

## Product-Specific NCC Performance Solutions and Part A2 Compliance Pathways

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### The case study of external cladding

(the first sneeze of a greater regulatory failure virus)

### After the Lacrosse fire; Initial reaction by industry and regulators



# Initial regulator response to suggestions of systemic failure



### Initial industry response



# Subsequent industry response



# Then the 'blame game' started



# After the Grenfell Tower fire



Regulators are still unsure of the size and scale of the problem, what are the compliance standards and how to act



Communication to industry and the community from regulators remains inconsistent and unclear



## Community view of industry and government regulators



#### Current positions of industry and regulators, the 'Mexican stand-off'

State & Territory Governments



Federal Government

### Where are we now?

Here's another fine mess you've gotten me into





## 1. The law

BUILDING REGULATORY REFORM SUMMIT 2018



#### National Construction Code 2016 (Building Code of Australia)



#### National Construction Code 2016 (Building Code of Australia)



- There are not Deemed-to-Satisfy Provisions for every NCC performance requirement, so almost every building project will require, by law, some performance solutions.
- □ Since 1997 this has not been done by designers, or requested by approval bodies.





- A significant part of the building industry does not understand that the DtS provisions <u>are not mandatory</u>, unless legitimised (chosen by the owner) as part of a building permit.
- If these DtS Provisions are not <u>chosen</u> by the owner, then approval as a <u>performance solution</u>, and often consultation and agreement from relevant authorities is required by the owner (through their designer or builder).
  This is a site specific performance solution.



- This methodology is what created the relatively new design professions of fire safety, energy efficiency and disability access consultants for <u>site</u> <u>specific performance solutions.</u>
- Weatherproofing consultants will probably be next because there are no DtS provisions for walls and balconies to be weatherproof (dry and not unhealthy) for non-domestic buildings, and no DtS provisions for plastic or foam-based cladding systems <u>for any building</u>.

### Australia's complex cladding problem

# *"For every complex problem there is a simple solution that is neat, convenient and wrong."*

H.L. Mencken (American journalist & scholar)



#### Construction of a building (materials) BCA Volume One

## PART A2 ACCEPTANCE OF DESIGN AND CONSTRUCTION

#### A2.1 Suitability

(a) Every part of a building must be constructed in an appropriate manner to achieve the requirements of the NCC, using materials, products, forms of construction and designs being fit for the purpose for which they are intended.



#### Construction of a building (materials) BCA Volume Two

#### **GENERAL REQUIREMENTS**

## PART 1.2 ACCEPTANCE OF DESIGN AND CONSTRUCTION

#### 1.2.1 Suitability of materials

Every part of a building must be constructed in an appropriate manner to achieve the requirements of the *Housing Provisions*, using materials that are fit for the purpose for which they are intended.

## 2. The problem

Part a.

## What is the external cladding combustibility issue?



#### History of building fires and cladding

- Building codes around the world generally require external walls of multistorey buildings (except homes) to be non-combustible or of 'limited combustibility'.
- In Westminster legal systems countries (Australia, Britain, Canada, New Zealand etc.) this goes back to the legislation introduced after the great fire of London on September 2<sup>nd</sup> 1666.
- King Charles II proclaimed that there be minimum widths of roads, buildings were to be erected largely from brick and stone instead of timber, and limits were placed on how much wood (timber) could be used on the outside of a building.

#### History of building fires and cladding

- Over the past few years new innovative products have become commonly used. Most of these are made from oil-based materials and are combustible plastics (foams).
- They are often used because of a need to improve thermal or acoustic efficiency of the external façade of a building.
- In Australia use of these products was exacerbated by energy efficiency requirements in the NCC.
- There have since been many serious fires around the world, and they are continuing.
- □ Non-compliance with building codes is a significant factor in these fires.



### Selangor Malaysia [February 2018]



#### EPS Cladding

#### What are ACP's or ACM's ?

#### Aluminium composite panel Flammable core

**Insulating core** 2-5mm thick, 100% polyethylene Heat from a fire will conduct quickly to the core through thin alumimium

Surfaces 0.5mm thick aluminium skin Core loses ability to bind, causing outer skins to deform and delaminate



#### What are ACP's or ACM's ?

Calorific value of fuel is the total quantity of heat liberated by <u>complete combustion</u> of a unit mass (or volume) of the fuel

Type of plastic	Elemental composition, %D.M.						Heating value, MJ/kg	Fuel	MJ/kg
								Hydrogen	141.9
	с	н	0	Ν	s	СІ	Qid	Gasoline	47
PE	81.89	12.37	0.00	0.46	1.92	0.97	41.80	Diesel	45
PP	68.89	9.13	14.61	1.82	1.29	1.24	30 90	Ethanol	29.8
PVC	37.56	4.94	44.00	0.42	0.71	4.43	13.69	Propane	49.9
PA	65.39	10.38	10.54	8.49	1.41	0.43	36.76	Butano	40.2
PS	88.48	8.36	0.00	0.50	1.12	0.16	38.97	Dutane	
PET	56.40	5.68	33.10	0.44	0.80	1.43	21.81	Wood	15
Average	59.18	7.94	23.68	1.05	1.16	2.37	26.41	Coal	15-27
Bituminous coal*	66.90	4.14	9.94	1.17	0.80	0.33	26.00	Natural Gas	54

#### What is Expanded Polystyrene (EPS) ?



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#### What is Expanded Polystyrene (EPS) ?

Benefits of Foamed Polystyrene (British Plastics Federation)

- Lightweight: EPS is made of 98% air
- Insulating: The thermal insulating properties of EPS acts as an insulator keeping products cold or warm depending on the application.
- Waterproof: EPS and XPS is insoluble and non-hygroscopic.
- Low Carbon Impacts: Clean manufacturing technologies mean minimal energy and water inputs with no production waste.
- End of Life;
  - EPS, sourced from packaging waste, is an ideal source material for Energy from Waste (EfW) schemes.
  - The key benefit of using EPS for EfW is that it has a high calorific value (46,000 kj/kg) not dissimilar to natural gas at 48,000 kj/kg.

http://www.bpf.co.uk/Packaging/Position Statements/Expanded and Extruded Polystyrene Position Statement.aspx#



#### Insulation is a contributing factor



#### Fire March 2017 in Melbourne







#### Compliance with the law is critical

□ A potential outcome of poor design is best described by J. E. Gordon;

- 'Structures are likely to be tested by unusual combinations of events...., although such eventualities ought to be provided for, it may be many years before they actually happen. So <u>an essentially unsafe structure</u> <u>may stand for a long time, simply because it has not been tested</u>'. [From the well-known text for undergraduate Structural Engineering students, *Structures, or why things don't fall down*, by J. E, Gordon, first published 1978].
- So where a building design does not satisfy the law, if everything goes 'to plan' (or the design has not yet been subject to those extreme conditions [tested]) it is easy to believe compliance was achieved and the building is 'acceptable'.
- This is not always true and can place significant risk onto building owners and the public.

## 2. The problem

### Part b. What is the external cladding weatherproofing issue?



#### The problem has occurred in other similar jurisdictions

- New Zealand, there are so many cases the NZ Courts have a 'Leaky Buildings List' and the media reports are numerous; <u>https://en.wikipedia.org/wiki/Leaky homes crisis, http://www.nzherald.co.nz/business/news/article.cfm?c\_id=3&objectid=1 1718273, http://www.nzherald.co.nz/business/news/article.cfm?c\_id=3&objectid=11743607, <u>https://www.courtsofnz.govt.nz/the-courts/high-court/high-court-lists/leaky-building-list-Auckland,</u> <u>https://www.lawsociety.org.nz/news-and-communications/latest-news/news/high-court-gives-go-ahead-for-leaky-buildingsclass-action.</u></u>
- Typically NZ Councils are being sued for significant amounts, most recently in the High Court where a Council had to pay \$25m in rectification costs to an owners corporation.
- □ The Council inherited the building permit file under amalgamation.

#### The problem has occurred in other similar jurisdictions

- The New Zealand crisis occurred a few years after a similar problem in Canada (British Columbia), see <u>https://en.wikipedia.org/wiki/Leaky\_condo\_crisis</u>.
- In NZ, building permits are issued by Councils, so the National Government intervened with a funded repair scheme to support local government from economic disaster.

#### The problem is here

# Some recent audit outcomes for 6 buildings

#### All do not comply with the BCA

(Class 2 buildings, 2-5 storeys tall, less than 7 years old)

























#### Here's what the Microbiology expert said

- Mould/yeast/fungi are not an 'infestation' per se, instead they are a <u>direct</u> <u>consequence of water ingress and damage.</u>
- Some people are at significantly raised risk of immediate harm on exposure to fungal allergens, such as those prone to asthma attacks.
- □ Mould spores <u>can remain viable for several years</u> at least.
- Infection with fungi is notably more difficult to treat than common bacterial infections given that the antibiotic drugs used on bacterial infections do not act on fungi, and anti-fungal drugs are notably more toxic to humans.

#### What is the size of the problem?

- □ The most recent cost estimates to the NZ Economy are \$11b \$20 billion.
- If we extrapolate that figure by population to Australia (a crude measure admittedly, but useful for comparative purposes), then the construction problem alone in Australia could be over 100 billion dollars.
- By comparison the Australian 'cost savings' estimates from building regulatory reform range between \$280-\$770 p.a. over 20 years = \$5.6 b – \$15.4 b)
- In New Zealand the post-construction problem still continues and the subsequent ongoing health cost of leaky buildings is estimated to be 20-40 billion dollars (greater than the cost of the Christchurch earthquake).
- The economic loss to consumers is also continuing as experts conclude that property prices of these 'leaky' buildings once repaired are reduced by up to 25%.

#### What is the size of the problem?

- By comparison, a single devastating fire event could raise this issue to another level, for example the Victorian 'black Saturday' bushfires were estimated by the Royal Commission to have had a 4.4 billion dollar cost to Victoria.
- A similar event, instead caused by regulatory failure could have a significant impact on society and public confidence, and lead the economy into recession.
- But any attempt to address these issues will also drive up the cost of construction because a significant number of buildings are being constructed at artificially reduced cost because of non-compliance with the NCC.

#### What is the size of the problem?

- No jurisdiction has yet completely understood the size of the problem, or how to fix it, but in Victoria alone, the number of non-compliant buildings is estimated to be at least 1,400.
- At a conservative estimate of 1-2 million dollars to fix each building (and the estimate to fix the Lacrosse building in Docklands is 15 million dollars), this is already at least a 2 3 billion dollar problem for Victoria.
- □ Single domestic dwellings (houses) are excluded from the current reviews.
- There are well in excess of 100,000 new houses built in Australia each year and, for example, EPS is a dominant cladding material.
- If we extrapolate from the NZ experience, the total cost (building defects, public heath and stigma or reputational damage) could easily exceed 200 billion dollars.
- None of this includes the impact of a major life loss fire on society in general.

#### The over-arching policy challenges

- Can we develop a common building industry language (our linguafranca).
- Are our buildings safe <u>because of</u> our building codes, or <u>in spite of</u> our building codes (develop an evidence, and data based strategic regulatory framework in an era of 'anti-science').
- How can we effectively remove the 'unnecessary red-tape' and increase housing affordability, but leave the 'necessary red-tape'.
- Should we regulate the coal-face (sub-trades) in an era of 'hands-off' builders.
- Can we adjust to a global economy and market for materials and products.

## 4. The solution



#### The practical solution

The solution is complex, but has five key themes:

- Model national building acts across all jurisdictions: including national registration/licensing/accreditation, product compliance and administrative procedures;
- better education and training across the entire building industry;
- Increased, targeted and relevant accountability, auditing and enforcement of buildings and practitioners for compliance with building regulations;
- decisive action on unsafe buildings and clear policy on non-compliant buildings; and
- increased government funding for research into appropriate technical standards so that building regulations can keep pace with a rapidly increasing level of innovative building products and construction methods.

## Thank you

