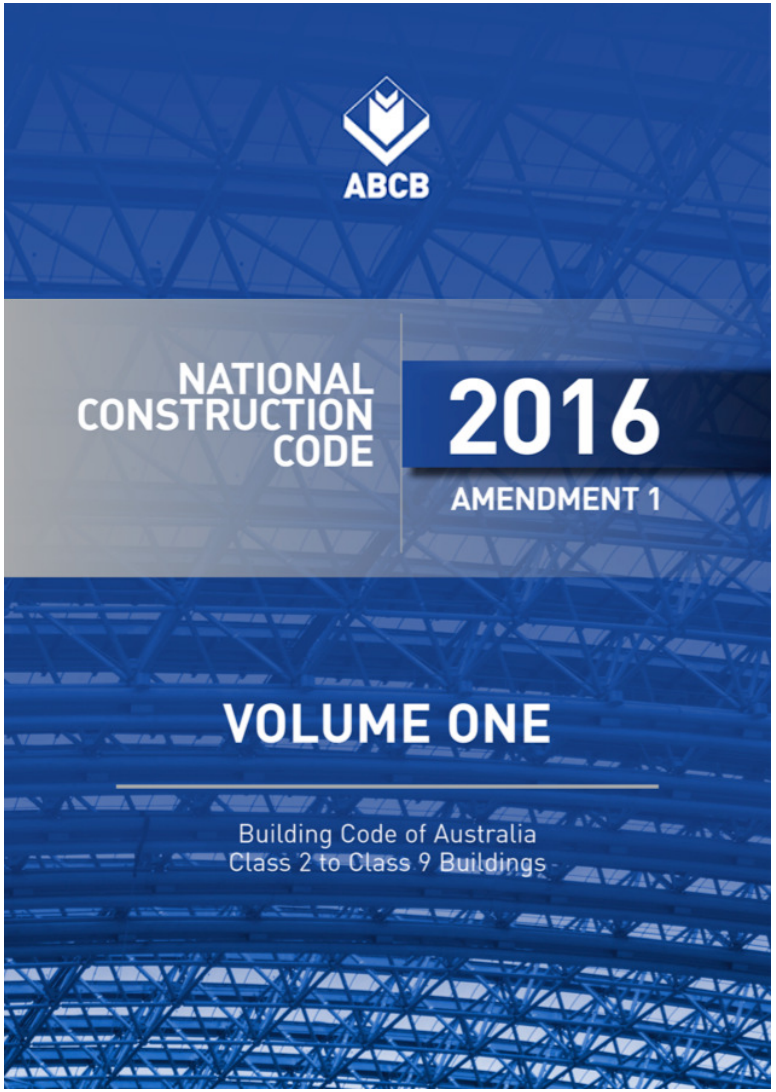
- Case 1: Cladding is [part of] the exterior **wall**
- Case 2: Cladding is an **attachment**

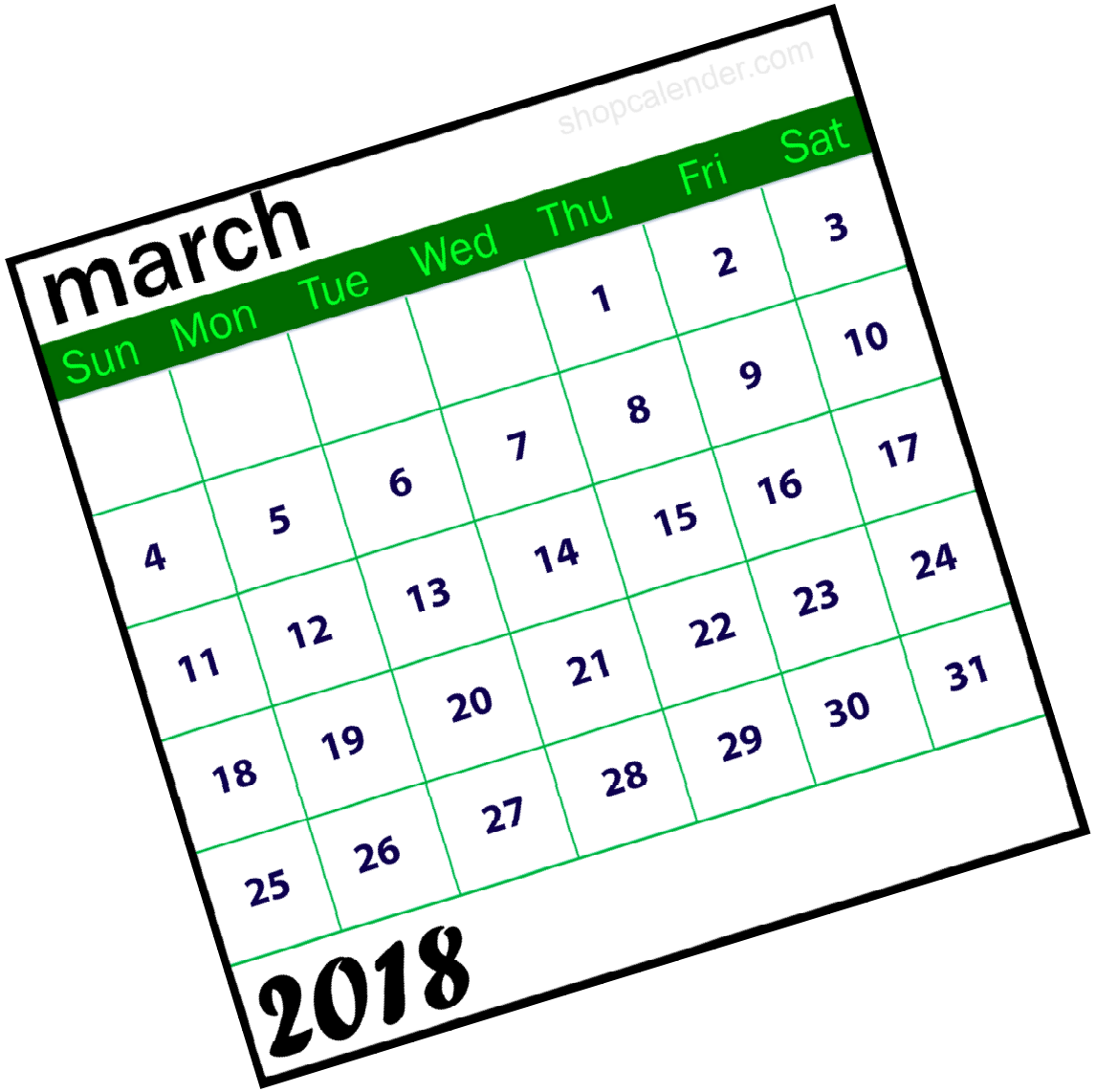


Facade

- Case 1: Cladding is [part of] the exterior **wall**
- Case 2: Cladding is an **attachment**

This has been clarified in amendment 1


ABCB
NATIONAL CONSTRUCTION CODE
2016
AMENDMENT 1
VOLUME ONE
Building Code of Australia
Class 2 to Class 9 Buildings


shopcalender.com
march
Sun Mon Tue Wed Thu Fri Sat
1 2 3
4 5 6 7 8 9 10
11 12 13 14 15 16 17
18 19 20 21 22 23 24
25 26 27 28 29 30 31
2018

What to use?

- Substantial Progress

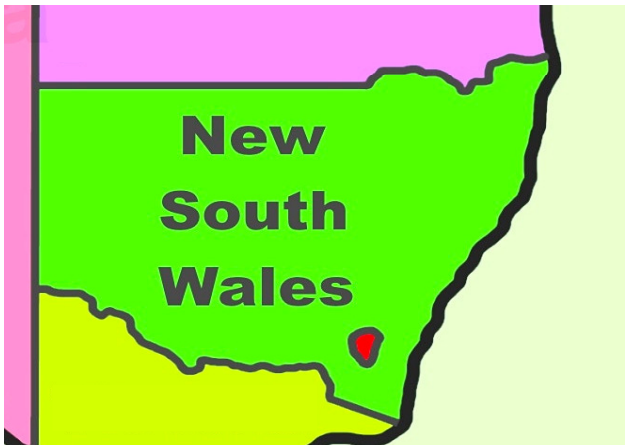
- Section 10(2)

A building regulation, or an amendment to abuilding regulation, does not apply to the carrying out of building work if the relevant building surveyor is satisfied, and certifies in writing, that substantial progress was made on the design of the building before the building regulation or amendment commenced.

What to use?

- Similar to VIC

- Day Building Permit is issued



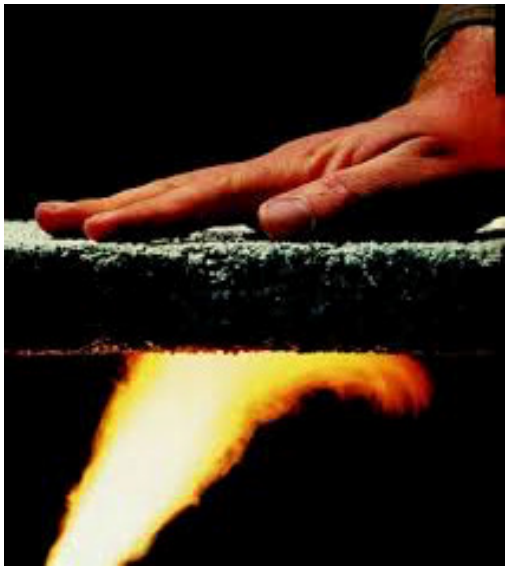
- Clarification
- Modification
- Addition

Clarification

Type A

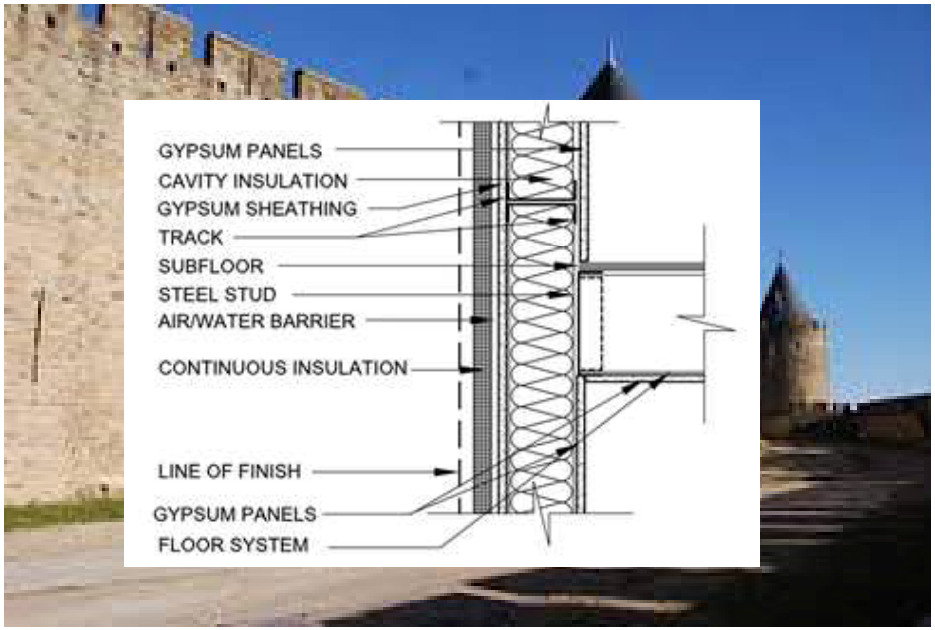
Type B

Clarification



CERTIFIED
NON-COMBUSTIBLE MATERIAL
CSIRO tested to AS1530.1

Clarification



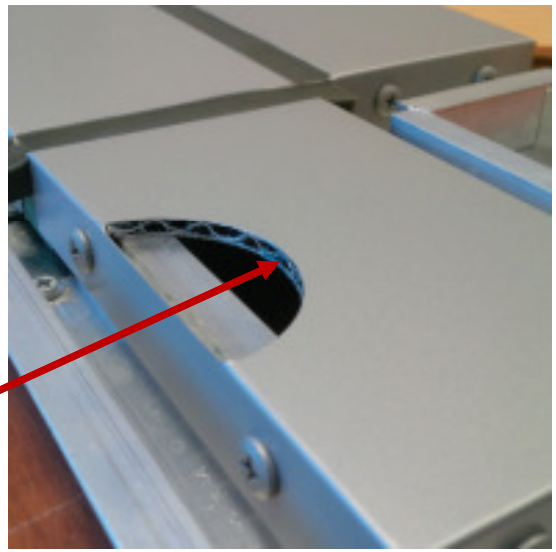
C1.9 (formerly C1.12)

- Plasterboard
- Fibre-reinforced cement sheet
- Pre-finished metal sheeting
- Bonded laminates

In 2019

Clause C1.9 e (vi) Bonded laminates

- Each **lamina** is *non-combustible*
- Each adhesive layer <1 mm
- Total adhesive layers < 2 mm



Clause C1.9 e (vi) Bonded laminates

- For the whole:
  - *Spread-of-Flame Index = 0*
  - *Smoke-Developed Index < 3*


EXCEPTION

Clause C1.9

Clause C1.9

Clarification

- The element is an Attachment
- This is an Ancillary element

Attachment ≡ **ANCILLARY**

- **UK** /ænˈsɪl.ər.i/ **US** /ˈæn.sə.ler.i/

Ancillary: Clause C1.14

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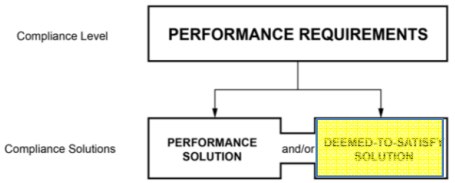
Ancillary: Clause C1.14

Ancillary: Clause C1.14

Ancillary: Clause C1.14

Facade

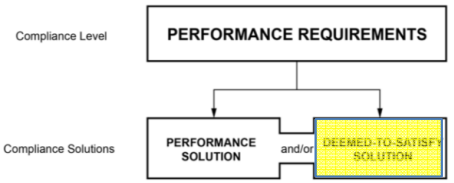
- Case 1: Cladding is [part of] the exterior **wall**
  - **Not combustible**



Facade

- Case 2: Cladding is an **attachment**
  - **Perhaps combustible**

5. An adjunct or supplementary device



But how did we get here?

- First modern code: Rome year 27, as a response to a collapse which killed or injured 50,000 people.

But how did we get here?

- In 64 Rome burned down: poor construction, combustible facades, lack of fire separation from boundary

But how did we get here?

- 1666 – fire in London. Major update to code, construction of party walls outside of all buildings to be made of brick and/or stone.

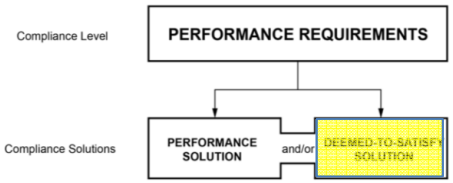
But how did we get here?

- 1871 – Chicago 250 dead, 17000 buildings destroyed. New building code
- We need to remember the past

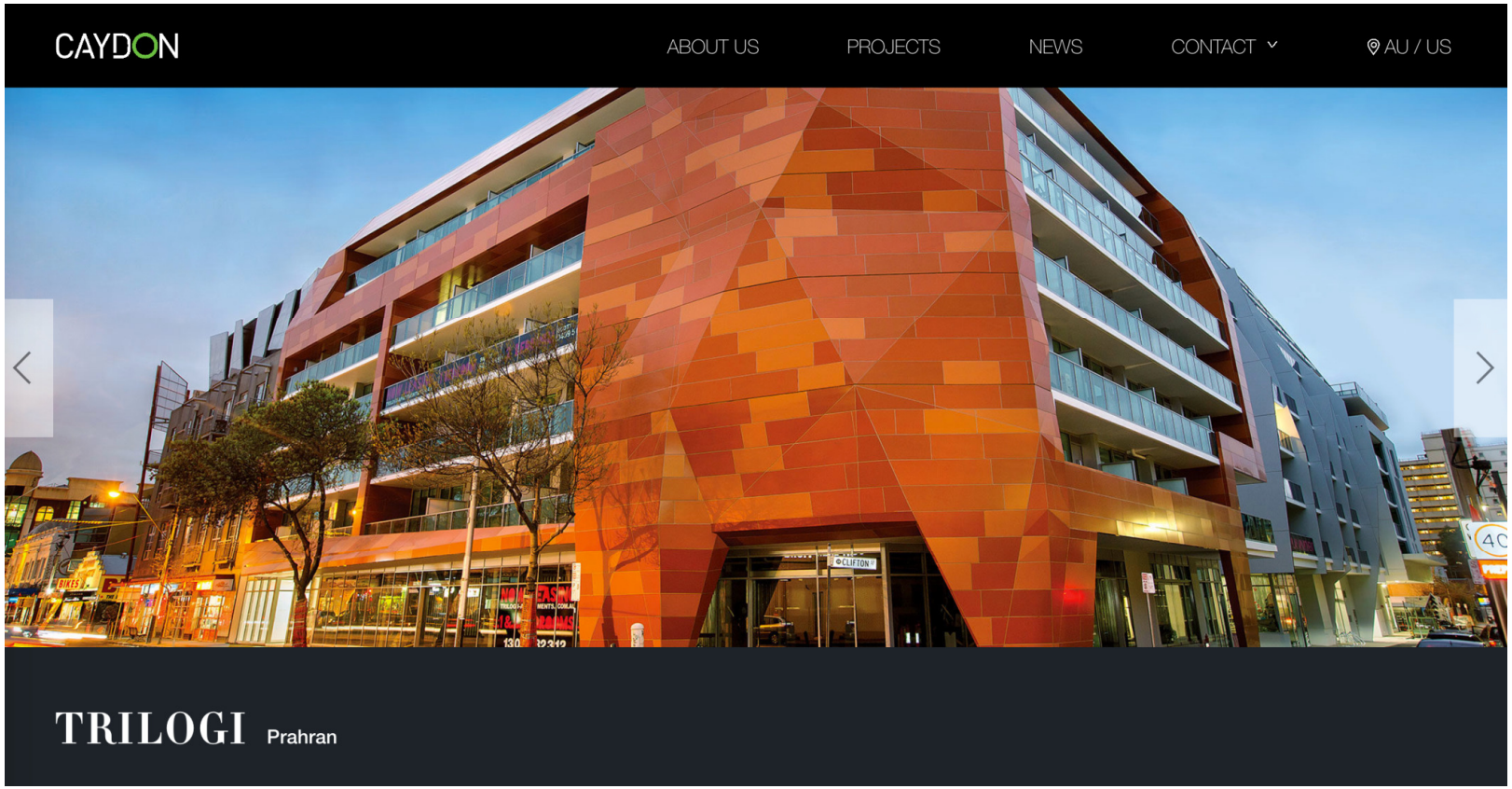
- How did we arrive at the façade compliance problem and who is responsible?
- Who should cover rectification costs?
- Why is the system making it so hard to fix the problem?
- When do we have to get on top of it?

DtS

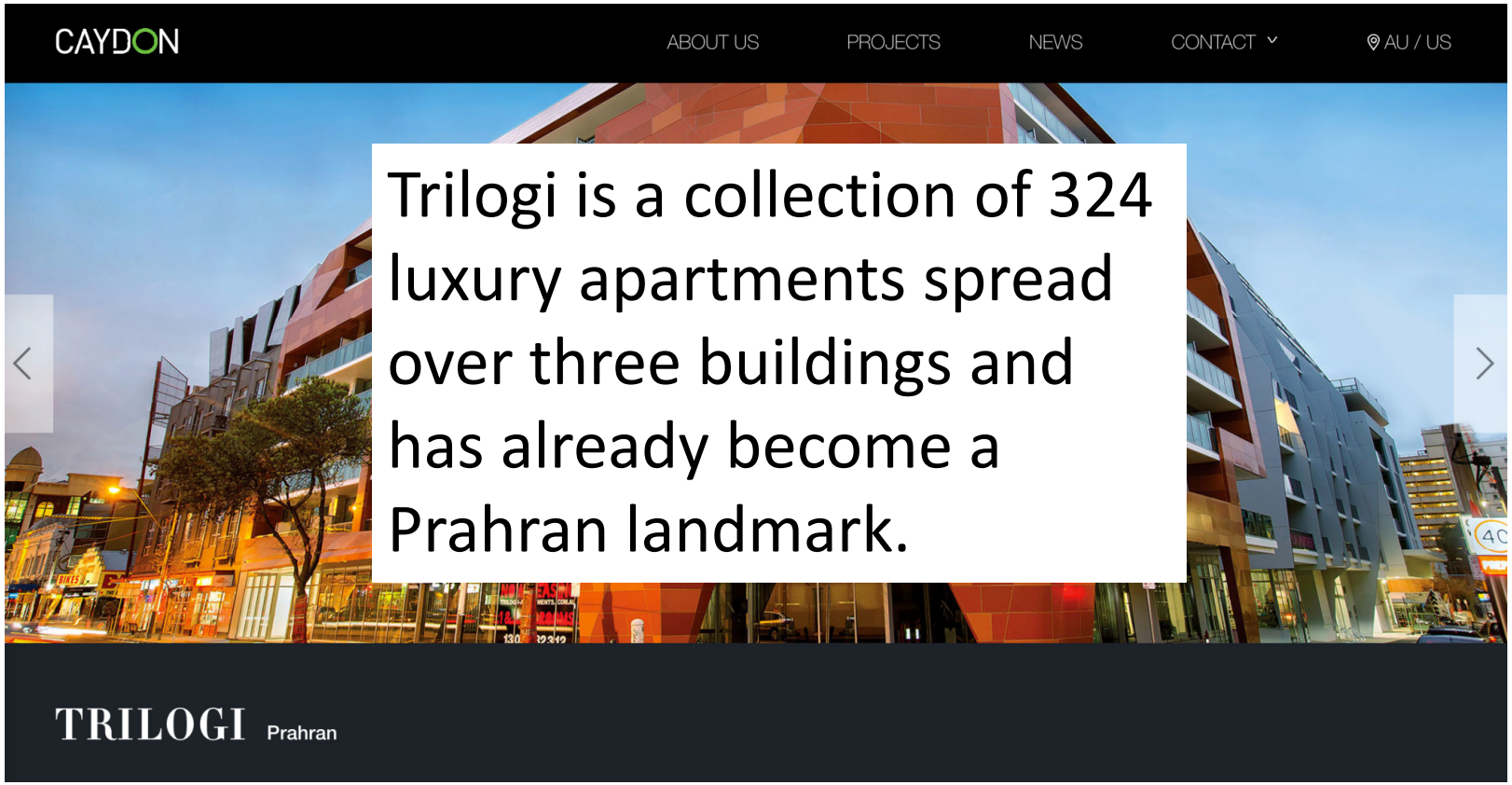
- Once we identify non-compliant cladding, what should we do?



Real examples



Other Buildings



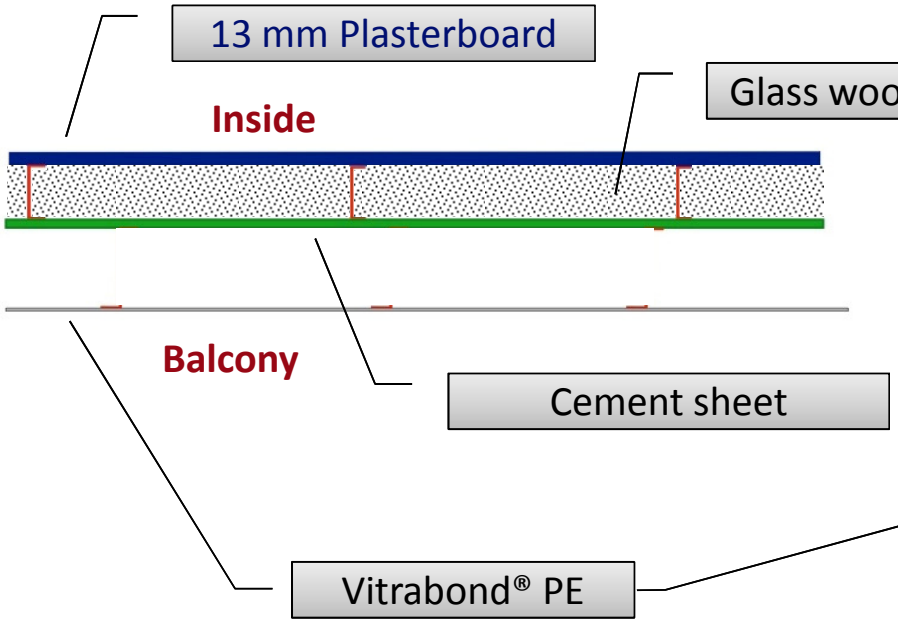
JULY 7 2017

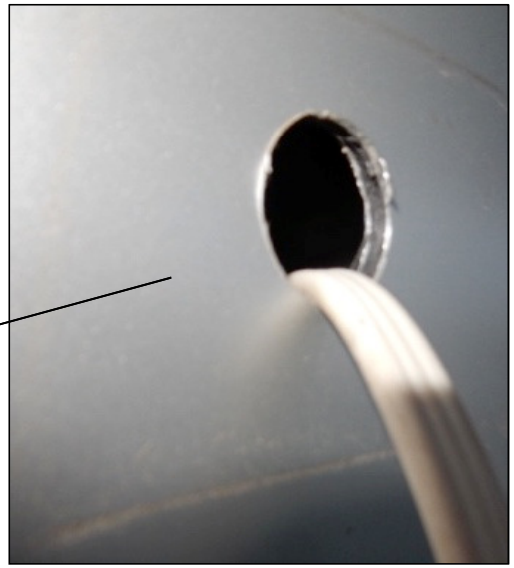
Prahran residents fear fire risk over flame-coloured facade

Bhakthi Puvanenthiran

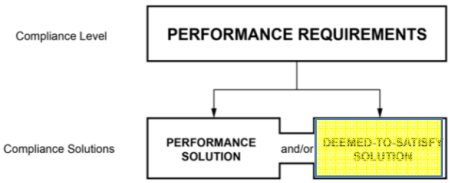
The atmosphere in the lift every morning changed after the signs went up. Neighbours would look at each other sideways, worried

Is Vitrabond® PE an attachment ???



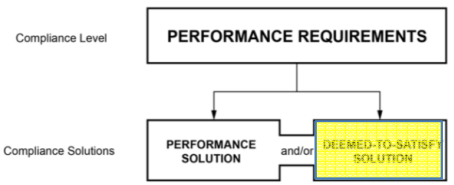


Note: The cement sheet may be used where a non-combustible element is required (BCA Specification C1.10)



Is the Vitrabond® PE an attachment ???

- The cement sheet has excellent resistance to water penetration and high wind loads, and is suitable for exposed applications.
- Therefore the Vitrabond® PE can be viewed as an attachment.

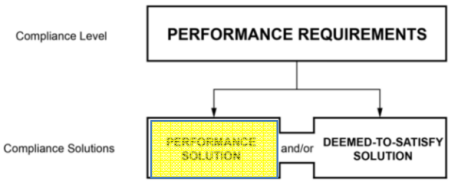


Is the cladding compliant?

- In this particular case the FER does not allow the use of combustible construction as sprinklers are omitted from the balcony

	such frames shall be not less than 20mm.
2.	Non-combustible construction shall enclose switchboards.
3.	Apartment balconies may be constructed of non-combustible materials in lieu of construction having the prescribed FRL subject to maintaining building sprinkler protection throughout internal apartment areas.
4.	Where kitchen exhaust facilities are to be provided in shafts they are to be constructed of materials capable of achieving FRL -/60/60 throughout the length of the shaft. Kitchen exhausts from apartments entering/penetrating such shafts shall be

	as specified in Section 9.3). A single monitored sprinkler isolation valve is also to be provided to serve both hydraulic circuit with remote test valves and switches reticulated back to the stairway.
6.	Sprinkler spacing arrangement to ensure full floor coverage is maintained throughout the residential component as required. Unless otherwise noted, external areas (e.g. balconies, eaves, overhangs etc.), which comprise non-combustible construction, need not be sprinklered.
7.	Concealed space sprinkler protection to be provided in accordance with AS 2118.1.
8.	The sprinkler system is to be sub-divided into isolation zones per floor for floors above ground level. In the case of the



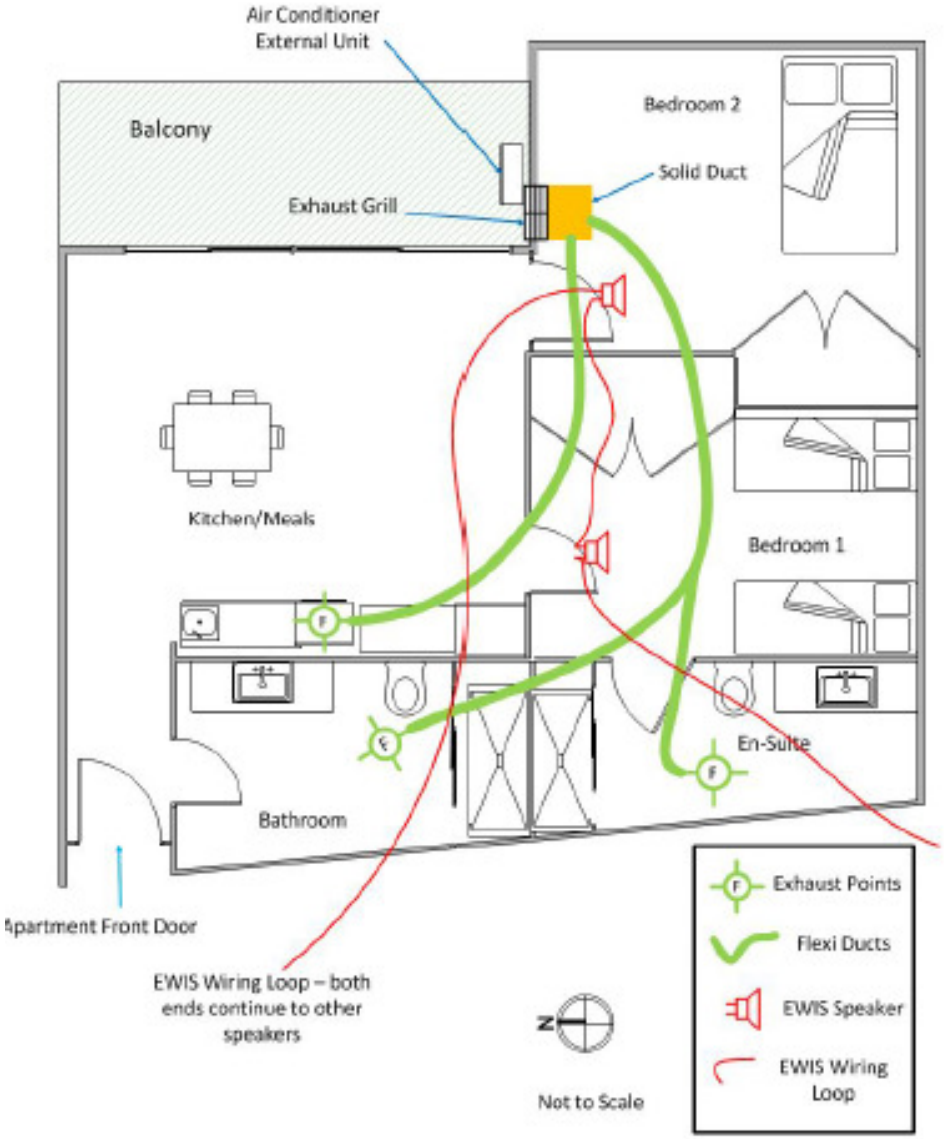
Forget the BCA

- Let’s look at the real problem

The balcony attachment

- Above the ACP panel is the grill for the bathroom and kitchen exhausts.

Fire spread - Lacrosse


Air Conditioner
External Unit
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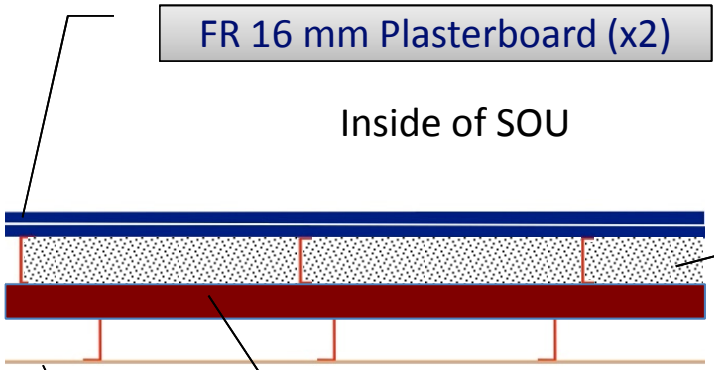
Exhaust Grill
Bedroom 2
Solid Duct
Kitchen/Meals
Bedroom 1
En-Suite
Bathroom
Apartment Front Door
EWIS Wiring Loop – both ends continue to other speakers
N
Not to Scale
Exhaust Points
Flexi Ducts
EWIS Speaker
EWIS Wiring Loop

Is it a real problem?

- It is non-compliant from a DtS viewpoint
- It is non-compliant from a performance viewpoint

It is non-compliant

External Wall



PIR Panel
is FR, but it is
combustible

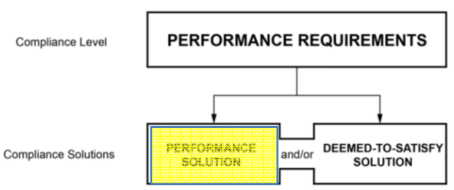
External Wall

- Even if the Vitrabond is an attachment, the PIR is part of the wall
- The PIR is combustible
- Therefore the wall is not compliant with the DtS provisions.
- Learning from Grenfell, it is non-compliant from a performance viewpoint.

Key points

- Who is going to rectify it?
- Why is it taking so long to rectify?
- Who is going to pay?
- Who is responsible?

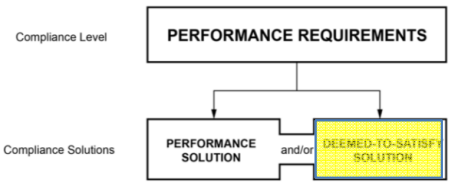
How will this be rectified?



CASE 2: Façade is an Attachment

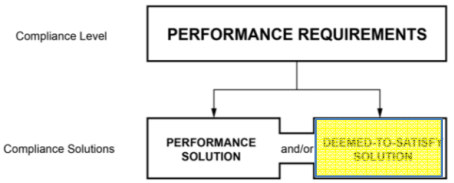
- DtS: Specification C1.1

(a) A *combustible* material may be used as a finish or lining to a wall or roof, or in a sign, sunscreen or blind, awning, or other attachment to a building element which has the *required* FRL if—



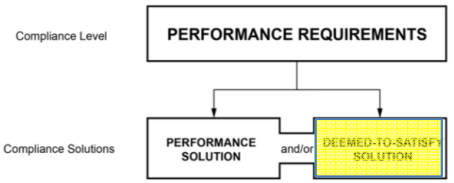
Properties

- Exempted under C1.10 or complies with specification C1.10
  - Simple to determine with the right information (certificate)



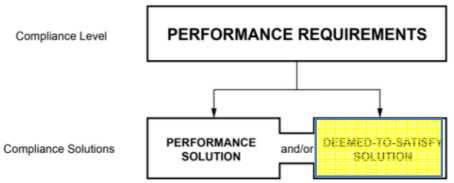
Fire Hazard Property

- Specification C1.10, Class 2, exempts things such as:
  - Plaster, cement render, concrete, terrazzo, ceramic tile or the like
  - Fire protective covering (such as 13 mm plasterboard)
  - Timber window framing
  - Paint
  - Any other material that does not significantly increase the hazards of fire.



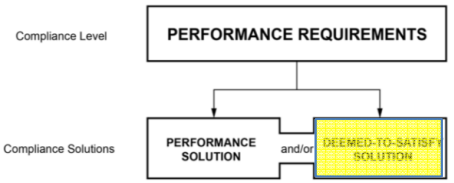
Properties

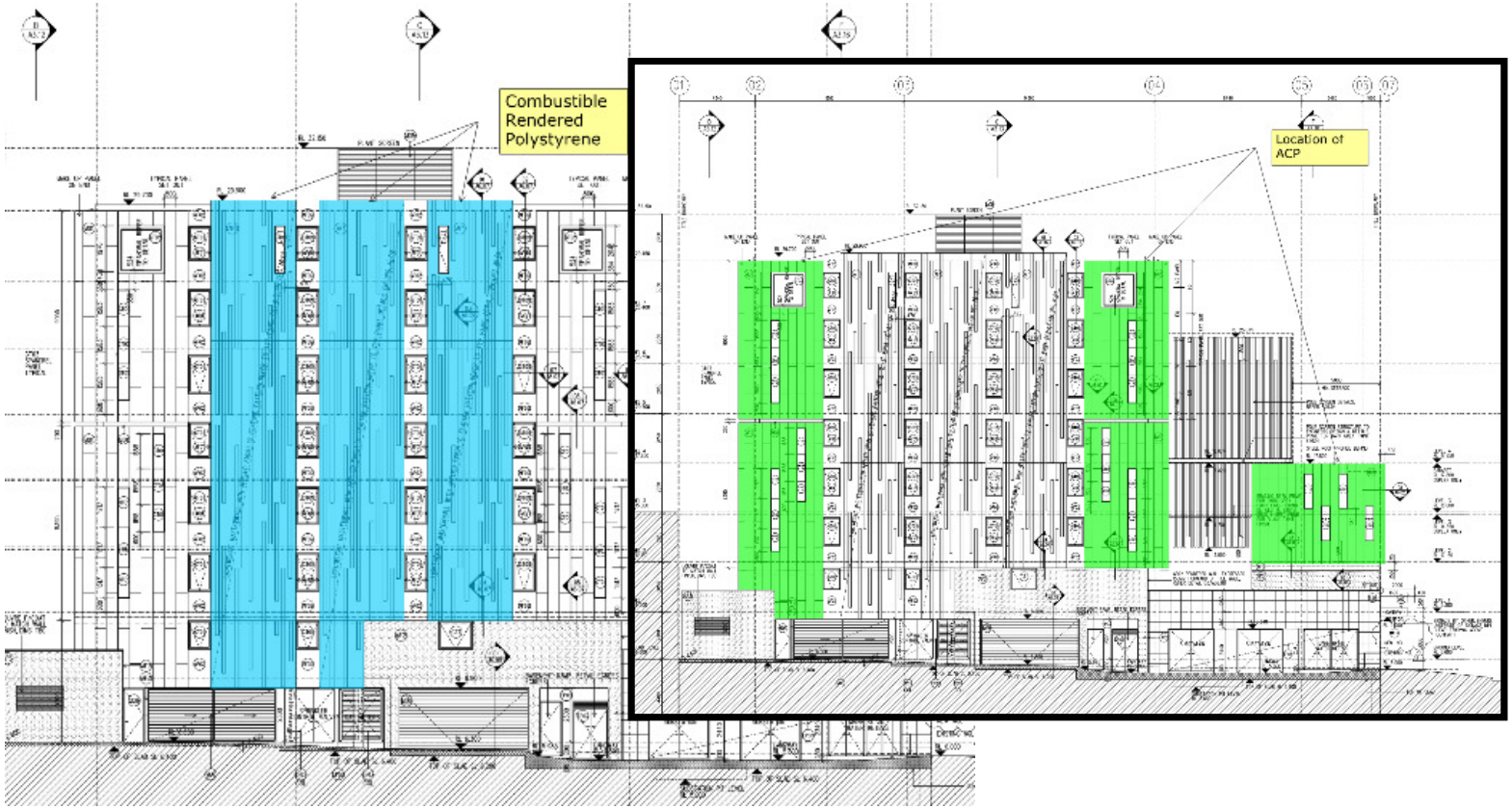
- **Make an exit unusable**
  - Attachment's location wrt the exit
  - Flame spread and radiant heat flux to the exit
  - Dripping if over an exit
- Requires engineering evaluation

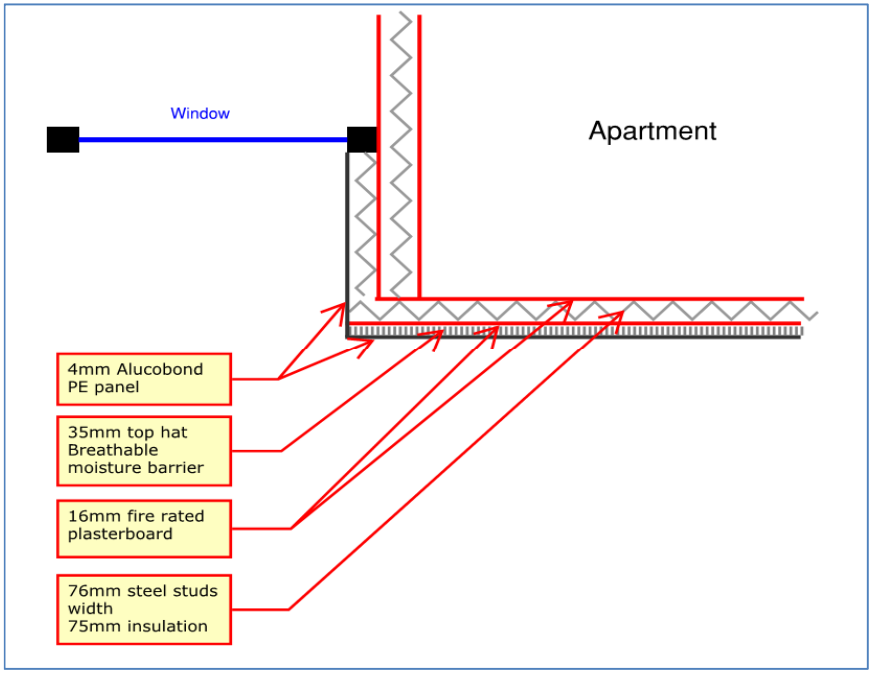


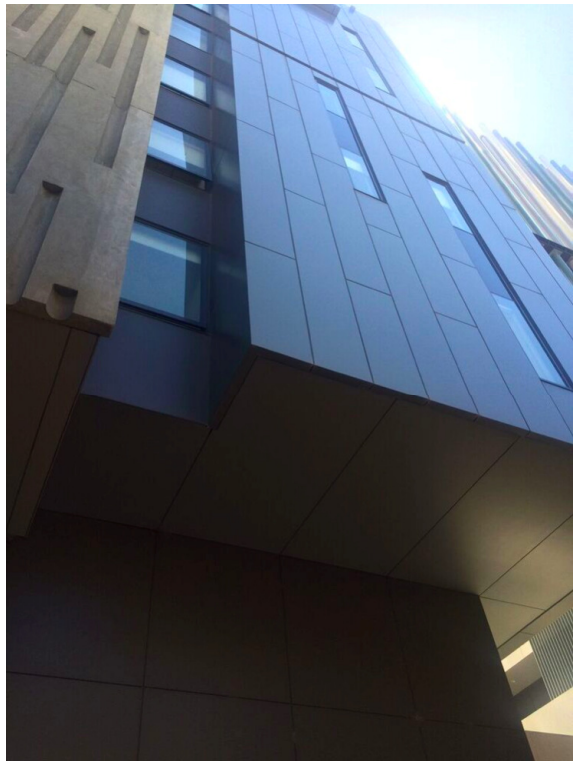
Properties

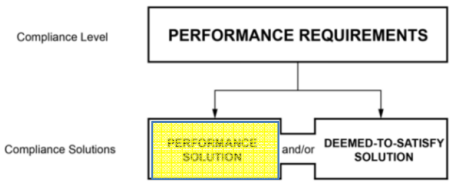
- Does not constitute an **undue risk of fire spread** via the façade
  - Need to know fire spread properties based on expected fire scenarios
- Requires engineering evaluation

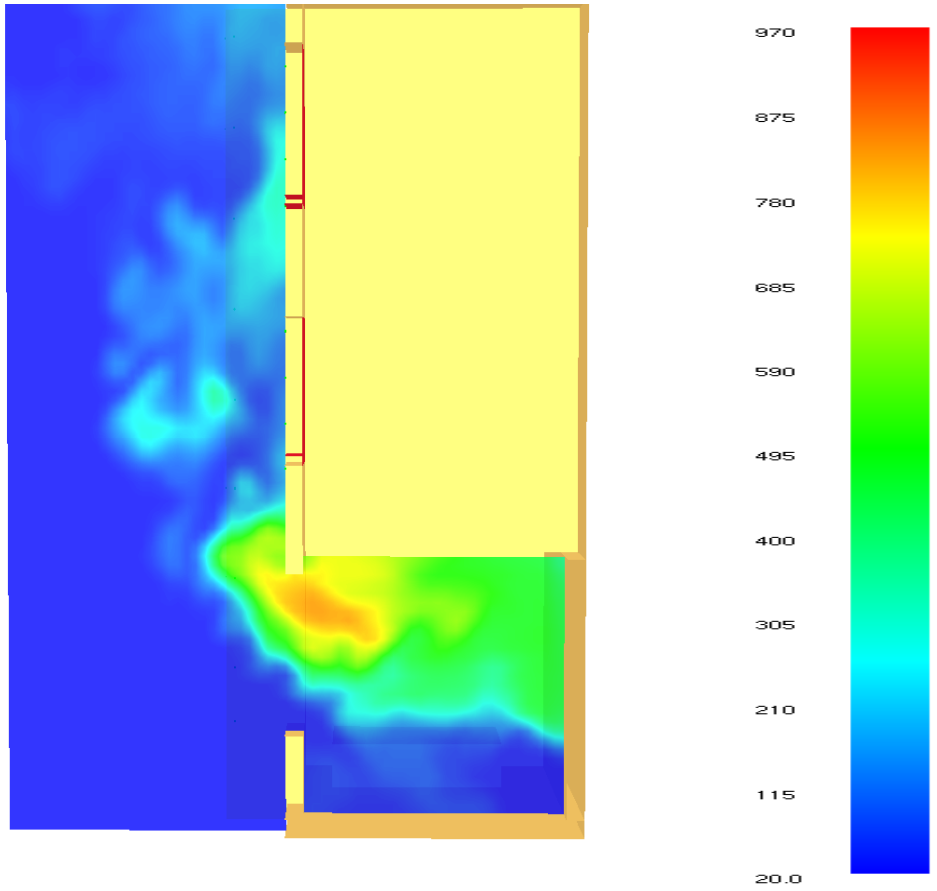


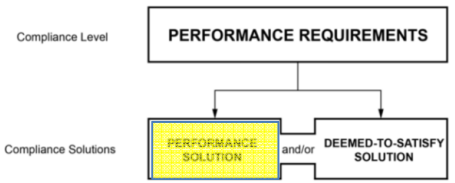

Combustible
Rendered
Polystyrene
Location of
ACP

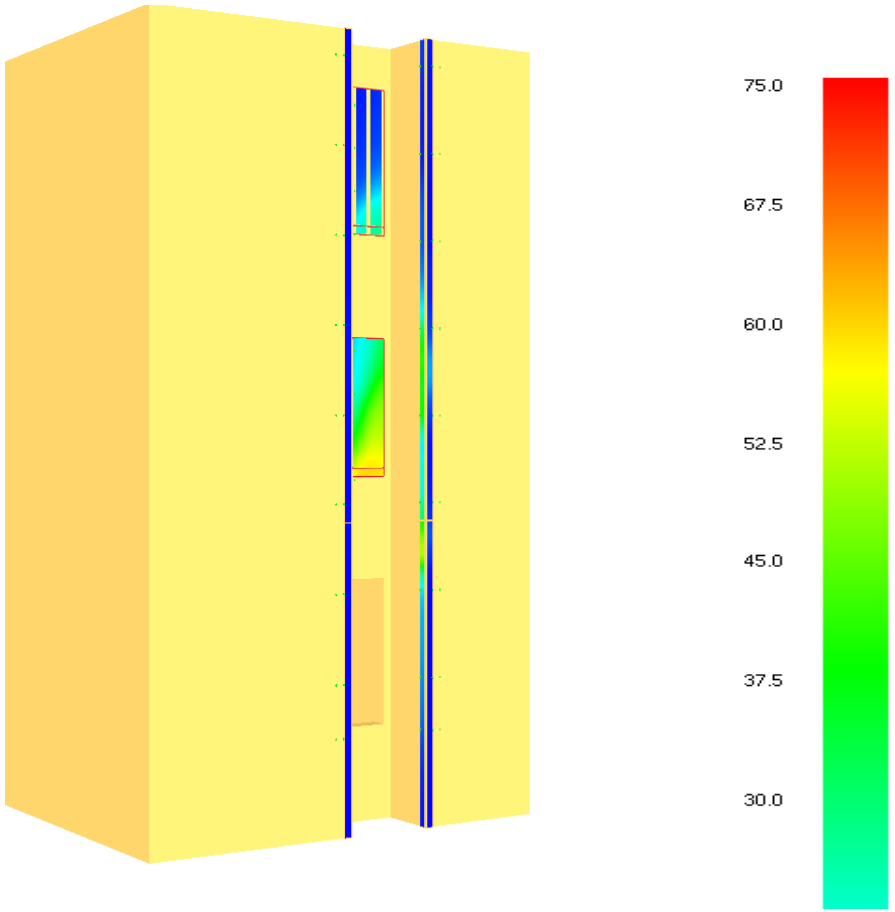

Window
Apartment
4mm Alucobond PE panel
35mm top hat Breathable moisture barrier
16mm fire rated plasterboard
76mm steel studs width 75mm insulation

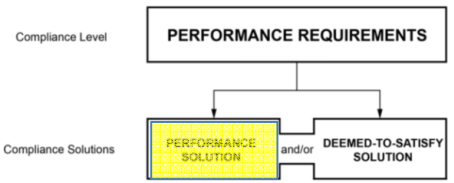


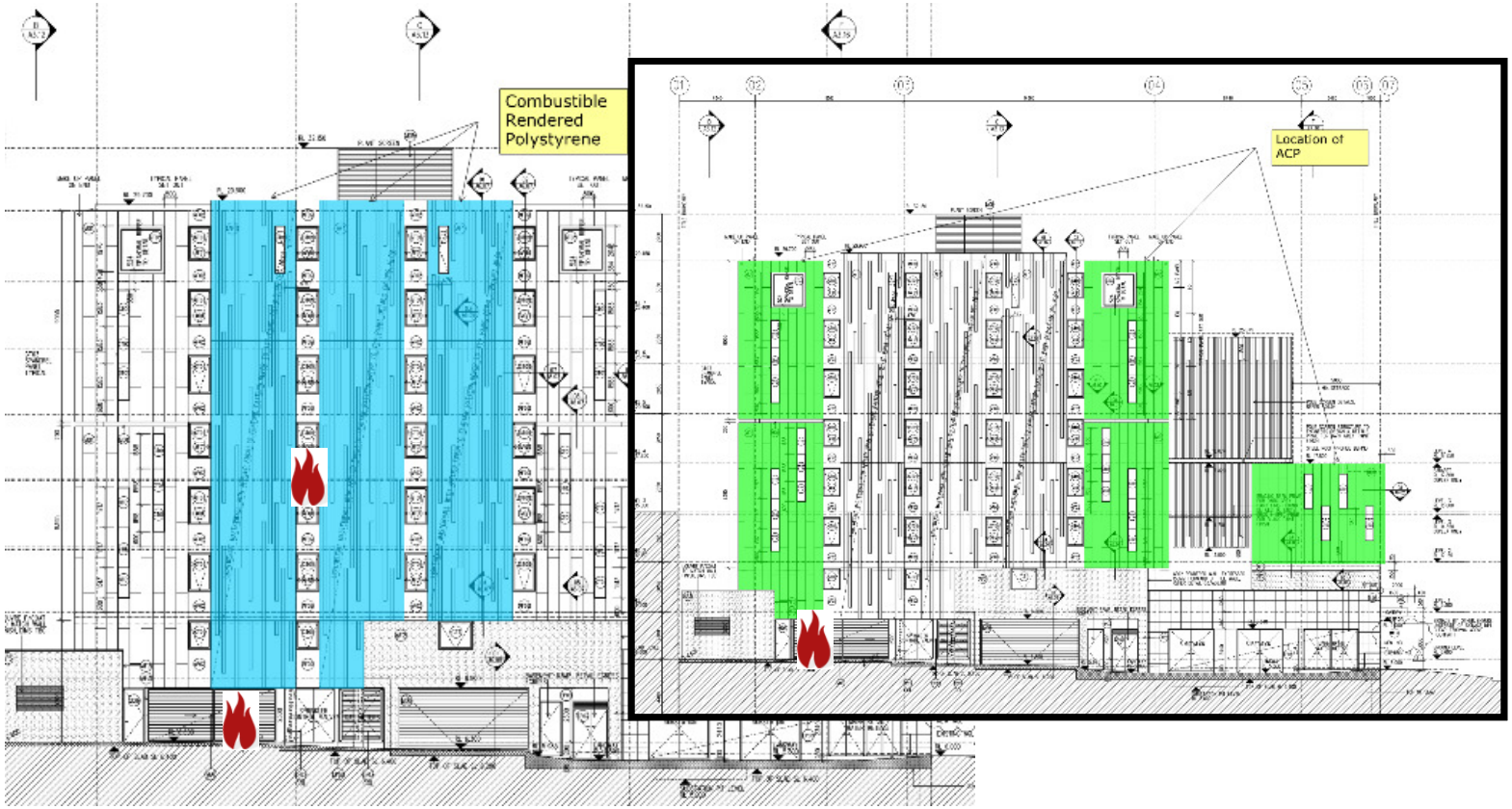

Compliance Level
PERFORMANCE REQUIREMENTS
Compliance Solutions
PERFORMANCE SOLUTION
and/or
DEEMED-TO-SATISFY SOLUTION

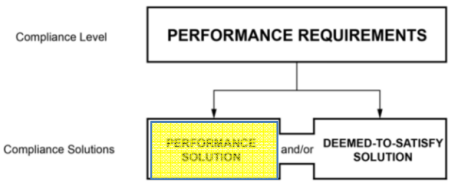

970
875
780
685
590
495
400
305
210
115
20.0


Compliance Level
PERFORMANCE REQUIREMENTS
Compliance Solutions
PERFORMANCE SOLUTION
and/or
DEEMED-TO-SATISFY SOLUTION

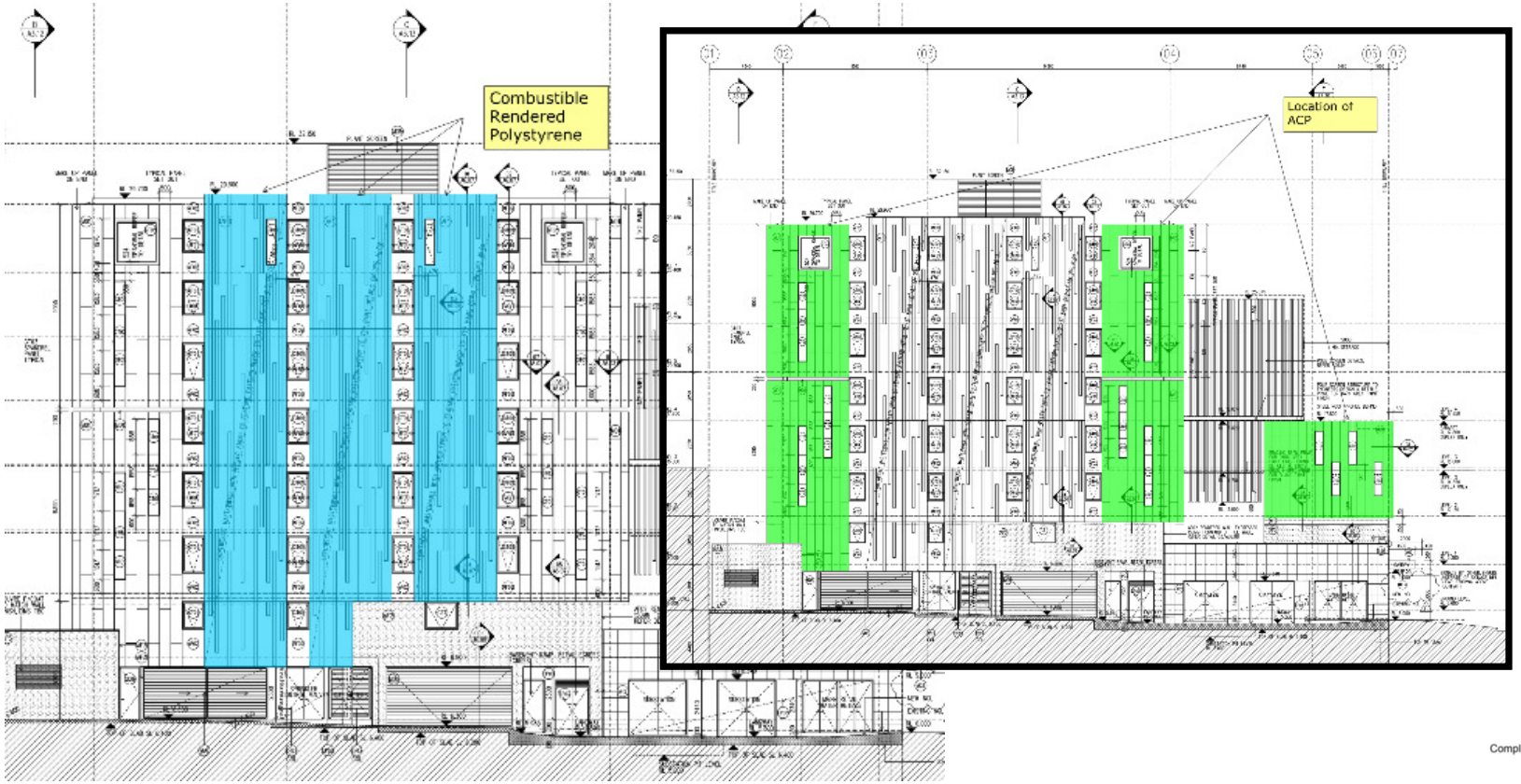

75.0
67.5
60.0
52.5
45.0
37.5
30.0

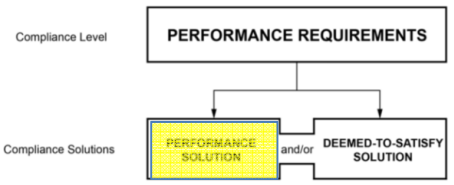

Compliance Level
PERFORMANCE REQUIREMENTS
Compliance Solutions
PERFORMANCE SOLUTION
and/or
DEEMED-TO-SATISFY SOLUTION


Combustible
Rendered
Polystyrene
Location of
ACP


Compliance Level
PERFORMANCE REQUIREMENTS
Compliance Solutions
PERFORMANCE SOLUTION
and/or
DEEMED-TO-SATISFY SOLUTION

How are we going to fix it?





When do we fix it?

- After the Australian Grenfell?
  - But didn’t we already have Lacrosse?

But who is going to pay?

- Designers: Insurance
- Certifiers: Insurance
- Home owners with or without government assistance

Solutions

- Identify the problem
  - Use an approach like the VBA is implementing
- Develop the expertise to fix and prevent
  - Licensed engineers
  - Proper education programs (not training that is not at an international level)
  - State of the art research
  - Certifiers that use experts
- So massive, we need Govt to step in with $$$

Lessons Learned from the Non-Compliant Façade Fiasco

Jonathan Barnett
M: 0467 508 868
E: jonathan@redfireengineers.com.au