Safety awareness of firefighters and their perception of fire risks in cladding fires

Research forum / **2019**

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Australian Government
Department of Industry, Innovation and Science

Business Cooperative Research Centres Programme

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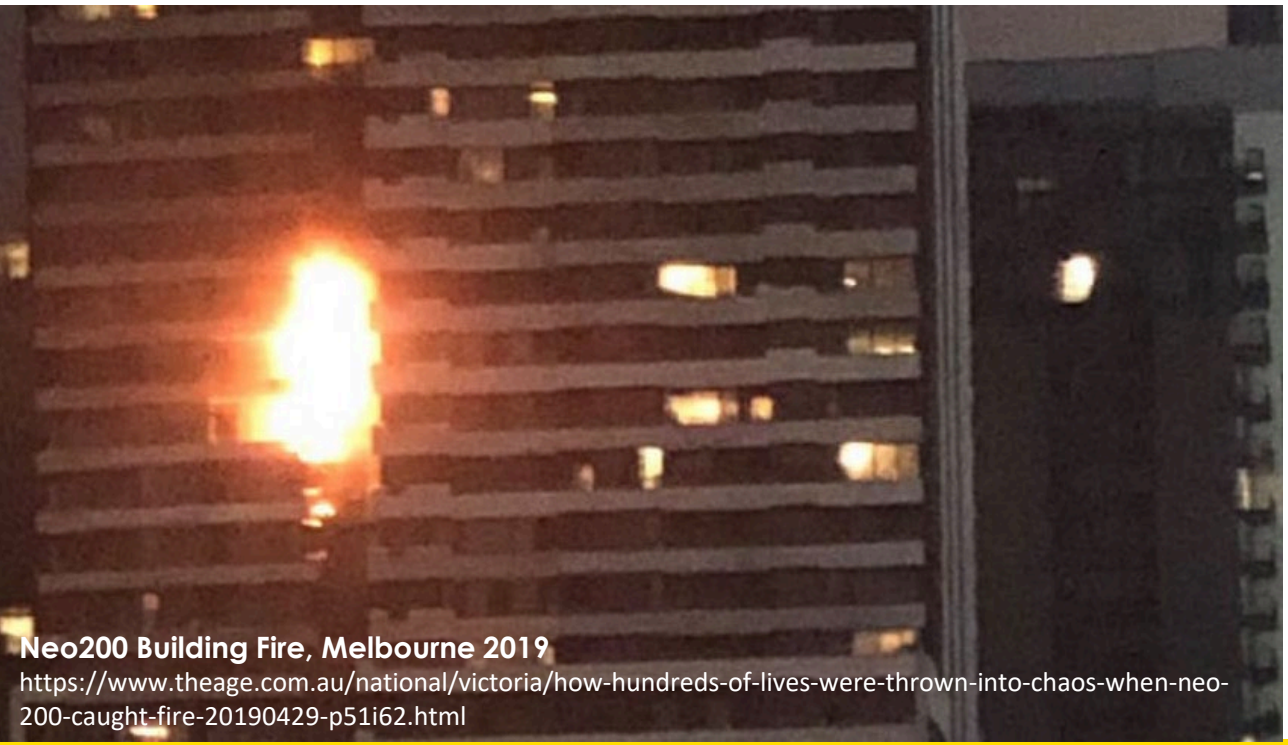


Neo200 Building Fire, Melbourne 2019
https://www.theage.com.au/national/victoria/how-hundreds-of-lives-were-thrown-into-chaos-when-neo-200-caught-fire-20190429-p51i62.html

Background

- The increased frequency of façade fires in high-rise buildings have significantly raised global awareness in the combustibility of high-performance polymer-based building materials.
- There remains a non-compliance issue with these rapidly evolving materials which have demonstrated to be very difficult to regulate.
- There is an **urgent need for a cladding replacement program** that faces many challenges
- Several hundred buildings in Melbourne and Sydney have been identified and residents are anxious and of heightened alert

Cladding Fire Risks

- The fires in the Grenfell Tower, and other high-rise buildings in Australia and internationally have exposed many of the flaws and negligence in the current building regulations and fire safety protocols.

- All the incidents have all involved composite panels (ACPs), which contain highly flammable core material:
  - Polyethylene (PE)
  - polyurethane (PUR),
  - polystyrene (EPS),
  - polyisocyanurate (PIR)

- All cases exhibit the following characteristics:
  - Rapid surface propagation
  - Flame spread through cavities within the exterior wall system
  - Fire re-entry on multiple levels

Grenfell Tower Fire, 2017

Current state on combustible claddings

- The cladding task force for each state released statistics on their audit for non-compliant building materials in 2018.
    - Victoria, in 1369 buildings, 770 were referred to an expert panel for further determination and, of those, **44** were placed in a higher risk category [1].
    - New South Wales, 1184 buildings were identified to have aluminium cladding, including **58** high-rise residential buildings necessitating further investigation [2].

- Legislation and building codes have yet to catch up with the requirements for assessing the fire risks involved in these buildings.
- Urgent need to resolve the present fire risks of existing building products and develop economically viable solutions.
- **It is also a massive risks to first responders such as firefighters during the operation of fire events.**

[1] https://www.planning.vic.gov.au/__data/assets/pdf_file/0029/394733/VCT-Taskforce-Update-October-2018.pdf
[2] Czoch, K.; Shukla, C. Australia: Non-Compliant Cladding in Construction of Buildings—A Year in Review

Survey on Safety awareness of Fire Fighters and their perception of fire risks in cladding fires

- An internet survey was conducted to investigate the fire risk perception of firefighters associated with combustible cladding material.
- The **aim** is to provide a greater understanding of the attitudes, beliefs and perception of firefighters toward fire risks associated with combustible cladding materials.
- It was approved by the UNSW Human Research Ethics Advisory Panel (approval number HC180884).
- The survey was conducted on March 20 - May 20, 2019.
- It was completed by a total of 439 participants consisting of firefighters from major state and rural fire agencies around Australia.

Questionnaire

- The survey consist of an 18-item questionnaire.
- It can be subdivided into four major parts to investigate different aspects of risks:
  - **demographics**
  - **Risk awareness and identification**
  - **Perceived risk**
  - **Risk mitigating behaviour**
- It is distributed through Qualtrics web-based survey tool.

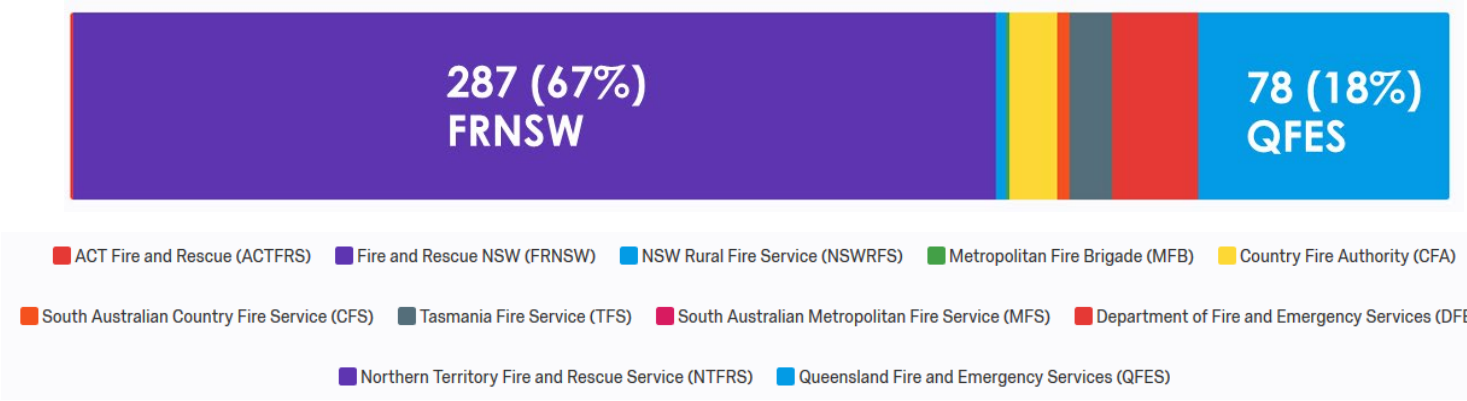
An **18-item** questionnaire was constructed to investigate the risk perception associated with highly combustible cladding materials.

It can be subdivided into four major parts:

- **Demographics**
  - participant's fire agency, experience and rank
- **Risk awareness and identification**
  - Can they identify buildings at risk?
  - Are they aware of the risks related to non-compliant building products, especially those involving combustible cladding products?
- **Perceived risk**
  - How likely do they think it is for them to respond to such a fire?
  - How dangerous/severe do they feel are the consequences?
  - Do they have such buildings in their zone?
  - What are their greatest concerns in such an event?
  - How willing are they to put their own safety at risk to save lives? property?
  - How confident are they in being able to manage an incident of this kind?
- **Risk mitigating behaviour**
  - How prepared are they for such an event?
  - Have they prepared PIPs (Pre-incident planning) for cladded buildings in their area?
  - Have they performed HFSC (Home Fire Safety Checklist) in affected buildings or delivered any Community Engagement educational programs to the community?

Participants

- 439 participants which includes 287 (66.90%) from Fire and Rescue New South Wales (FRNSW) and 78 (18.18%) from Queensland Fire and Emergency Services (QFES) and 64 (14.92%) from other Fire Services in Australia.
- Additional demographic questions were asked specifically for FRNSW participants. There is a good distribution of different ranking officers and zone locations.

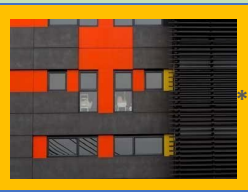


Rank	%	Count	Zone / Response Area	%	Count
Recruit firefighter	0.35%	1	Metropolitan East	35.18%	95
Firefighter to Leading Firefighter	41.61%	119	Metropolitan South	11.11%	30
Station Officer or above	32.52%	93	Metropolitan North	12.96%	35
Retained firefighter	15.38%	44	Metropolitan West	18.52%	50
Deputy Captain or above	8.04%	23	Regional North	7.77%	21
Other - Please specify	2.10%	6	Regional West	5.55%	15
			Regional South	8.88%	24

Risk Awareness and Identification

"Participants were asked to identify buildings at risk of combustible cladding from list of images"

- 12 images of building structures of which 6 have aluminium composite panel (ACP) installed
- **Only 3 (0.09%) participants correctly identified all 6 images** without any additional selection in their answer.
- 178 (53.78%) had the correct 6 images in their answer of which 92 (27.79%) selected all 12 images as having ACP.
- Accuracy rate of **58.6%** which is slightly higher than random guess (50%).
- Results suggest there are still difficulty in correctly identifying ACPs.
- Based on the raw selection counts for each image, the participants tend to select images with **reflective smooth surface finish**.

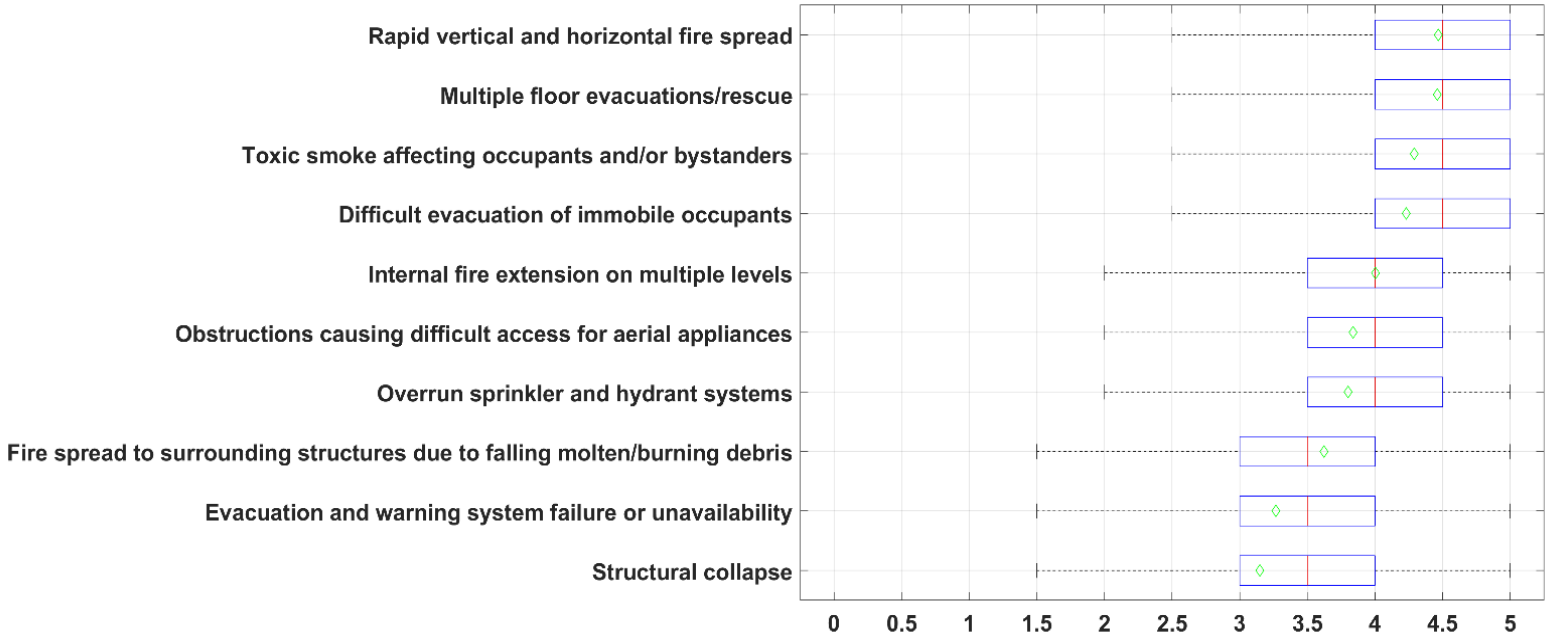
Image	% (count)	Image	%	Image	% (count)
1 *	8.94% (304)	5	5.68% (193)	9	6.12% (208)
2 *	9.62% (327)	6	6.30% (214)	10	8.88% (302)
3	7.09% (241)	7 *	9.86% (335)	11 *	9.62% (327)
4  *	9.77% (332)	8 *	9.80% (333)	12	8.33% (283)

Images with combustible cladding are highlighted in orange and without combustible cladding are highlighted in green

Perceived Risk of critical factors associated with ACP

"Participants were asked to rate the likelihood of occurrence and the consequence for a list of critical factors widely associated with combustible cladding"

- Rating based on 5-point Likert scale (5:Very High, 4: High, 3: Moderate, 2: Minor, 1: Negligible).
- Based on the results, we can see **3 distinct groups of critical factors** ranked based on the firefighters perception.

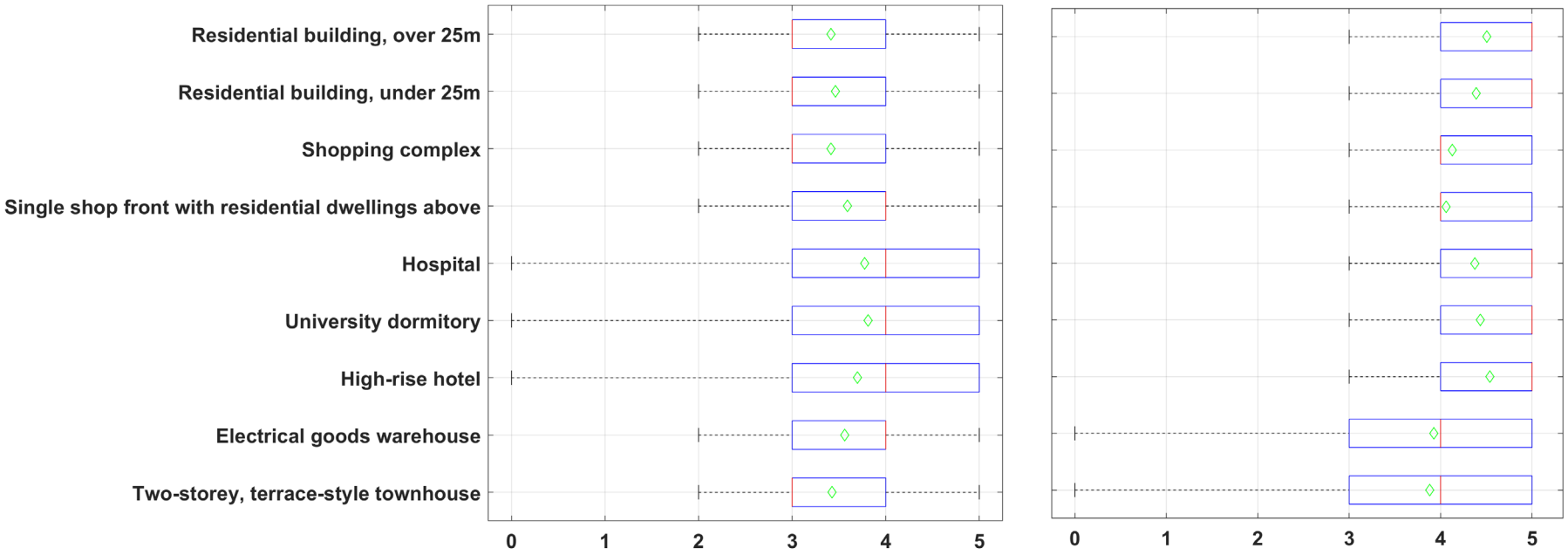


mean	std	var
4.4684	0.7352	0.5405
4.4608	0.7466	0.5574
4.2892	0.8581	0.7364
4.2319	0.8357	0.6983
4.0030	0.8106	0.6571
3.8389	0.8015	0.6424
3.8012	0.9121	0.8320
3.6235	0.8845	0.7823
3.2681	0.8192	0.6711
3.1476	0.9332	0.8709

Perceived Risk for different Building Types

"Participants were asked to rate the consequence(severity) of fires with and without involving ACP for different buildings"

- In a normal fire scenario, **hospital**, **high-rise hotel** and **university dormitory** is ranked highest (based on mean)
- Fires involving ACP resulted in increase rating across all building category.
- The increase in **risk from ACP** is most significant for **Residential Buildings (over and under 25m)** and **High-rise hotels**.

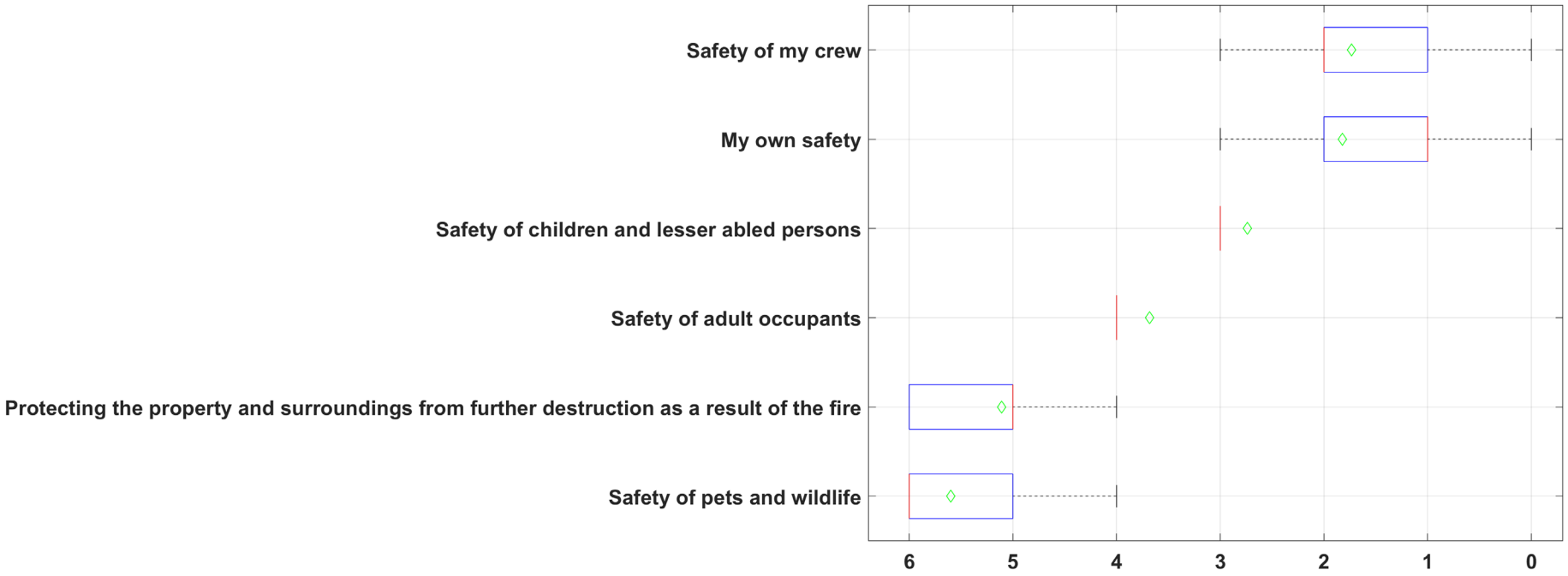


w/o ACP	w/ ACP	diff
3.4157	4.5060	1.0904
3.4608	4.3886	0.9277
3.4157	4.1295	0.7139
3.5904	4.0602	0.4699
3.7741	4.3735	0.5994
3.8133	4.4337	0.6205
3.6988	4.5392	0.8404
3.5602	3.9277	0.3675
3.4247	3.8795	0.4548

Firefighter's priorities in a fire incident

"Participants were asked to rate to rank their priorities in a structural fire, with 1 being your highest priority and 6 being your lowest priority."

- **Top priority** is **safety of crew** and the firefighter's **own safety** both are statistically higher than other options.
- Followed by safety of children and disabled and adult occupants. Note that there is almost no variation in rank 3 and 4 (i.e huge majority of participants ranked them 3 and 4)
- Property and wildlife is lowest priority.



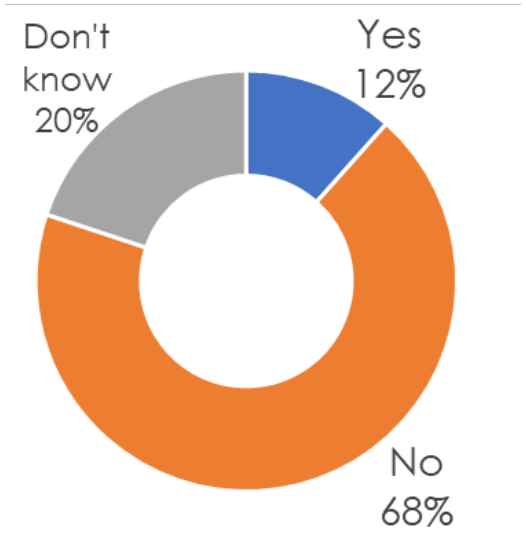
mean	std	var
1.76	0.68	0.47
1.85	1.22	1.5
2.78	0.69	0.47
3.74	0.64	0.41
5.19	0.69	0.47
5.69	0.5	0.25

Readiness for attending incidents involving combustible cladding

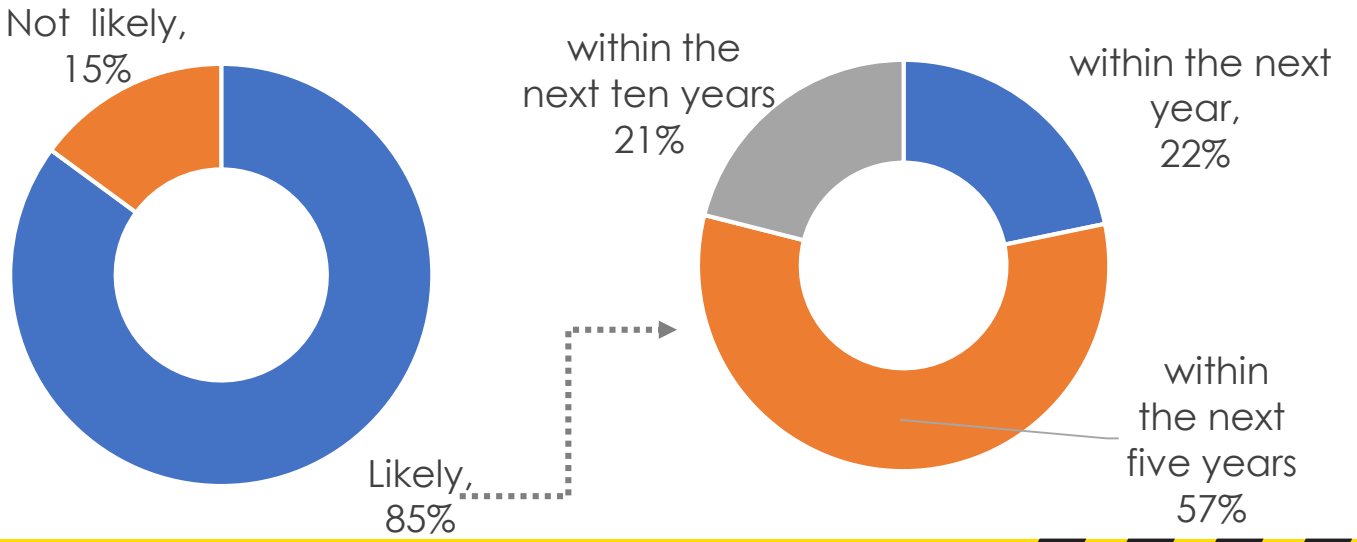
"A series of questions was asked to investigate how firefighters think about their readiness attending fires involving combustible cladding."

- Only **11.57%** of the participants that have attending a fire that involved non-compliant/combustible cladding products

"Have you ever attended a fire that involved non-compliant/combustible cladding products?"

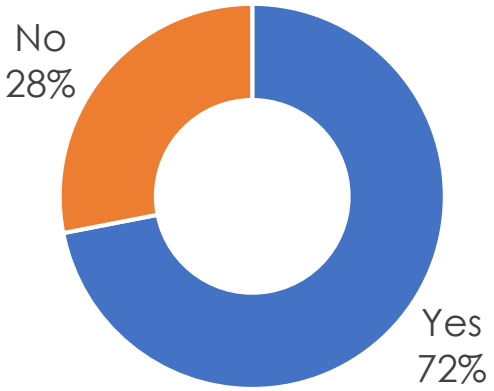


"What do you think is the likelihood that you will attend a fire involving combustible cladding in your zone/response area?"

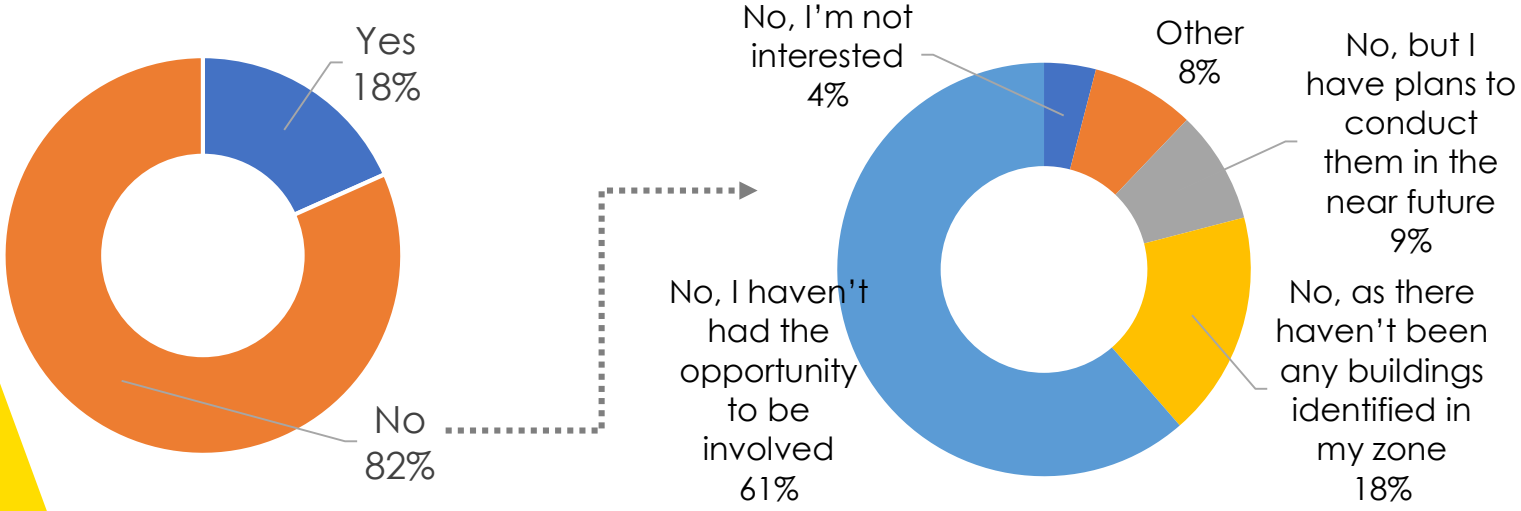


Readiness for attending incidents involving combustible cladding

*"Have you conducted any **pre-incident planning** for buildings with potentially non-compliant cladding in your zone/response area?"*



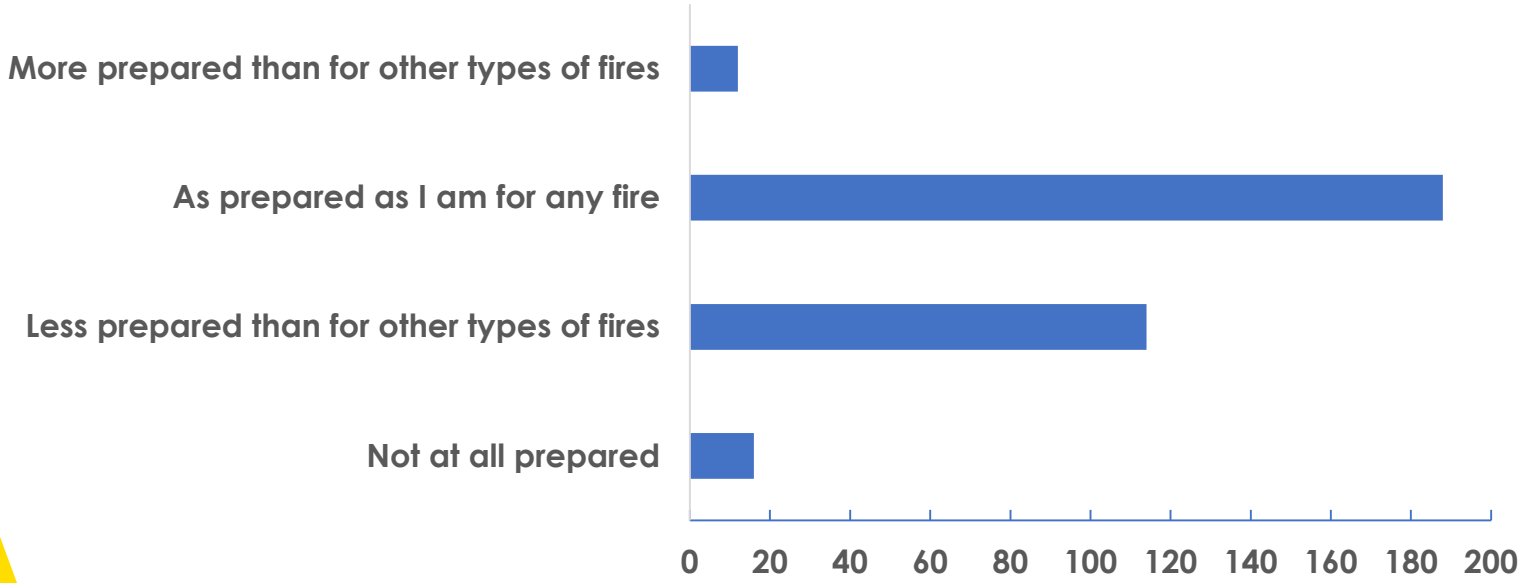
*Have you conducted any **targeted home fire safety checks** and/or delivered any **educational materials** for residents or occupants of buildings with potentially non-compliant cladding in your zone/response area?*



- **72%** of participants said their zone have conducted PIP on buildings with potential combustible
- **Only 18.32% of participants have delivered any educational material for residents and occupants** with potential combustible cladding.

Readiness for attending incidents involving combustible cladding

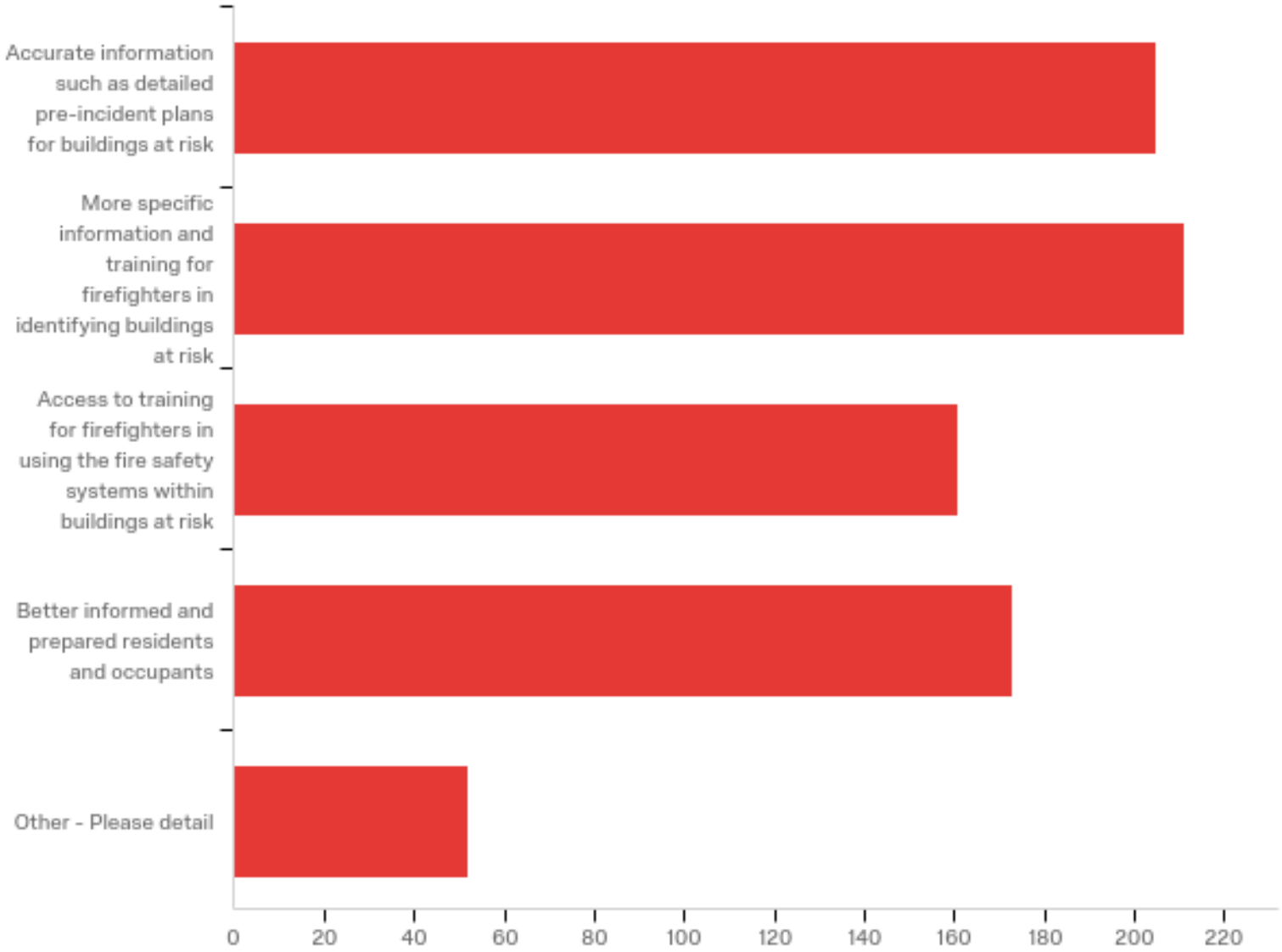
*"How would you **rate your level of preparedness** in attending an incident involving highly combustible cladding?"*



- **3.64%** said they were more prepared than other types of fire
- **56.97%** selected they were just as prepared as for any other fire
- **34.55%** Less prepared than for other types of fires

"The participants were asked to select which options would help them feel more prepared for fire incidents involving combustible cladding."

- There is an equal distribution between the options that were given in the question
- This suggests that all the approaches have equal importance towards improving the readiness.
- Even though majority of participants have conducted PIP for buildings at risk, they still rank accurate information such as PIP as a top priority for improved readiness.
- There is a significant amount of comments to this question that have specifically highlighted the need for **better aerial equipment and tactics.** As the fire often extend beyond the reach of firefighters when they arrive.



Key Takeaway points

- It was found that firefighters can not reliably identifying combustible cladding (ACP)s and when attending such event, it is critical to have **correct intel** from pre-incident planning (PIP) reports.
- Improved PIP will also lead to more effective deployment upon dispatch – ensure appropriate gear is deployed. **Access to better aerial equipment** have been repeatedly brought up in the survey as essential for tackling cladding fires.
- PIP have been conducted in all NSW zones regardless of population density and number of high-rise buildings and 85% of participants claim they were involved.
- However, many have commented that the current system is **reactive**, i.e. it relies on building managers raising the issue to fire agencies. Then experts will be sent to verify the claim. This process is slow, so we are left with many buildings with "potential" combustible cladding.
- The survey has also found that only **18% of participants have delivered any educational material for residents and occupants**, this suggests that occupants should be better informed of the possible fire risks of their respective buildings, so that they would have an awareness of potential fire risk.

Thank You !

Special acknowledgement to Fire and Rescue New South Wales (FRNSW), Australia, for their valuable technical advice and support.

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