Investigating Passive Fire Protection Defects in Residential Buildings

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The Chief Investigator is grateful for the assistance of Jasmin Goldberg and Lisa Simpson in providing research support.

Acknowledgements

This research was supported by the Victorian Building Authority in association with Deakin University, Plus Systems and Focus Fire Safety.

Thank you to the companies that provided valuable data and to the individuals who participated in the interview phase of this research.

Report reproduction

Date of publication: September 2022

Executive summary

In modern buildings, a combination of passive and active fire protection systems are used in an effort to safeguard residents from death or injury by facilitating safe evacuation, enabling emergency services to safely undertake activities, and limiting the spread of fire to other properties. To avoid a catastrophic outcome, all fire protection systems must complement each other, working together in a holistic way. This research project focuses on Passive Fire Protection (PFP) systems. These systems use construction elements within a building that are purposefully designed to prevent or delay the spread of fire.

The motivation to undertake this research was a result of a previous study that found fire protection defects were the second most prevalent defect type in an analysis of 212 buildings. The study also found that passive fire defects, in particular, are likely to be under-reported due to the difficulties in identifying defects post-construction. To better understand the extent of passive fire defects, this project was devised to take a building lifecycle approach in an effort to identify defects in the design, construction and occupancy stages. It was envisaged that this approach would uncover the types of passive fire defects that are ostensibly latent.

The overall aim of this research project was to better understand commonly identified PFP defects and the regulatory environment associated with this construction system.

The objectives were to:

- add to the existing database on PFP defects in order to gain a better understanding of the types and prevalence of PFP defects in existing residential buildings;
- review the regulatory system in order to identify the rules and standards for PFP;
- identify any regulatory gaps in Victoria relating to practitioner competencies. This review was a cross-jurisdictional comparative analysis of registration and licensing regimes for industry practitioners and trades relating to passive fire systems including, builders, architects/building designers, fire safety engineers, building surveyors/certifiers, and fire safety and compliance installers; and
- propose recommendations for reform or changes in policies.

This study primarily used an exploratory approach to the research design. Exploratory research is appropriate in circumstances where a research area has not been well-developed. As this topic area is relatively unexplored, multiple methods of inquiry were used to better understand the phenomenon. Four research activities were undertaken including, a cross-jurisdictional comparative analysis of industry practitioners' regulations, a regulatory review which identified and briefly examined the laws, codes, and standards regulating PFP systems in Victoria and compared these laws to other jurisdictions; building audit data analysis; and industry professionals semi-structured interviews.

Ten key insights were drawn from the findings of this study.

1. Although difficult to quantify, there is evidence to suggest that a large number of Class 2 buildings in Victoria are likely to have PFP defects. Most of these defects are likely to relate to fire walls and penetrations.
2. It is essential that PFP defects are identified and remedied during the design and construction stages. The risk of non-detection of PFP defects is extremely high post-construction. Therefore, rectification is difficult and can be prohibitively expensive particularly if access to these defects is hindered by other construction elements or systems (e.g., walls).

3. There are limitations on PFP product testing and verification. The volume of PFP systems and products in the market that need to intersect makes testing all possible combinations prohibitively expensive. This is especially true for small to medium sized manufacturers. Testing is limited in terms of sample size and application. Therefore, any system that extends testing capabilities requires additional verification that is not frequently undertaken. Access to, and interpretation of, testing data and reports is problematic. Complex installation manuals can inevitably deter compliance if they are too difficult to understand.
4. Mandatory inspections of PFP systems are limited and building surveyors do not necessarily have the requisite skills to identify all passive fire non-compliance.
5. Building documentation and information transfer from the developer to the owners corporation is poorly undertaken. This leads to complications with Essential Safety Measures (ESM) maintenance and rectification works.
6. Builders, developers and service contractors are engaging unregulated passive fire practitioners to identify PFP defects, monitor defect rectification and install PFP elements and systems. This highlights a need in the marketplace for skilled practitioners to be included in practitioner registration schemes and for an education and training pathway to be provided.
7. Some large building companies are proactively implementing quality assurance programs to minimise the risks of PFP defects. Installation and verification protocols are set down early in the planning stage to ensure compliance during construction.
8. Owners corporations appear reluctant to rectify costlier PFP defects until ordered by a local government authority. A fire in a building with a number of PFP defects carries a high risk (of death or injury) but the probability of a fire seems low so rectification is not prioritised.
9. Unregulated ESM maintenance contractors may not have the expertise to identify PFP defects. They also may contract out the inspection of PFP systems and elements leaving owners corporations exposed.
10. More research is required in key areas identified in this project.

It is evident from undertaking this research that investigating PFP defects in residential buildings in Victoria (and perhaps elsewhere) is indeed a complex and onerous task. The exploratory nature of this research has allowed the researchers to make unanticipated discoveries along the way. By delving into the nuances of this topic in the interview phase, further insights have been uncovered that require further exploration in order to truly understand all the intricacies associated with PFP defects in residential buildings. Therefore, although some outcomes from this project are clear and articulated in the recommendations, others require further work. This research does not capture every aspect of PFP defects but provides a solid starting point for further exploration.

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Chapter 1: Introduction

1.1 Project context

In the right environment with enough fuel and oxygen, a fire will spread at impressive speed in a building without some form of fire control.[1] In modern buildings, a combination of passive and active fire protection systems[2] are used in an effort to safeguard residents from death or injury by facilitating safe evacuation, enabling emergency services to safely undertake activities, and limiting the spread of fire to other properties. To avoid a catastrophic outcome, all fire protection systems must complement each other, working together in a holistic way. One system failure may prevent the necessary safeguards from enabling the safe evacuation of building residents particularly in multi-storey apartment buildings. The ability to exit a high-rise building quickly may be hindered by resident inaction (alarm not heard or activated; complacency (e.g. the belief that the alarm is a drill); mobility challenges of elderly, ill or disabled residents; or by smoke or fire impacting exits including stairwells.

When people think of fire protection systems, many may think of active systems – sprinklers, fire extinguishers, and alarms. Active systems typically only come into play at or after combustion, alerting occupants, controlling the spread of the fire, safeguarding residents while escaping and protecting the building infrastructure.

The less known systems are the Passive Fire Protection (PFP) systems. These systems use construction elements within a building that are purposefully designed to prevent or delay the spread of fire and smoke. These systems are built into the building's design and can include separation of the building into fire compartments (to impede fire moving from one apartment to the next) and protection of openings within the building (when services cables, conduits, drains, pipes need to infiltrate the floors, wall and ceilings). As part of the wall system, fire doors must also be designed in a manner that restricts fire spread.[3]

As explained by Wittasek and Black,

> …passive systems do not require a sequenced response to aid in the control of smoke and fire spread; instead, they are always in place and constantly working to reduce fire spread before a fire event starts and to assist in safe occupant evacuation during a fire event."[4]

Although it is essential that these systems are maintained throughout a building's life, they are often difficult to inspect post-construction making it difficult to confirm whether, for example, the fire separation elements have remained intact over time. It is fundamental to the protection of the building and its residents to ensure these systems are correctly designed and installed in the first place due to the difficulty in maintaining and monitoring them in the occupancy phase of a building.[5]

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[1] National Construction Code, CPD Course on Passive Fire Protection, undertaken in 2022 - https://cpd.abcb.gov.au/abcbncc/2307-ncc-cpd-course-on-passive-fire-protection

[2] Referred to as *fire safety systems* within the national Construction Code.

[3] Ibid.

[4] Nathan Wittasek and Kevin Black, 'Choosing active and passive fire protection systems' (2021) *Building Solutions* 48, 50.

[5] Ibid.

The purpose of this research is to focus on PFP systems and to better understand the types of defects that commonly arise, the regulatory protections, and the role and skill of building practitioners interfacing with these protection systems.

1.2 Motivation, aim and objectives of the research

The motivation to undertake this research was a result of a previous study[6] (authored by the lead researcher on this project) that found fire protection defects were the second most prevalent defect type in an analysis of 212 buildings. The study also found that passive fire defects, in particular, are likely to be under-reported due to the difficulties in identifying defects post-construction. That is, when the building and all interiors are enclosed, it is difficult without destructive testing, to identify passive fire defects relating to fire resisting walls including penetrations of those walls. These defects can lay dormant and perhaps not be discovered until a major fire event occurs. To better understand the extent of passive fire defects, this project was devised to take a building lifecycle approach in an effort to identify defects in the design, construction and occupancy stages. It is envisaged that this approach will uncover the types of passive fire defects that are ostensibly latent.

The overall aim of this research project is to better understand PFP defects and the regulatory environment associated with this construction system.

The objectives are to:

- add to the existing database[7] on PFP defects in order to gain a better understanding of the types and prevalence of PFP defects in existing residential buildings;
- review the regulatory system in order to identify the rules and standards for PFP. This review identifies and examines the laws (legislation and regulation) and code regulating passive fire safety systems in Victoria. An additional comparative overview has been provided, highlighting the various approaches undertaken by the states with substantial apartment supply (New South Wales (NSW), Queensland (Qld), and Western Australia (WA));
- identify any regulatory gaps in Victoria relating to practitioner competencies. This review is a cross-jurisdictional comparative analysis of registration and licensing regimes for industry practitioners and trades relating to passive fire systems including, builders, architects/building designers, fire safety engineers, building surveyors/certifiers, and fire safety and compliance installers; and
- propose recommendations for reform or changes in policies.

1.3 Report structure

The report is divided into seven chapters. Chapter 1 provides an introduction to the project including the aims and objectives, the types of buildings considered in the analysis, how the term ‘defects’ will be used in this research and research limitations. Chapter 2 briefly outlines the literature relating to PFP system defects. Chapter 3 outlines the study’s methodological approach and research activities undertaken. Chapter 4 reviews the regulatory system in Victoria relating to PFP and highlights jurisdictional differences. Chapter 5 identifies the regulatory requirements for building practitioners and highlights jurisdictional differences. Chapter 6 provides the results and findings of the building audit data and practitioner

[6] Nicole Johnston and Sacha Reid, ‘An examination of building defects in residential multi-owned properties’ (2019), Deakin University.
[7] As developed by the lead author of this report.

interviews. Chapter 7 discusses the research results and findings and proposes recommendations for reform.

1.4 Building type considered in project

This project broadly investigates PFP defects in multi-storey residential buildings and specifically, strata schemes. However, due to the construction aspect of this project most of the data provided relates to Class 2 buildings. As discussed further in this report, Class 2 buildings contain two or more sole-occupancy units where people live above, beside, or below other occupancies. It is likely that most multi-storey residential buildings that include two or more storeys are classified as Class 2 or Class 3. Strata schemes on the other hand, can be commercial, industrial or residential (or a combination) and include duplexes, townhouses, free-standing dwellings (that may be Class 1) as well as apartments. Therefore, it is not surprising the data shows a much higher number of strata schemes in Victoria compared to Class 2 and 3 buildings combined.

In 2020, Victoria had approximately 113,000 strata schemes.[8] A large proportion (approximately 83,000 or 73%) of these schemes consist of less than six lots, with another 24,000 (21%) consisting of six lots or more but less than 20 lots.[9] A small proportion of strata schemes (6,500 or 5.7%) are considered larger schemes, consisting of at least 21 lots. It is likely that these larger schemes and a proportion of mid-size schemes (six to 20 lots) are classified as Class 2 or 3 buildings under the NCC requirements.[10] This is to some extent consistent with the Victorian Building Stock Database (VBSD) created for the Victorian Building Authority (VBA).[11]

Thirty-three datasets were collated to create the VBSD. The VBSD is an estimation of the as-built environment of buildings in Victoria. Inaccuracies in terms may be attributed to estimations made when joining the various sourced data (e.g. due to the use of addresses as the determinant feature to connect the datasets, and coding for buildings that have more than one class applied). As highlighted in Table 1.1, as of February 2020, there were an estimated 11,942 Class 2 buildings and 5,611 Class 3 buildings in Victoria with a combined total of 17,553.[12]

[8] Nicole Johnston et al, 'A data-driven holistic understanding of strata insurance in Australia and New Zealand' (2020), Deakin University.
[9] Ibid.
[10] Ibid.
[11] Details about the construction of the VBSD, and its sources, assumptions, and limitations, are set out in Victorian Building Authority's report: 'Market Demand and Workforce Capacity for the Routine Servicing of Fire Protection Equipment' (2020) - https://www.vba.vic.gov.au/about/research/routine-servicing-of-wet-fire-protection-equipment.
[12] Information on building height (from ground/street level) was sourced from a Geoscape dataset. Geoscape is a digital representation of every building in Australia, and Geoscape data is derived from satellite and aerial imagery. The Geoscape dataset does not include data on 'rise in storeys', and no other datasets were identified to contain this information. 'Number of storeys' in Victorian buildings has been estimated by dividing building height by 2.5 metres, with 2.5 metres representing a storey. Multiple factors can impact the quality of the assigned elevation or height, these include but are not limited to; age of source imagery, an obscured or partially obscured building or tree coverage surrounding a building.

Table 1.1: VBSD estimate of Class 2 and 3 buildings by number of storeys

Building storeys	Class 2	Class 3	Totals
Four or less	10,864	5,064	15,928
Five to nine	608	84	692
10 to 19	251	28	279
20 or more	122	6	128
Unknown	97	429	526
Totals	**11,942**	**5,611**	**17,553**

Just over half of all Class 2 buildings are located in the Local Government Areas (LGA) of Melbourne, Port Phillip and Stonnington. These LGAs include: the City of Melbourne, St Kilda, South Melbourne, Port Melbourne, Malvern, Prahran, Albert Park, Middle Park, Southbank, Elwood, South Yarra, Toorak, Armadale, and Kooyong. Table 1.2 highlights the LGAs that comprise 86% of all Class 2 buildings in Victoria.

Table 1.2: VBSD estimate[13] of Class 2 buildings in Victoria by LGA

LGA	Class 2 buildings (number of)	Class 2 buildings (percentage of)
Melbourne	2,525	21.1%
Port Phillip	2,237	18.7%
Stonnington	1,614	13.5%
Yarra	774	6.5%
Boroondara	665	5.6%
Glen Eira	474	4%
Moreland	431	3.6%
Moonee Valley	412	3.5%
Bayside	248	2.1%
Maribyrnong	223	1.9%
Whitehorse	217	1.8%
Darebin	205	1.7%
Kingston	201	1.7%
Subtotal	10,226	85.7%

1.5 Defining the term ‘defects’

As highlighted in the work by Johnston and Reid[14] and Crommelin et al,[15] the term ‘defect’ or ‘defective work’ has not been consistently applied across the literature.[16] It is not the purpose of this work to debate varying views, but it is important to explain how the term will be used in this research. Given the analysis provided by Crommelin et al, this project has adopted their definition with minor amendments to facilitate issues relevant to PFP systems. The amendments applied are highlighted in bold.

[13] Victorian Building Authority report: ‘Market Demand and Workforce Capacity for the Routine Servicing of Fire Protection Equipment’ (2020) - https://www.vba.vic.gov.au/about/research/routine-servicing-of-wet-fire-protection-equipment.
[14] Johnston (n 6).
[15] Laura Crommelin et al, ‘Cracks in the compact city: tackling defects in multi-unit strata housing’ (2021), UNSW Sydney.
[16] See Crommelin et al work for a detailed review of this term.

A defect refers to:

> *a building **system or element** that is not fit for its purpose due to a failing or shortcoming in the function, performance, statutory or user requirements of the building **system or element**, where the failing or shortcoming has existed since construction or been triggered later on by faulty original construction or design.*[17]

To be clear, for the purpose of this research, the term defect will be used to include non-compliant work whether arising in the design, construction and post-construction phase. Defect does not mean a failure that has occurred due to poor maintenance practices.[18]

1.6 Project disclaimer and limitations

This research project was devised with a non-technical audience in mind. This research has been undertaken by researchers that do not have expertise in construction, engineering or PFP management. The intention is to: provide insights into the various PFP defects identified by practitioners; identify any gaps in the regulatory framework that may cause or contribute to these defects; and to determine whether changes are needed to provide a safe environment for apartment residents. The authors have depended on industry experts to inform this project.

As highlighted in previous research on building defects,[19] access to quantitative data on any topic relating to building defects is fraught with difficulties. As identified by Crommelin et al,[20] building defect information is scarce and spread widely across organisations and institutions. Data robustness is an issue as the skill and competency of people identifying defects varies, defect identification is often determined through visual inspections (that is, without destructive testing) and data is often provided in an inconsistent format. An additional barrier for this research project related to the Covid-19 pandemic and resourcing issues for audit companies. Although support was provided by many involved in auditing PFP systems, the time limitations for this project, the surge of work in the construction industry after Melbourne lock downs, and staff shortages significantly hindered the ability of audit companies to transfer data to the research team. The lack of access to consistent and robust data will continue to be a challenge for researchers. It will take a concerted effort to standardise and co-ordinate data in order to expose the true story of building defects in this country. Therefore, care needs to be taken when referencing or understanding building defect results.

[17] Crommelin (n 15), 25.
[18] Note: there are instances in the results and findings sections where interviewees have used the term ‘non-compliance’. To ensure that their true voice is heard, changes have not been made.
[19] Johnston (n 6), Crommelin (n 15).
[20] Crommelin (n 15).

Chapter 2: Literature review

Worldwide there is a paucity of research on Passive Fire Protection (PFP) defects in residential apartment buildings. Drawing on extant literature to inform the direction of this research is therefore difficult. The briefness of the literature review highlights the limited scholarly work on this topic.

A small number of publications over the last decade have, to varying degrees, identified fire safety defects more broadly. In Australia, a substantial amount of academic work has been undertaken by the University of New South Wales (UNSW) (City Futures Research Centre) and Deakin University.

2.1 Passive fire protection system defects in residential apartments

In 2012, a UNSW study identified the types of defects commonly occurring in strata schemes in New South Wales (NSW). A survey of strata owners found that 15% of their schemes had fire safety measure defects.[21] The research did not identify, more specifically, the types of fire safety defects. That is, whether those defects related to passive or active fire system failures.

In 2019, a Deakin University study identified that fire protection was the second most prevalent defect type in residential construction based on a sample of 212 buildings in NSW, Queensland (Qld) and Victoria.[22] PFP defects were the most prevalent in the fire protection category. Examples of defects reported included: fire penetration seals (missing fire collars, missing or incomplete fire separation, incorrect fire collar used, damage to fire wall) and fire separation (compromised fire barrier, cracking to fire rated ceilings, lack of appropriate fire separation between units, and incorrect material used for fire barrier). This study highlighted the difficulties in identifying passive fire defects post-construction particularly failures relating to fire walls.[23]

In 2021, a further UNSW study found that the most prevalent types of defects in residential apartments related to water, cracking and fire safety issues.[24] These findings were consistent with previous research. It was estimated that 17% of their most robust study sample had fire safety issues. The researchers of this study explained that they had expected higher fire safety defects than reported. They observed that these differences may be attributable to the way in which defects were categorised in the data and the latency issues related to many fire elements.[25]

New Zealand researchers have been at the forefront of this issue for longer and important insights can be learned from their work. In 2008, the Fire Protection Association of New Zealand undertook a pilot study to highlight issues relating to PFP systems.[26]

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[21] Hazel Easthope, Bill Randolph, B. and Sarah Judd, 'Governing the Compact City: The role and effectiveness of strata management' (2012) City Futures Research Centre, UNSW.
[22] Johnston (n 6).
[23] Ibid.
[24] Crommelin (n 15).
[25] Ibid.
[26] Fire Protection Association of New Zealand, 'Determining barriers to industry delivery of fire-safe buildings in New Zealand' (2008) FPA New Zealand.

Although acknowledging that the sample was small, the researchers concluded that:

> "There is reason to assume that based on the work undertaken, a large number of buildings in New Zealand would fall well short of the level of fire safety performance expected from the NZBC [New Zealand Building Code], due to inadequacies in the PFP systems."[27]

Although the study included various building types (aside from residential), many of the issues identified were specific to residential construction. The study featured a residential apartment case where the rectification works were invasive and culminated in over $1 million in expenditure. The primary issues that required fixing related to service penetrations that had no fire stopping elements.[28] The study also interviewed fire engineers, product suppliers and representatives from various building consent authorities. Nine themes (issues and trends) were identified by the researchers including: designer involvement, trade coordination, product knowledge, product substitution, installer competence, Independent Qualified Person competence, specified systems and compliance schedules, building work, and standards.

Consistent comments regarding the types of passive fire defects and the causes of, and contributors to, these defects included: high levels of non-compliance relating to service penetrations, incorrect installation of fire collars and fire stopping, lack of co-ordination of trades on site, knowledge gaps across the spectrum of building practitioners, gaps between design and what is ultimately built, little cohesion between designers and fire engineers, evidentiary issues with test certificates, and problems associated with self-certification of products.

One interviewee highlighted the fundamental problem with PFP defects:

> "A very minor omission can have catastrophic consequences in respect of overall fire safety for building occupants in the first instance – in other words there is often very little if any redundancy."[29]

2.2 Passive fire protection defects cost

As identified in the New Zealand study, the costs associated with rectifying PFP defects post-construction can be prohibitive. This is especially true if the defect has occurred in multiple locations and requires invasive and destructive works to be undertaken in order to remedy the problems. However, costs can be a good indicator of a defects problem.

In order to accurately estimate the costs associated with defect rectification, the size and the specifics of the problem need to be known. As discussed in this review, there are many barriers that make it difficult to accurately determine the breadth of the defects problem in Australia. As highlighted by Crommelin et al, "…defect prevalence is extremely difficult to estimate, undermining attempts to model costs."[30] However, attempts have been made to determine the costs related to rectifying building defects broadly and fire safety defects more specifically.

[27] Ibid, 23.
[28] Ibid.
[29] Ibid, 8.
[30] Crommelin (n 15) 46.

Equity Economics found that the costs of rectifying fire safety defects in apartments substantially affected ranges from $4,000 to $14,000 per apartment.[31]

The Centre for International Economics estimates that the average cost of rectifying fire safety defects (excluding combustible cladding) in Class 2 buildings is $2,172 per lot.[32] This figure is based on the assumption that 1% of a building's total rectification costs are attributable to fire safety.[33]

Given the difficulty in accurately identifying PFP defects in apartment buildings, it is likely that these cost ranges are grossly underestimated.

2.3 Building products

Aside from academic research, it is important to highlight reports that have been prepared to examine problems and challenges associated with building products. Given the wide use of products in PFP, commentary on building products is appropriate to outline.

Shortly after the 2014 Lacrosse fire in Melbourne, the Economics Reference Committee (Australian Senate) commenced an inquiry into non-conforming building products in Australia. The impetus for the inquiry was due to "a number of industry-led forums that highlighted the growing body of evidence of the use of non-conforming building materials in the Australian construction industry."[34] Three years after the commencement of the inquiry, the final report was delivered. The Committee found that there were weaknesses in the regulatory regime, that privatisation of building certification processes and laxed regulatory control paired with high product importation contributed to the proliferation and installation of non-compliant products. A general lack of accountability further compounded the issues. The Committee highlighted that there were a multitude of issues relating to fire safety products (aside from external combustible cladding).[35] The inquiry reported on issues relating to fraudulent documentation (including certificates relating to passive fire elements) and a high level of non-compliance across the board. Some of the recommendations pertinent to PFP systems are highlighted in Chapter 7 of this report.

In April 2022, the International Building Quality Centre (IBQC) issued a discussion paper to examine the known problems and challenges associated with building product conformance and included examples from Australia. The paper categorised ten issues in need of further exploration including: volume and source of construction products; compliance culture; development of standards and codes; accreditation processes and competencies of assessment bodies; product substitution; product installation; role and competencies of

[31] Equity Economics, 'The cost of building defects: economic modelling of the cost of building defects in apartments across Australia.' (2018). https://www.equityeconomics.com.au/report-archive/the-cost-of-building-defects

[32] The Centre for International Economics, 'Building Confidence Report: A case for intervention' (2021). https://www.abcb.gov.au/sites/default/files/resources/2022/Building-confidence-report-case-intervention.pdf

[33] Ibid, 131.

[34] Australian Senate, Economics Reference Committee, 'Non-conforming building products: the need for a coherent and robust regulatory regime' (2018), IX.

[35] Ibid, International Building Quality Centre, 'Building Product Performance' (2022) - http://www.ibqc.org.au/wp-content/uploads/2022/04/IBQC-Building-Product-Performance-Part-1-2022.04-FINAL.pdf

specifiers, designers and approval officers; regulatory oversight; quality assurance during construction; and service and maintenance post-construction.[36]

In a follow-up public forum, the members of the IBQC working group highlighted various issues specific to their jurisdiction.[37] Some of the commentary provided in this forum is noteworthy for inclusion in this project.

Neil Savery (former Chief Executive Officer of the Australian Building Codes Board) succinctly highlighted where the issues lie –

> "Where failures occur based on the work that's been done here [referring to Australia] and elsewhere, there appears to be two obvious problems with a number of contributing factors. There are those products that would appear to be deliberately marketed for use when they do not conform with the requirements that need to be satisfied for a particular application. There are also then those products that meet certain standards and have been tested for specific applications but are used incorrectly and in circumstances where they shouldn't be by building practitioners. In other words the products are being used in a manner that is non-compliant."[38]

Bronwyn Weir (Weir Legal and Consulting) discussed the complexity of product documentation, the difficulty for some building practitioners in interpreting these documents, and the lack of education and upskilling in the industry.

> "New products might have certificates or rather complex documents that need to be interpreted and the actors involved in the chain aren't necessarily keeping up with those standards. There might also be an issue with the initial qualification that is being given to these different actors in the system and how well they're being trained to account for innovation and change that is occurring quite rapidly not just in the building industry but globally…I think we have real issues with our education system. You need to be able to control continuing professional development and up-skilling and what we see in the building industry is that sometimes this is delivered by the manufacturers themselves who may or may not be qualified."[39]

Given these concerns, it is important that product non-conformance and non-compliance form part of the investigation for this research project. [40]

The lack of research undertaken on PFP defects in residential buildings highlights a significant gap in our knowledge base. Until we thoroughly investigate the concerns that

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[36] International Building Quality Centre, 'Building Product Performance' (2022) - http://www.ibqc.org.au/wp-content/uploads/2022/04/IBQC-Building-Product-Performance-Part-1-2022.04-FINAL.pdf

[37] International Building Quality Centre,' Building Product Performance workshop (2022) - https://www.youtube.com/watch?v=9V9iceRE3ps

[38] Ibid, mark 5.50 of recording.

[39] Ibid, mark 1.20.52 of recording.

[40] It is important to note that in December 2021, the Australian Building Codes Board published the National Building Product Assurance Framework in reference to the Building Confidence Recommendation (BCR) 21. This recommendation stated, "that Building Ministers agree a position on the establishment of a compulsory product certification system for high-risk products." The Building Ministers agreed to extend the recommendation to ensure the delivery of a holistic package of measures that provide a reliable conformity assessment framework. Five elements are presented in the framework and include (1) strengthening NCC evidence of suitability requirements, (2) Information obligations for manufacturers and suppliers, (3) product traceability and identification, (4) improved surveillance, research and information sharing, and (5) strengthened compliance and enforcement. The framework has yet to be implemented but is progressing through a number of stages. https://www.abcb.gov.au/sites/default/files/resources/2021/BCR-rec21-Building-product-safety_0.pdf

have been raised, the extent of the problem will remain unknown and deficiencies in our construction system may continue. It is imperative for the safety and wellbeing of apartment residents that we better understand these issues and where relevant take immediate action to curtail the effects of PFP defects. Ignoring the defects problem is and will continue to put apartment residents' lives at risk.

Chapter 3: Methodology

This study primarily uses an exploratory approach to the research design. Exploratory research is appropriate in circumstances where a research area has not been well-developed. This methodology allows for serendipitous discoveries due to its flexible and investigative nature. As this topic area (defects associated with PFP systems) is relatively unexplored, multiple methods of inquiry were used to better understand the phenomenon.

For clarity and ease, the methods of inquiry for this study have been aligned with four research activities. These activities were not necessarily undertaken sequentially.

Activity 1: Cross-jurisdictional comparative analysis of industry practitioners' regulations

This analysis compares (across the Australian jurisdictions of New South Wales (NSW), Queensland (Qld), Western Australia (WA) and Victoria (Vic) the regulatory requirements for industry practitioners (including designers, builders, fire engineers, building surveyors /certifiers, passive fire contractors) in terms of their qualifications, registration and licensing.

Activity 2: Regulatory review

This review identifies and briefly examines the laws (legislation and regulation), codes, and standards regulating (directly or indirectly) PFP systems in Victoria and compares these laws to other jurisdictions, where relevant.

Activity 3: Building audit data analysis

Building inspection data, taken from multiple inspection points throughout the construction stage, was provided by:

- the Victorian Building Authority (VBA) through its Proactive Inspection Program (PIP) (134 buildings),
- a passive fire and compliance company (referred to as Company A) (12 buildings)
- a second passive fire and compliance company (referred to as Company B) (2 buildings).

The data provided by these organisations was either in aggregate form or the inspection reports were provided in PDF form. As the research team are not technical fire specialists, the categorisation of data and the explanations provided as to why an element or system was deemed non-compliant were not evaluated for accuracy. The data was cleaned to ensure that only Class 2 buildings were included in the dataset and that any replications or missing information were voided. Relevant information presented in the PDF inspection reports was extracted, sorted and aggregated to enable analysis. Further data was provided by a company that undertakes Essential Safety Measures (ESM) maintenance in the occupancy phase. This data was provided in aggregate form and included information from 434 buildings.

Activity 4: Industry professionals semi-structured interviews

Semi-structured interviews were undertaken to gain further insights into PFP defects. Sixteen participants from the construction industry were invited to participate and were asked a range of questions relating to the aims and objectives for this project. Interviews were conducted either face-to-face or via zoom, recorded and transcribed. The interview data was interpreted using thematic analysis. Table 3.1 outlines the interviewee's professional affiliation and the identification code assigned to each practitioner. These identification codes are positioned at

the end of quoted material in the results and findings chapter of this paper. This allows the reader to better understand the position of the interviewee based on their affiliation.

Table: 3.1 Interviewees identification code and professional affiliation

Identification code assigned	Practitioner professional affiliation
1	Fire safety engineer
2	Fire safety and compliance practitioner
3	State Building Surveyor
4	Building surveyor
5	Project manager
6	Builder
7	Fire safety and compliance practitioner
8	Fire research engineer
9	Fire safety engineer
10	Manufacturer
11	Fire safety and compliance practitioner
12	Building surveyor
13	Fire safety and compliance practitioner
14	Builder
15	Fire Protection Association Australia representative
16	Manufacturer

Due to the nature of the research project, ethics approval was sought and granted by Deakin University. On 25 August 2021, Deakin University's Business and Law Faculty Human Ethics Advisory Group approved the project (BL-EC 33-21).

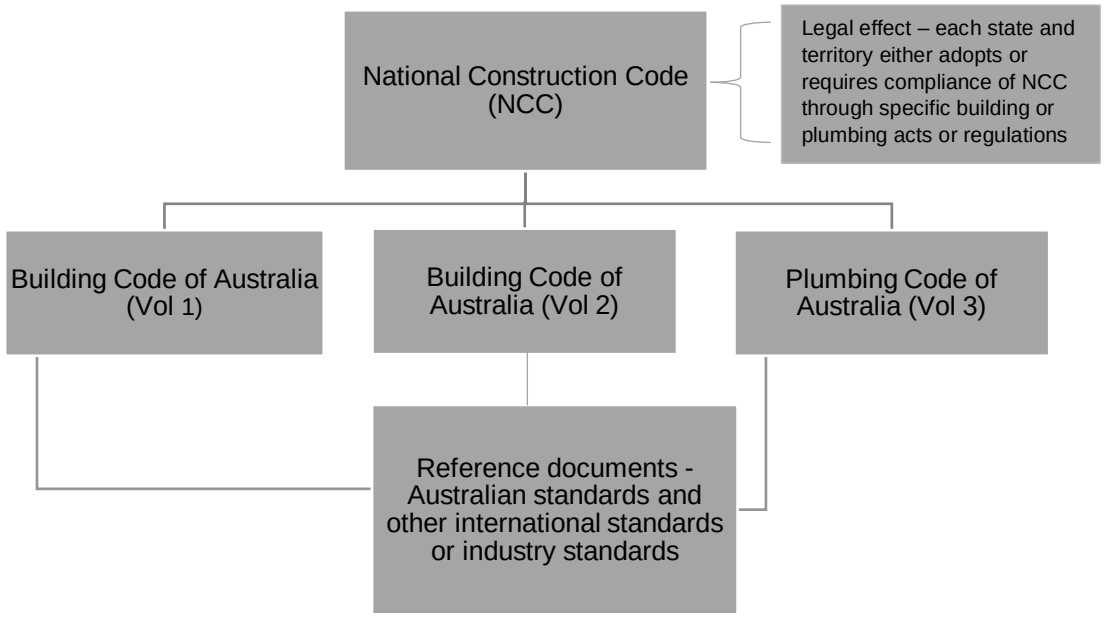
Chapter 4: Australia's regulatory approach to construction

The purpose of this chapter is to outline Australia's regulatory approach to construction paying particular attention to the requirements relating to Passive Fire Protection (PFP). The review is somewhat superficial in that there are numerous technical requirements relating to construction and passive fire that have not been detailed in this chapter. This chapter should be therefore viewed from a lay perspective. The chapter considers the structure and relevant Performance Requirements as outlined in the National Construction Code (NCC), the objective and main provisions of building Acts and regulations as they relate to PFP, ancillary regulations, and the legislation regulating essential safety measures maintenance. Although the main focus is highlighting the requirement for Victoria, useful comparisons have been included to show the differences in the states of New South Wales (NSW), Queensland (Qld) and Western Australia (WA).

4.1 National Construction Code

Since the early 1970's, Australian states and territories have recognised the need for a uniform building code. Although various iterations have been introduced, widespread adoption of a building code didn't occur until the 1990's. In 1996, the Australian Building Codes Board (ABCB) introduced a new performance based regulatory code (Building Code of Australia (BCA)), which within two years was adopted by all state and territories. Subsequently, three code volumes were developed including a code dedicated to plumbing work. In 2011, the building code and the plumbing code came together under the NCC. Figure 4.1 outlines the components of the NCC framework.

Figure 4.1: NCC Framework



Although the NCC is the nationally adopted building code, each state and territory have laws that regulate building work and construction processes that are informed by the NCC. The prevailing regulations, in the event of any inconsistency, are the state and territory building laws.

The NCC provides the minimum necessary requirements for health and safety; amenity, accessibility and sustainability in design construction; performance; and liveability of new building work throughout Australia.

The NCC identifies different classes of buildings for the purpose of prescribing applicable regulatory provisions. For this research, residential apartment buildings are generally categorised as Class 2. Class 2 buildings are defined as a building containing two or more sole-occupancy units where people live above, or below each other. A Class 2 building may also be a single storey dwelling where there is a common space below. For example, two adjacent dwellings above a common basement or carpark.

The NCC also specifies the minimum type of fire-resisting construction, including by class of building. There are three types of construction, A, B and C. The different types of construction aid in determining the Fire Resistance Level (FRL) for elements of the building. Table 4.1 highlights the construction types of Class 2 buildings (excluding any permitted concessions).

Table 4.1: Minimum type of fire-resisting construction of a Class 2 building

Construction type	Rise in storeys	FRLs
Type A	Three-storeys or greater	FRL requirements for building elements are the highest for Type A construction and the lowest for Type C construction
Type B	Two-storeys	
Type C	One-storey	

The BCA contains nationally consistent minimum levels of performance that buildings and building elements must meet. Volume 1 applies to Class 2-9 buildings. The BCA is not, of itself, legally binding. To give legal effect to the BCA it is recognised and adopted, with or without variation by each jurisdiction. More specifically, the BCA:

- identifies different classes of buildings for the purpose of prescribing applicable regulatory provisions;
- contains technical provisions for the design and construction of buildings and other structures through the NCC;
- allows for state variations to provide additional requirements or cater for specific community expectations. This means the code defines the way of achieving a specified outcome without prescribing a particular method;
- sets performance requirements at the minimum level of performance that buildings and building elements must meet;
- incorporates technical standards that set out specifications and design procedures to ensure products and services consistently perform safely, reliably, and as intended.

The BCA is a performance-based code, which contains performance requirements. These are mandatory minimum levels of compliance. These mandatory levels are achieved in one of two ways. The first is by using the Deemed-To-Satisfy (DTS) provisions. DTS solutions prescribe various methods of design and construction including material, components, and design factors, which if used are deemed to satisfy the performance requirements. The second way to meet the BCA performance requirements is by using a performance solution.

This approach allows any material, component, method, or design to be approved if it meets one or more of the BCA's assessment methods.

Assessment methods must show compliance with the BCA and that the solution is fit for purpose. There are four ways to assess compliance:

1. **Evidence of suitability** e.g., a certificate from an accredited testing authority.
2. **Verification** by calculations, tests, and inspections.
3. **Expert judgement** where physical criteria have been unable to be tested and the opinion of a technical expert is accepted instead.
4. **Comparison** of DTS solutions and the proposed performance solution to demonstrate equivalence.

4.1.1 Performance requirements for passive fire protection

It is important to note that the NCC takes a holistic approach. Therefore, all sections of the code need to be considered to correctly interpret the requirements. Section A of Volume 1 provides rules and instructions for using and complying with the NCC and includes provisions relating to classes of buildings.

Section B of Volume 1 provides the structural reliability performance requirements.[41] This section requires that all buildings and structures perform adequately under certain design actions such as various loads (permanent and live), wind and earthquake, and differential movement. As detailed in a 2019 NCC bulletin, Class 2 buildings must ensure that non-structural building parts and components are designed to resist horizontal and vertical forces (e.g. earthquake) and that such parts and components include walls, partitions, ceilings, and smoke control and fire suppression systems.[42]

The NCC provides in Section C the fire resistance requirements including performance requirements, DTS provisions and specifications. Nine performance requirements are articulated including: structural stability during a fire, spread of fire, spread of fire and smoke in health and residential care buildings, safe conditions for evacuation, behaviour of concrete external walls in a fire, fire protection of service equipment, fire protection of emergency equipment, fire protection of openings and penetrations, and fire brigade access.[43]

In relation to PFP systems, the performance requirements relating to structural reliability, fire resistance and stability, spread of fire, and fire protection of openings and penetrations are most relevant. It is important to note that the performance requirements relating to safe conditions for evacuation are at the heart of these fire safety provisions. The requirements provide for an environment that allows residents to safely evacuate the building in the event of a fire by ensuring that materials and assemblies minimise fire and smoke spread and limit the generation of smoke, heat, and toxic gases. An understanding of the nature of the building, the characteristics of the residents and the active fire systems installed is necessary to ensure compliance. The PFP performance requirements include:

- **Structural reliability** – this requirement ensures that buildings and structures, inter alia, perform adequately and withstand extreme or frequently repeated actions that

[41] Australian Building Codes Board, 'National Construction Code, Volume One' (2019) https://ncc.abcb.gov.au/editions/2019-a1/ncc-2019-volume-one-amendment-1/contents-and-introduction/copyright-and-licence
[42] See, NCC Design of non-structural building elements for earthquake forces (2019) https://www.abcb.gov.au/news/2019/design-non-structural-building-elements-earthquake-forces
[43] Australian Building Codes Board (n 41).

include but are not limited to: specified loads, wind and earthquake movement, ground movement. For the purpose of this research, fire-resisting load-bearing walls for example, would need to satisfy this performance requirement.

- **Fire resistance and stability** – this requirement ensures that, in the event of a fire, a building maintains its structural stability for a specified duration. In essence, building elements and their components, including external walls, common walls, lifts, shafts, and non-loadbearing internal walls that are required to be fire resistant must also be non-combustible.
- **Spread of fire** – this requirement ensures that building elements contain the spread of a fire to building exits, individual apartments, common corridors, and between and within a building as necessary. There are a number of DTS provisions relating to compartmentation and separation. These provisions specify the requirements relating to vertically aligned windows and other openings to external walls for buildings that are at least three-storeys, fire walls, separations in relation to lift shafts, equipment, and supply systems, and corridors. The minimum FRLs for each element and system is articulated.
- **Protection of openings and penetrations** – this requirement ensures that certain building elements are protected in the event of a fire, so that an adequate level of performance is maintained. The DTS provisions relate to openings in external walls, different fire compartments, fire-isolated exits, lift shafts and other shafts, floors and ceilings for services, service installations; doorways in fire walls, sliding fire doors, doorways in horizontal exits, service penetrations in fire-isolated exits, construction joints, and columns protected with lightweight construction that passes through a building element.[44]

Section D is important to PFP as it provides the requirements to protect egress from the building in the event of a fire.

Schedule 5 of the NCC sets out the procedure for determining the FRL of building elements. An FRL is the estimated ability (in minutes) of an element to withstand fire based upon a standardised fire test. The FRL has three criteria – structural adequacy (ability to maintain stability and adequate load-bearing capacity), integrity (ability to resist the passage of flames and hot gases) and insulation (ability to maintain a temperature on the surface).[45] The schedule provides a list of building elements deemed to have achieved the required FRLs and alternative methods allowable to satisfy the requirements.

In addition to prescribed requirements in the NCC, there are Australian Standards that prescribe additional technical detail. The BCA also references other standards to assist in the design of fire protection. These include the Australian Fire Engineering Guidelines (AFEG), which contains contemporary information for the fire safety design of buildings. The AFEG also gives guidance to fire engineers on the analysis and evaluation of fire safety strategies for a building. The AFEG supersedes the International Fire Engineering Guidelines (IFEG). The Fire Brigade Intervention Model (FBIM) is another NCC support document. The FBIM, for example, provides estimated timeframes for fire brigade intervention at a site where that is part of the performance requirements.

4.2 Building Acts and Regulations

Building laws set out the framework for the regulation of building construction, building standards and the maintenance of specific building safety features. Building permits are

[44] Ibid.
[45] Ibid.

issued under building laws to regulate the design, construction and maintenance aspects of a particular building or development. Building certificates (including, for example, occupancy permits and certificates of final inspection) are issued on the completion of the building.

Table 4.2 provides an overview of the relevant building laws in Victoria including the purposes of the regulation and the main provisions. The *Building Act 1993* (Vic) has an overarching objective to protect the health and safety of people who use buildings and to improve the amenity of buildings. The Act also establishes the Victorian Building Authority (VBA), the regulator for Victoria's building and plumbing industries and administers a registration scheme for specified categories of building practitioner (among other functions). The *Building Regulations 2018* (Vic) adopts the BCA, prescribes standards of construction, outlines the process of issuing building permits and outlines the compliance requirements for essential safety measures. The *Domestic Building Contracts Act 1995* (Vic) provides for the maintenance of proper standards and includes implied warranties relating to workmanship, the quality of supplied materials and a duty on builders take reasonable care and skill in carrying out domestic building work including work on Class 2 buildings.

Table 4.2: Relevant Victorian building laws, purposes, and pertinent provisions

Level	Purpose	Main provisions relating to purpose
***Building Act 1993* (Vic)**	To regulate building work and building standards.	Part 2 establishes the framework for setting building standards. The building regulations may apply, adopt, or incorporate, either wholly or in part and with or without any modification, any matter contained in the Building Code of Australia (BCA) or any other document as in force or as issued or published at a particular time or as in force or as issued or published from time to time.
	To provide for the accreditation of building products, construction methods, building components, and building systems.	A person may apply in accordance with the regulations to the Building Regulations Advisory Committee or a person or body referred to in s4(1) for the issue of a certificate of accreditation for a building product, construction method, design, component or system accredited by the Building Regulations Advisory Committee or the person or body (as the case requires) (Part 2).
	To provide a system for issuing building and occupancy permits and administering and enforcing related building and safety matters and resolving building disputes.	A person must not carry out building work unless the work is carried out in accordance with this Act, the building regulations and the building permit issued in relation to that work (Part 3), inspected (Part 4) and issued with an occupancy permit (Part 5)
	To regulate building practitioners and plumbers	Part 11 establishes a scheme for registration of building practitioners and Part 12A establishes a scheme for the licensing and registration of plumbers. Note that engineers are no longer 'building practitioners' under the *Building Act 1993* and have their own system of registration dealt with elsewhere in this report.
***Building Regulations 2018* (Vic)**	To make the regulations that control the design, construction, and use of buildings.	The BCA is adopted by and forms part of the regulations as modified by these regulations (reg 10).
	To prescribe standards for the construction and demolition of buildings.	There are various provisions relating to this objective outlined in the regulations. For the purpose of the research, there are fire safety standards (automatic smoke detection) for certain residential buildings that are relevant (including residential care and shared accommodation). Regulation 117 onwards specifically deals with building demolition.

Level	Purpose	Main provisions relating to purpose
	To prescribe standards and matters relating to the maintenance of fire safety and safety measures.	The owner of the building or place of public entertainment must ensure that each essential safety measure that is the subject of a maintenance determination in relation to that building or place performs at the level to fulfil its purpose specified in the maintenance determination; and is inspected, tested and maintained in accordance with the requirements specified in the maintenance determination (reg 216). Apartment building owners in Vic are required to prepare an Annual Essential Safety Measure Report (AESMR). The AESMR is a report that specifies that the Essential Safety Measures (ESMs) have been inspected, tested and maintained in accordance with the requirements of the regs and as set out in the occupancy permit.
	To provide for matters relating to the accreditation of building products, construction methods, designs, components and systems connected with building work	Part 17 provides for building product accreditation including prescribed accreditation persons and bodies, and the process of accreditation including, but not limited to, the information that must be set out in a certificate of accreditation.
	To prescribe qualifications and provide for other matters relating to registration of building practitioners	Part 18 provides for registration requirements for the various classes of building practitioner including prescribed qualifications.
Domestic Building Contracts Act 1995 **(Vic)**	Provides for the maintenance of proper standards in the carrying out of domestic building work and enables a quick and fair dispute resolution process and to enable building owners to have access to insurance funds in some case (not applicable to high rise above three-storeys).	The Act provides a number of implied warranties that form part of any domestic building contract and include warranties as to the workmanship and suitability of supplied materials and a duty on the builder to carry out work with reasonable care and skill (s8).

Table 4.3 outlines the relevant building laws and objectives in the states of NSW, Qld and WA. A number of state building regulations provide a similar framework as Victoria, specifically for regulating building works and standards, issuing building and occupancy certificates, providing for ongoing building maintenance, and dispute resolution mechanisms. However, NSW and Qld have more recently enacted legislation in an effort to curtail problems relating to building defects and building product failures.

NSW has enacted the *Design and Building Practitioners Act 2020* (NSW) to: strengthen registration requirements for designers and builders; increase accountability and transparency in the design process; and impose a statutory duty of care on building practitioners. In response to the building defects crisis, the *Residential Apartments Building (Compliance and Enforcement) Act 2020* (NSW) allows the Secretary of the relevant government department to make an order that prohibits the issuance of an occupation certificate if, amongst other things that are procedural in nature, the Secretary is satisfied that a serious defect in the building exists, or building bond as required under the relevant strata legislation has not been provided.

The Qld Government introduced the *Building and Construction Legislation (Non-conforming Building Products— Chain of Responsibility and Other Matters) Amendment Act* 2017 holding all persons in the building products supply chain responsible for ensuring products are not non-conforming. This was in response to concerns about highly flammable external cladding. In essence, a product is deemed a non-conforming product if: it is not or will not be

safe; does not comply with a relevant regulatory provision; or the product does not or cannot perform to its intended standard.

Table 4.3: Relevant building laws and objectives in NSW, Qld, and WA

Comparable state	Relevant regulation	Purposes / objectives of enactments
NSW	*Home Building Act 1989* (NSW)	The Act makes provision concerning the residential building industry and certain specialist work.
	Design and Building Practitioners Act 2020 (NSW)	The Act: • provides for registration of builders and building designers; • creates a scheme to register regulated designs and variations for each building on a portal before work commences and within one day of a variation being made. Regulated designs cover all building elements, building work and performance solutions; • requires compliance declarations to be made by design practitioners that the design complies with the Building Code of Australia (BCA); • creates a statutory duty of care on a person who carries out building design and work to exercise reasonable care to avoid economic loss caused by defects. This operates in addition to homeowner warranties, which apply in similar terms in both NSW and Vic. The duty of care is owed to each owner of the land including all subsequent owners. The duty of care is retrospective and applies to buildings less than 10 years old from 10 June 2020.
	Residential Apartments Building (Compliance and Enforcement) Act 2020 (NSW)	The Act applies to Class 2 buildings and is intended to prevent serious defects resulting in harm or loss to future owners. A builder must give advanced notice of applying for an occupation certificate and through a series of reports and inspections the occupation certificate will not be granted until defects have been rectified and the building complies with the BCA and Australian standards.
Qld	*Building Act 1975* (Qld)	The Act governs all building work in Qld, empowering the regulation of certain aspects of buildings and structures. It includes the administrative terms necessary to give effect to the laws.
	Queensland Building and Construction Commission Act 1991 (Qld)	The Act regulates the building industry by: • ensuring the maintenance of proper standards; • achieving a reasonable balance between the interests of building contractors and consumers; • providing remedies for defective building work; • providing support, education and advice for consumers and those people undertaking building work. The Act also holds that a person in the chain of responsibility for a building product must, so far as responsibly practicable, ensure the product is not a non-conforming building product for an intended use. The Act requires that a person in the chain of responsibility has a duty to provide 'required information' to accompany a building product as it passes to the next person in the building product supply chain.[46] Each person in the chain of responsibility also needs to conduct due diligence investigation on the 'required information' they receive to ensure compliance with the Act.

[46] *Queensland Building and Construction Commission Act 1991* (Qld) s 74AG.

		The Act contemplates that more than one person can concurrently have the same duty and each person must comply with that duty. The senior executives of a company who fall within the chain of responsibility must exercise due diligence to ensure the company complies with the duties imposed on it. This includes gaining an understanding of the safety and non-compliance risks associated with the products the company designs, sells or installs and ensuring the company applies its resources to remove or minimise those risks.
WA	*Building Act 2011* (WA)	The Act provides for permits for building work and demolition work; standards for the construction and demolition of buildings and incidental structures; the use and maintenance of existing buildings and incidental structures; and other related matters.
	Building Regulations 2012 (WA)	The Regulations set out the process for obtaining a building permit, applicable building standards for various works and structures, occupancy and building approval certificates, and maintenance of building requirements.

4.3 Mandated inspections relating to passive fire protection systems

During the construction phase of a residential building, mandatory onsite inspections are required to be undertaken by independent and qualified party (e.g., the building surveyor that issued the building permit, or another person on their behalf) in order to ensure regulatory compliance is being met. This step in the construction process is an essential oversight mechanism. This is particularly important for some of the PFP systems that cannot be easily inspected post-construction (for example, fire wall systems).

4.3.1 Mandatory inspection requirements – Victoria

For all class 2 buildings, the Relevant Building Surveyor (RBS) must inspect on each storey of the building any building element, and one of each stair shaft, lift shaft or service shaft that is lightweight construction and required to resist the spread of fire. For the purpose of this provision, lightweight construction means construction which incorporates or comprises sheet or board material, plaster, render, sprayed application, or other material similarly susceptible to damage by impact, pressure or abrasion. Inspections must be carried out when the building element is accessible and able to be clearly viewed. These provisions do not apply in relation to building work carried out under a permit issued before 2 June 2018.[47]

4.3.2 Mandatory inspection requirements – NSW

PFP components and elements of Class 2 buildings in NSW must be inspected at critical stages as defined by clause 162A of the *Environmental Planning and Assessment Regulation 2000* (NSW). The critical stages for passive fire inspections are:

- prior to the covering of fire protection at service penetrations to building elements that are required to resist internal fire or smoke spread. An inspection of a minimum of one of each type of protection method for each type of service, on each storey of the building comprising the building work is required; and
- prior to covering the junction of any internal fire-resisting construction bounding a sole-occupancy unit, and any other building element required to resist internal fire spread. An inspection of a minimum of 30% of sole-occupancy units on each storey of the building containing sole-occupancy units is required.

[47] *Building Regulations 2018* (Vic) reg 172.

4.3.3 Mandatory inspection requirements – Qld

In Qld, the frequency and extent of PFP system inspections during construction is determined by reference to guidelines published pursuant to the *Building Act 1975* (Qld).[48] The guidelines acknowledge fire safety requirements may differ across the various classes of buildings. They could potentially be more complex for buildings of a public nature or residential use when compared with general commercial buildings such as warehouses and factories. The guidelines require an inspection schedule to be agreed that enables inspections of passive fire components and elements at times when they are accessible and able to be clearly viewed. The examples given for different types of buildings suggest it may be appropriate these fire safety systems are inspected as each level of the building reaches a stage in the construction program that precedes wall and ceiling finishes.

4.3.4 Mandatory inspection requirements – WA

There are no regulatory provisions in WA relating to the frequency and extent of passive fire inspection during construction.

4.4 Relevant ancillary regulations

In addition to building specific regulations, there are numerous other laws that should be briefly considered. There are planning, professional registration, strata and community title, and consumer protection laws that relate to residential construction and building defects more broadly, and fire safety more specifically. Each of these ancillary regulatory areas are briefly outlined and compared across jurisdictions.

4.4.1 Planning laws

Planning laws provide a process for applying for permission to use and develop land in a certain way. A planning permit contains a written document with conditions that must be met and a set of plans. Local councils issue most planning permits, but some may be issued directly by the minister responsible for planning. Table 4.4 outlines state specific planning laws and objectives.

Table 4.4: Comparative planning laws and objectives

State	Enactment	Objective
Vic	*Planning and Environment Act 1987* (Vic)	This Act establishes a framework for planning the use, development, and protection of land in Vic. It also provides for planning permits that allow developments to be undertaken according to approved plans and conditions.
NSW	*Environment Planning and Assessment Act 1979* (NSW)	This Act has similar objectives to the *Planning and Environment Act 1987* (Vic).
Qld	*Planning Act 2016* (Qld)	This Act has similar objectives and provisions to the *Planning and Environment Act 1987* (Vic).
WA	*Planning and Development Act 2016* (WA)	This Act has similar objectives and provisions as the *Planning and Environment Act 1987* (Vic) and local authority laws.

[48] *Building Act 1975* (Qld) s 258 and Department of Housing and Public Works, Guidelines for Class 2-9 buildings, effective 1 October 2020.

4.4.2 Practitioner registration laws

Practitioner registration laws provide different forms of registration and licensure for the range of participants in the building industry. These laws may provide for licenses, registration, endorsements, and permits to do restricted work and establish a regime for stipulating conditions under which this work can be done. The conditions will typically include for example, where the applicant holds the minimum education qualifications, relevant experience, professional indemnity insurance, and continuing professional development participation. The laws contain provisions to enable the regulator to take enforcement and disciplinary action against a building practitioner. Table 4.5 highlights the relevant state legislation that regulates key building practitioners. Chapter 5 of this paper provides more detail relating to the practitioner registration requirements.

Table 4.5: Comparative practitioner registration laws

Discipline	Vic	NSW	Qld	WA
Builders	*Building Act 1993* (Vic)	*Design and Building Practitioners Act 2020* (NSW)	*Queensland Building and Construction Commission Act 1991* (Qld)	*Building Services Registration Act 2011* (WA)
Architect	*Architects Act 1991* (Vic)	*Architects Act 2003* (NSW)	*Architects Act 2002* (Qld)	*Architects Act 2004* (WA)
Draftsperson/Designer	*Building Act 1993* (Vic)	*Design and Building Practitioners Act 2020* (NSW)	*Queensland Building and Construction Commission Act 1991* (Qld)	*Building Services Registration Act 2011* (WA)
Site or project manager	*Building Act 1993* (Vic)	*Design and Building Practitioners Act 2020* (NSW)	*Queensland Building and Construction Commission Act 1991* (Qld)	*Building Services Registration Act 2011* (WA)
Fire safety engineer	*Professional Engineers Registration Act 2019* (Vic)	*Design and Building Practitioners Act 2020* (NSW)	*Professional Engineers Act 2002* (Qld)	Not currently registered – proposed reforms
Structural and other engineers	*Professional Engineers Registration Act 2019* (Vic)	*Design and Building Practitioners Act 2020* (NSW)	*Professional Engineers Act 2002* (Qld)	Not currently registered – proposed reforms
Building surveyor /certifier	*Building Act 1993* (Vic)	*Building and Development Certifiers Act 2018* (NSW)	*Queensland Building and Construction Commission Act 1991* (Qld)	*Building Services Registration Act 2011* (WA)
Fire safety installer	Not registered	*Building and Development Certifiers Regulation 2018* (NSW). Certified as competent by the building certifier (reg 65)	*Queensland Building and Construction Commission Act 1991* (Qld)	Not registered
Carpenters	Not registered	*Home Building Act 1989* (NSW)	*Queensland Building and Construction Commission Act 1991* (Qld)	*Building Services Registration Act 2011* (WA) – Registered Building Practitioner
Electricians	*Electricity Safety Act 1998* (Vic)	*Home Building Act 1989* (NSW)	*Electricity Safety Act 2002* (Qld)	*Electricity (Licensing) Regulations 1991* (WA)
Plumbers	*Building Act 1993* (Vic)	*Home Building Act 1989* (NSW)	*Plumbing and Drainage Act 2018* (Qld)	*Plumbers Licensing Act 1995* (WA)

4.4.3 Strata and community title laws

Strata and community title laws impact on apartment buildings in two ways. Firstly, strata and community development laws can require developers to structure ownership and management arrangements of apartment buildings in ways that best suit the unidentified future owners. These laws can impact on long term contracts for the servicing and annual auditing of building components, including passive fire system componentry. For example, a developer, on behalf of the owners corporation, can enter into a contract with a ESM provider for several years (depending on the restrictions in the various jurisdictions) disempowering the collective owners ability to choose its preferred provider. Secondly, strata management laws require maintenance of buildings in a particular way, which is unique to this form of property ownership. These laws contain statutory duties to keep the common property maintained and repaired immediately any part of the common property falls into disrepair. These laws extend to services and infrastructure within common property. Table 4.6 outlines the relevant regulations in each state and the relevant legislative objectives.

Table 4.6: Comparative strata and community title laws

Category	Vic	NSW	Qld	WA
Strata management	*Subdivision Act 1988* (Vic) This law allows land and buildings to be subdivided into lots (apartments) and common property. It imposes obligations on the developer on the formation of the owners corporation to hold and manage the common property.	*Strata Schemes Management Act 2015* (NSW) This law provides for the management of strata schemes and to provide resolution of disputes arising from the schemes.	*Body Corporate and Community Management Act 1997 (*Qld) Incorporates both strata development and strata management laws similar in effect to the *Subdivision Act 1988* (Vic); *Owners Corporations Act 2006* (Vic); *Strata Schemes Development Act 2015* (NSW); *Strata Schemes Management Act 2015* (NSW*).*	*Strata Titles Act 1985* (WA) This law allows land and buildings to be subdivided into lots (apartments) and common property and to be managed by a strata company, It imposes obligations on the developer on the formation of the strata company to hold and manage the common property.
Strata development	*Owners Corporations Act 2006* (Vic) This law provides for the formation and functioning of an owners corporation to hold and manage the common property and the strata scheme. It imposes strict obligations regarding maintenance and repair on common property including services and infrastructure.	*Strata Schemes Development Act 2015* (NSW*)* An Act to create freehold strata schemes and leasehold strata schemes; to provide for dealings with lots and common property in the schemes and for varying, terminating and renewing the schemes.	*Body Corporate and Community Management Act 1997 (*Qld) The laws relating to development of strata in Qld are contained in the same Act as the management laws – see above.	*Strata Titles Act 1985* (WA) The laws relating to development of strata in WA are contained in the same Act as the management laws – see above.

4.4.4 Consumer protection laws

Consumer protection laws for the building and construction industry include laws relating to warranties to homeowners about how work will be performed and the suitability of materials to be used. Additionally, NSW provides a duty of care to avoid economic loss caused by defects. These consumer protection rights cannot be excluded and apply for the benefit of successors in title including future purchasers of residential apartment.

Table 4.7: Comparative consumer protection laws – warranties and duties

State	Enactments	Warranties and duties provisions
Vic	*Domestic Building Contracts Act 1995* (Vic)	Residential apartment buildings fall within the definition of 'domestic building work' for the DBC. This Act implies statutory warranties about standards of work and fitness of materials, which extend for 10 years (generally after the issuance of the occupancy certificates) and benefit all the successive owners in that time. Note that although implied warranties apply to all residential high-rise buildings, the statutory insurance scheme under the DBC applies only to residential buildings of not more than three-storeys.
NSW	*Home Building Act 1989* (NSW) *Design and Building Practitioners Act 2020* (NSW)	This Act contains statutory homeowner warranties like the *Domestic Building Contracts Act 2000* (Vic). This Act creates a statutory duty of care on a person who carries out building design and work to exercise reasonable care to avoid economic loss caused by defects.
Qld	*Queensland Building and Construction Commission Act 1991* (Qld)	This Act contains statutory homeowners' warranties like the *Domestic Building Contracts Act 2000* (Vic) and the *Home Building Act 1989* (NSW).
WA	*Home Building Contracts Act (1991)* (WA)	This Act implies terms into home building contracts including those to be strata titled.

4.5 Ongoing maintenance obligations

Although this research focuses on PFP defects (arising from the construction stage), it is instructive to include an overview of the post-construction obligations placed on building owners to maintain fire services including PFP systems. This section outlines the legal requirements placed on building owners (owners corporations, bodies corporate) to maintain essential fire safety systems.

4.5.1 Building owners maintenance obligations - Victoria

The requirements for Victorian building owners and occupiers to maintain, inspect and report on fire safety measures, are contained in the *Building Regulations 2018* (Vic). This includes owners corporations.

Building owners must ensure that Essential Safety Measures (ESMs) are maintained and operate satisfactorily. The owner is required to maintain all ESMs for a building as specified

in the regulations. Building occupiers have an obligation to ensure all exits and paths of travel to exits are kept readily accessible, functional, and clear of obstructions.

ESMs are the safety features required in a building to protect occupants in the event of a fire. ESMs include PFP systems, as well as other fire safety equipment. ESMs are required to be specified in the occupancy certificate issued by the building surveyor for the building. Councils have responsibility for the enforcement of building safety within their municipality.[49]

Regulation 223 requires building owners (where an ESM is required) to prepare an Annual Essential Safety Measures Report (AESMR) within a prescribed time limitation on an annual basis. An AESMR provides a framework for yearly reporting by a building owner indicating that the ESMs of a building are being maintained and are working. If there is no occupancy permit or maintenance determination, an AESMR must be prepared within the 28 days before 13 June each year. An AESMR needs to be prepared in accordance with the prescribed form.

Building owners must also keep records of maintenance checks, safety measures and repair work so they can be inspected by a Municipal Building Surveyor (MBS) or chief officer of the fire brigade. The Building Act gives the power for the chief officer and MBS to inspect ESMs or any records relating to maintenance of ESMs.[50] Building owners must make these documents and the annual reports available on request after 24 hours' notice has been given. Documents relating to the building and/or place required for availability are as follows:

- the current AESMR;
- all AESMRs prepared under these regulations or any previous corresponding regulations within 10 years before the request;
- all maintenance schedules in relation to the ESMs;
- all maintenance determinations requiring an ESM to be provided;
- the records of all inspections, testing, and maintenance (including repairs) of any ESM for the building or place.

Regulation 227 requires the owner of a building and/or place to ensure ESMs are not removed from an approved location except for the purpose of inspection, testing of, or the carrying out of maintenance on that ESM.

4.5.2 Building owners maintenance obligations - NSW

The requirements for building owners and occupiers regarding maintenance and reporting about fire safety systems are contained in the *Environmental Planning and Assessment Regulation 2000* (NSW).

A fire safety certificate is issued by, or on behalf of, the building owner(s) upon the completion of new building work. The certificate confirms each of the fire safety measures that apply to a building (as listed in the fire safety schedule) have been installed and checked by a qualified person.

The fire safety schedule specifies each of the fire safety measures that apply to the building premises. The schedule specifies the minimum standard of performance for each of the

[49] *Building Act 1993* (Vic) Part 8.
[50] *Building Act 1993* (Vic) s 227E.

measures. This schedule reflects the standard to which each measure is designed, installed and capable of operating.[51]

The building owner is responsible for maintaining each fire safety measure to the required minimum standard of performance contained in the fire safety schedule. For fire safety measures that apply to buildings by means other than a fire safety schedule, the measures must be maintained to the standard to which each measure was originally designed and implemented.[52]

A building owner must ensure an annual fire safety statement for the building is issued each year and that a copy of the statement is provided to the local council and Commissioner of Fire and Rescue NSW.[53] An annual fire safety statement is a declaration by or on behalf of a building owner that an accredited practitioner (fire safety) has:

- assessed, inspected, and verified the performance of each existing essential fire safety measure that applies to the building;
- inspected the exit systems serving the building and found that the exit systems within the building do not contravene the provisions of Division 7 of Part 9 of the regulation.

A person may be provided with the appropriate authority from the building owner to issue the statement on behalf of the owner(s). For residential apartments, this may include a strata manager, or the executive committee of an owners corporation.

4.5.3 Building owners maintenance obligations - Qld

Owners of, or a business or person occupying a building in Qld have a legal obligation to ensure the safety of any person in that building in the event of a fire or hazardous material emergency under the *Fire and Emergency Services Act 1990* (Qld) and the *Building Fire Safety Regulation 2008* (Qld), *Building Act 1975* (Qld), and the *Queensland Development Code* MP 6.1. The occupier of a building (body corporate) must maintain at all times, adequate means of escape, prescribed fire safety installations, monitored systems, and evacuation plans. If the building owner receives a critical defect notice following a maintenance inspection, they must take action within one month of receipt and show evidence of the corrective action.

4.5.4 Building owners maintenance obligations - WA

In WA, the owner of an existing Class 2 to Class 9 building must ensure the safety measures in each part of the building can perform to a standard set out in the relevant building standards for the part.[54] There are no requirements for annual testing, inspections and reporting of compliance.

4.6 Development document handover

In each Australian jurisdiction, the relevant strata and community title legislation requires specified documentation to be handed over to the new building owner or its representative (e.g., owners corporation or body corporate) at a time post scheme registration (usually at the first Annual General Meeting (AGM) for the scheme). The requirement to handover these

[51] *Environmental Planning and Assessment Regulation 2000* (NSW) r 168.
[52] Ibid, r 182.
[53] Ibid, r 175.
[54] *Building Regulation 2012* (WA), s 48A.

documents is a statutory requirement, as these documents should provide the necessary information to the new owner in order for the building and assets to be properly maintained. It is essential to understand the type of construction, the products used, the manufacturers of products (for warranty purposes), where specific assets, cables, conduits, pipes, and various systems are located in the scheme, and the approvals and certificates that are issued by various industry practitioners or local councils. The following outlines the respective document handover requirements in each of the states reviewed.

4.6.1 Document handover requirements - Victoria

In Victoria, a person who applies for registration of a strata plan (i.e., the developer) must provide documents to the owners corporation including building and construction documents.[55] These documents must be provided at the first AGM, which must be held within six months of the registration of the plan of subdivision.[56] The primary obligation to provide building and construction documents requires the developer to provide 'all building plans, planning documents and other similar documents'.[57] There are also other building and construction related documents that must be provided including a maintenance plan, warranties and guarantees provided by tradespeople and suppliers, and a building maintenance manual.

4.6.2 Document handover requirements - NSW

In NSW, the original owner (developer) must provide documents and records to the owners corporation.[58] These documents and records must be provided not later than 48 hours before the first AGM. The documents required to be provided include - all relevant plans, specifications, occupation certificates, other certificates, diagrams, depreciation schedules, insurance policies, other documents. Without limitation, planning approvals, as-built drawings, and fire safety certificates must be included.

4.6.3 Document handover requirements - Qld

In Qld, the original owner (developer) must provide documents and records to the body corporate in accordance with the relevant provisions under the applying module regulation. The Standard Module requires the following construction related documents to be delivered – a register of assets, development approval, all plans, specifications, diagrams and drawings of buildings and improvements forming part of scheme land, as built, showing water pipes, electrical wiring, drainage, ventilation ducts, air-conditioning systems and other utility infrastructure, a fire evacuation plan, documents in the original owner's possession or control relevant to the buildings or improvements on scheme land including contracts for building work.[59]

[55] *Owners Corporations Act 2006* (Vic), s 67(1).
[56] Ibid, s 66.
[57] Ibid, s 67 (1)(e).
[58] *Strata Schemes Management Act 2015* (NSW), s 16(1).
[59] *Body Corporate and Community Management (Standard Module) Regulation 2020* (Qld), s 96.

4.6.4 Document handover requirements - WA

In WA, the developer must provide key documents to the strata company at the first AGM.[60] The key documents include the application for registration of the scheme, planning approvals, occupancy permits and building approval certificates, specifications, diagrams and drawings (including any specifications, diagrams and drawings that show utility conduits, utility infrastructure or sustainability infrastructure), any contracts (including variations) relevant to the design or construction of buildings and improvements, and as constructed plans and diagrams.[61]

[60] *Strata Titles Act 1985* (WA), s 78.
[61] Ibid, s 3 (Definitions).

Chapter 5: Construction roles and responsibilities

Ensuring Passive Fire Protection (PFP) systems are correctly designed, specified, tested, installed, and maintained reduces the risks of defects. Therefore, it is essential each practitioner and tradesperson involved in the design and installation of the system is not only competent but complies with the laws, codes, and specifications relating to the PFP system being installed. The number and role of practitioners and trades involved can vary from one development to the other depending on the complexities of the PFP system. Table 5.1 describes the main practitioners in PFP systems and summarises their roles in the construction of a residential apartment building.

Table 5.1: Main practitioners in the passive fire protection

Role	Key responsibilities for passive fire protection
Builder	Engages the design team and is responsible for building compliance being achieved and maintained.
Architect /Building designer	Provides design drawings to all project practitioners and details the passive fire protection requirements.
Fire safety engineer/designer	Produces the fire engineering brief (where the building incorporates performance solutions) containing the fire safety strategy, produces the fire engineering report, documents the fire safety measures and completion requirements.[62]
Civil/structural engineers	Specify the fire resistance levels of building elements.
Mechanical/electrical/hydraulic engineers	Provides services regarding the penetrations of fire resisting building elements.
Relevant Building Surveyor (RBS) /certifier	Checks and declares work complies with the required codes and standards, may require third-party peer review, and may rely on the fire engineering brief and fire engineering report before issuing building permits.
Fire safety and compliance practitioner / installer	Provides services relating to the installation, maintenance, and inspection of passive fire systems.
Various service contractors (plasterer, electrician, plumber, communications etc)	Work that involves openings and penetrations of passive fire safety systems.

This section details the regulatory framework for each of the practitioners in PFP in Victoria and then compares each discipline registration requirements across the states of Victoria, New South Wales (NSW), Queensland (Qld), and Western Australia (WA)

It is important to note that although property developers are influential in the residential construction industry, they are not required to be registered or licensed in Victoria, NSW, Qld, or WA if they have contracted out building work and supervision. In WA, developers are required to register their principal place of business with the Commissioner for Consumer Protection for as long as the business is carried out.[63]

[62] Other engineers are involved in passive fire safety; for example, façade and energy efficiency engineers (for their work with wall materials) and designers of fire safety systems (including of sprinklers, hydrants, fire detection, etc) and other engineers when they specify materials and equipment that involves openings and penetrations.

[63] *Real Estate and Business Agents Act 1978* (WA), s 57.

5.1 Builders

There are many categories of registration for builders in Victoria. This research is concerned with, commercial and domestic builders that carry out building work on Class 2 buildings. In the 10-year period from July 2011 to June 2021, 8,853 building permits for the construction of Class 2 buildings (for new builds) were issued. Of those permits, 4,119 (47%) were issued to registered domestic builders in the unlimited category, and 2,568 (29%) were issued to registered commercial builders in the unlimited category. Therefore, it is evident that nearly half of new Class 2 builds are undertaken by domestic builders.[64]

Builders' registration is governed by the *Building Act 1993* (Vic) and regulated by the Victorian Building Authority (VBA). The VBA is responsible for, among other matters, monitoring and enforcing compliance with the Act and regulations, and to supervise and monitor the conduct and ability to practice of registered building practitioners.

Table 5.2 compares builders' registration provisions in Victoria with the other identified states. Although there are some consistencies when comparing the requirements across these jurisdictions (e.g., police checks, fit and proper person tests, certificate or diploma qualifications), there is variation in the qualifications, experience or other requirements. A building surveyor must not issue a building permit unless they are satisfied that the building work and the building permit will comply with the *Building Act 1993* (Vic) and regulations.[65] A domestic builder carrying out building work valued in excess of $16,000 also requires a certificate of domestic building insurance for the work.

The level of practical experience required to be eligible to be registered ranges from two years to seven years with varying additional requirements. NSW is the only state to require National Construction Code (NCC) competency mandatory modules to be undertaken. Currently only Qld requires professional indemnity insurance and has annual financial reporting obligations. NSW will require professional indemnity insurance by July 2022. NSW and WA have record keeping requirements with NSW having included more specifications around this requirement and inspection parameters. NSW is also the only state with a statutory code of conduct and continuing professional development regime. It is evident from this review that NSW and, to a certain extent, Qld have the most rigorous registration requirements for builders.

[64] Data provided by the Victorian Building Authority, collated from building permit information reported to the VBA by building surveyors, as required under the *Building Act 1993*.
[65] *Building Act 1993* (Vic) s. 24(1).

Table 5.2: Builder registration requirements by state

Builders	Vic		NSW (dual licensing system)		Qld	WA
Designation	Commercial builder - unlimited	Domestic builder – unlimited	Builder licence	Building practitioner	Builder – open contractor	Registered building practitioner
Requirement to register	Managing and arranging all components of commercial building work of unlimited height and floor size when a building permit is required.	Carrying out all components of domestic building work for the construction, renovation, improvement, or maintenance of a home (including Class 1,2 and 4 buildings)	Carry out building work	Working as a building practitioner to make declarations that Class 2 buildings will be constructed to designs compliant with the Building Code of Australia (BCA) and lodge regulated designs in NSW planning portal before work commences and within one day of making variations.	To work on all classes of buildings, prepare plans, and specifications and until 2 May 2025 install and maintain fire collars, fire rated penetrations and fire rates joint sealing, fire and smoke walls and fire rated ceilings.	To be named as a builder on a building permit; provide services as a builder for work that requires a building permit, has a value of $20,000 or more and is located within the area of the board's jurisdiction; or use a prescribed title such as registered building contractor.
Legislation	*Building Act 1993* (Vic) *Building Regulations 2018*	*Building Act 1993* (Vic) *Domestic Building Contracts Act 1995* (Vic) *Building Regulations 2018*	*Home Building Act 1989* (NSW)	*Design and Building Practitioners Act 2021* (NSW)	*Queensland Building and Construction Commission Act* 1991 (Qld)	*Building Services Regulation Act 2011* (WA)
Regulatory authority	Victorian Building Authority (VBA)	Victorian Building Authority (VBA)	Department of Fair Trading	Department of Fair Trading / Office of Building Commissioner	Queensland Building and Construction Commission	Building Services Board
Qualifications requirements	Prescribed degree or an advanced diploma of building and construction management (CPC 60212 or CPC 602220).	Prescribed degree or diploma of building and construction management	Certificate IV in building and construction plus another approved degree or diploma.	<u>Qualifications</u> Must hold an endorsed contractor licence authorising general building work under the *Home Building Act 1989* (NSW). <u>Knowledge</u>	Advanced diploma of building and construction (management) CPC 60220 or equivalent.	Diploma of building and construction.

Builders	Vic		NSW (dual licensing system)		Qld	WA
				Design and Building Practitioners Act 2020 (NSW) *Design and Building Practitioners Regulation 2021* (NSW) *Environmental Planning and Assessment Act 1979* (NSW) and regulations relevant to the class. *BCA* (Volumes 1 and 2) relevant to the class. Building design including methods, materials and planning relevant to the class of registration.		

Builders	Vic		NSW (dual licensing system)		Qld	WA
Experience requirements	At least three years relevant practical experience (gained within the seven years prior to the application) including construction of buildings higher than 25 metres.	At least three years practical experience	At least two years across a wide range of building construction.	<u>Skills</u> Must be able to interpret, apply and assess compliance with the relevant requirements of the BCA. <u>Experience</u> Five years practical which is: *Recent* – at least five years (or equivalent part-time) experience within the last 10 years, including at least two years Australian experience. *Relevant* - experience relevant to this class of registration involving a Class 2, 3, 9a or 9c building.	Four years with more than 50% building work in the open class.	Seven years of experience in carrying out and supervising building and construction. There are other pathways offered with a mixture of different qualifications and experience levels.
Fit and proper person test	Yes, including insolvency of influential person for a company within two years.	Yes, including insolvency of influential person for a company within two years.	Yes	Yes	Yes	Yes
Police check	Yes	Yes	Yes	Yes	Yes	Yes
National Construction Code (NCC) competency	No specific requirements	No specific requirements	No specific requirements	Yes, two mandatory modules from the Construct NSW learning modules.	No specific requirements	No specific requirements
Professional indemnity insurance (PII)	No	No	No	Commences from 1 July 2022	Yes, minimum amount $500,000	No

Builders	Vic		NSW (dual licensing system)		Qld	WA
Minimum financial requirements	No	No	No	No	Yes, annual reporting obligations and revenue and net tangible asset tests applied according to licenses categories and classes.	No
Record keeping	Not specified	Not specified	No	Yes, for inspection for at least 10 years.	No	Yes, but not defined
Code of conduct	No	No	No	Yes, Sch 4 *Design and Building Practitioners Regulation 2021* (NSW)	No	No
Continuing Professional Development (CPD)	Not required	Not required	Yes, 12 hours per annum.	Yes, at least three hours per annum using Construct NSW learning platform for the Australian Building Codes Board (ABCB) NCC CPD system.	No	No

5.2 Architects

Architects are regulated, by a profession specific enactment, *Architects Act 1991* (Vic). This Act provides for the establishment of a regulatory board, Architects Registration Board of Victoria (ARBV).

The ARBV is responsible for registering working architects. The Board prescribes the qualifications, knowledge, skills, and experience necessary to work as an architect in accordance with the National Standard of Competency for Architects (NSCA). The NSCA is published by Architects Accreditation Council of Australia (AACA).

The ARBV also sets other eligibility requirement for registration including tests for character fitness, codes of conduct, professional indemnity insurance, and continuing professional development requirements.

Table 5.3 compares registration of architects in Victoria with the other main states. The classes of registration for architects are consistent across the identified jurisdictions. Architects are required to hold an approved degree and prescribed experience. Architects in NSW, Qld and WA are required to undertake 3300 hours of supervised experience. Victorian architects must have a minimum of two years' experience. There are no NCC competency or record keeping requirements. Each state has a fit and proper person test and a statutory code of conduct (except WA has not yet provided a code only the provision for it). Professional indemnity insurance and CPD (20 hours per year with formal CPD requirements) is required. NSW is the only state with a dual licensing system that includes the registering of a design practitioner - architectural. Only these registered practitioners are eligible to carry out building work on Class 2 buildings and must have knowledge and understanding of the relevant NSW building and planning laws, the BCA and building design. They must have at least five years' experience and have completed NCC competency modules. There are record keeping and inspection requirements, specified CPD, and professional indemnity insurance (commencing 1 July 2022). Again, there is a much more rigorous registration regime in NSW for architects involved in the design of Class 2 buildings than any other jurisdiction.

Table 5.3: Architect registration requirements by state

Architects	Victoria	NSW	Qld	WA
Designation	Architect	Architect, registered architect (Column information deleted intentionally)	Architect	Architect
Requirement to register	To persons and entities representing to be architects or provide architectural services.	To persons and entities representing to be architects or provide architectural services.	To persons holding out or offering architectural services.	To persons holding out or offering architectural services.
Legislation	*Architects Act 1991* (Vic)	*Architects Act 2003* (NSW)	*Architects Act 2002* (Qld)	*Architects Act 2004* (WA)
Regulatory authority	Architects Registration Board of Victoria (ARBV)	NSW Architects Registration Board (NSWARB)	Board of Architects Queensland (BOAQ)	Architects Board of Western Australia (ABWA)
Classes of registration	Two registration classes: Architect (practising) Architect (non-practising) Individuals approved as well as partnerships and companies.	Two registration classes: Architect (practising) Architect (non-practising) Does not approve partnerships and companies.	Two registration classes: Architect (practising) Architect (non-practising) Does not approve partnerships and companies.	Two registration classes: Architect (practising) Architect (non-practising) Individuals approved as well as partnerships and companies.
Qualifications and knowledge requirements	Approved architectural degree or qualification and have passed the Architectural Practice Exam (APE).	Approved architectural degree or qualification, good fame, and character, passed APE.	Approved architectural degree or qualification, passed APE, and fit to practice.	Approved architectural degree or qualification, passed APE.
Skills and experience	Two years of experience	3300 hours supervised relevant work experience	3300 hours supervised relevant work experience	3300 hours supervised relevant work experience
National Construction Code (NCC) competency	No specific requirements	No specific requirements	No specific requirements	No specific requirements
Fit and proper person test	Yes, limited to last 10 years; limited to architectural work and within the last 10 years.	Yes, not convicted of a serious offence; guilty of an offence under the *Architects Act 2003* (NSW); registration previously cancelled or suspended; no previous insolvency.	Yes, must have no convictions for serious crimes or offence against the Act; registration not previously cancelled or suspended in Qld or elsewhere; not affected by insolvency; not Impacted by physical and mental health.	Yes, not convicted of a serious crime and otherwise be fit and proper person (no guidance given on the meaning of this term).

Architects	Victoria	NSW	Qld	WA
Code of conduct	The Victorian Architects Code of Professional Conduct is a Schedule to the *Architects Regulations 2015* (Vic).	Statutory code of conduct	Statutory code of conduct	There is provision for a code to be adopted but this has not happened.
Professional indemnity insurance (PII)	PII required and set by ministerial order 15 February 2020.	PII required in sum determined by each architect as appropriate.	PII required by code of conduct in a sum thought sufficient by the architect.	PII is a condition of getting a license to practise.
Record keeping		No	No	No
Continuing Professional Development (CPD)	For practising architects, 20 hours per year with at least 10 hours being formal CPD activities.	For practising architects, 20 hours per year with at least 10 hours being formal CPD activities.	For practising architects, 20 hours per year with at least 10 hours being formal CPD activities.	For practising architects, 20 hours per year with at least 12 hours being formal CPD activities.

5.3 Designers

Building designers, once called ‘draftsmen’ or ‘draftspersons’, are regularly tasked with the production of building plans and associated documents, assist with the preparation of building permit applications, refine plans and documentation to enable builders to tender for construction, and work with engineers to produce compliant designs in order to obtain building permits and guide service installation. Table 5.4 outlines the regulatory requirements across the identified states for building designers.

There are similarities between the work of building designers and architects. The latter are usually more expensive and have more extensive qualifications with a focus on the creative aspect of the work, particularly the exteriors.

Table 5.4: Designers registration requirements by state

Designers	Vic	NSW	Qld	WA
Designation	Building Design (Architectural) Building Design (Interior) Building Design (Services)	Design practitioner–architectural	Building design – open licence	No registration requirements
Requirements to register	Registered practitioners do the following[66] for all classes of buildings and types of construction: -produce plans and documentation for building work; -assist with building permit applications and other associated permits; -develop plans and documentation to enable builders to tender for construction; -work closely with endorsed building engineers to produce compliant designs and drawings to obtain building permits and guide service installation.	To be authorised to prepare regulated designs and make compliance declarations in relation to an architectural service.		
Legislation	*Building Act 1993* (Vic), *Building Regulations 2018*	*Design and Building Practitioners Act 2020* (NSW)	*Queensland Building and Construction Commission Act* 1991 (Qld)	

[66] The scope of work for the classes in this category is not prescribed in the Building Regulations 2018, and this description is obtained from the VBA website: Draftsperson | Victorian Building Authority (vba.vic.gov.au). This description of the scope of work only relates to the class of Building Design (Architectural); there are different scope of works for Building Design (Interior) and Building Design (Services).

Designers	Vic	NSW	Qld	WA
Regulatory authority	Victorian Building Authority (VBA)	Department of Fair Trading /Office of Building Commissioner	Queensland Building and Construction Commission	
Qualifications requirements	You satisfy the knowledge requirements for registration in Building Design (Architectural), if you have successfully completed one of the following qualifications: - 22268VIC Advanced Diploma of Building Design (Architectural), or - 22477VIC Advanced Diploma of Building Design (Architectural). - Bachelor of Building Design from Victoria University, plus: o CPCWHS1001 Prepare to work safely in the construction industry unit; or o A copy of your WorkSafe Construction Induction card	Hold full registration as an architect under the *Architects Act 2003* (NSW) including university qualification in architecture prescribed by the board or qualifications that the board deems equivalent. Be recorded as a practicing architect in the register maintained by the Registrar of NSW Architects Registration Board. <u>Knowledge</u> *Design and Building Practitioners Act 2020* (NSW) *Design and Building Practitioners Regulation 2021*(NSW) *Environmental Planning and Assessment Act 1979* (NSW) and regulations relevant to the class. *BCA* (Volumes 1 and 2) relevant to the class Building design including methods, materials	Any one of the following— (a) successful completion of any of the following courses - Bachelor of Design (Honours) (Architectural Studies) DE42 (QUT); or, Bachelor of Building Design CU65 (CQU); - successful completion of a course or modules of a course the commission considers is at least equivalent to a course mentioned in paragraph (a); - recognition certificate as a building designer qualified to carry out the scope of work for the class; - a qualification or statement of attainment of required competency for the class of licence.	

Designers	Vic	NSW	Qld	WA
		and planning relevant to the class of registration.		
Experience requirements	You must hold at least two years practical experience obtained in the last seven years in the following areas of experience: - prepare Class 1 technical Building design (architectural) drawings; - prepare Class 2 to 9 technical Building design (architectural) drawings; -initiate the application for building permits; - project administration and building contract administration; - brief and coordinate secondary consultants. This experience must have been supervised by a person registered in one of the following: - draftsperson, Building Design (Architectural) - an architect registered by the Architects Registration Board of Victoria (ARBV)	<u>Skills</u> - interpret, apply, and assess compliance with the relevant requirements of the Building Code of Australia (BCA); - apply and assess compliance with relevant standards relating to the design of a building, including materials, finishes, fittings, components, and systems of a building relevant to the class of registration. <u>Experience</u> Five years practical experience which is: - *Recent* – being at least five years, or equivalent part-time, within the last 10 years, jncluding at least two years in Australia. - *Relevant* – being experienced relevant to this class of registration involving a Class 2, 3, 9a or 9c building. Practitioners can include the two years of pre-registration		

Designers	Vic	NSW	Qld	WA
	- a person registered as a Domestic Builder (Unlimited) (if the builder was the direct employer)	practical experience required by the NSW Architects Registration Board in their five years of experience.		
National Construction Code (NCC) competency	No specific requirement	Yes, two mandatory modules from the construct NSW learning platform.	No	
Police check	Yes	Yes	Yes	
Code of conduct	No specific requirements	Yes, the statutory code provides architects must: - act in a professional manner; - act within their level of competence and expertise; - maintain satisfactory level of competence; - avoid conflicts of interest; - maintain confidentiality.	No	
Minimum financial requirements	No	Commences from 1 July 2022	Yes	
Record keeping	No	Yes, for inspection for at least 10 years.	No	
Continuing Professional Development (CPD)	No (CPD framework under consideration)	Yes, at least three hours per annum using Construct NSW learning platform or the Australian Building Codes Board (ABCB) NCC CPD system.	No	

5.4 Fire safety engineering

Victoria operates a dual system of registration and endorsement of professional engineers. The system only applies to individuals, not companies.

There are six classes of professional engineer registration categories, including fire safety engineers. Fire safety engineering involves the application of scientific and engineering principles, rules and expert judgement based on an appreciation of the fire phenomenon, the effects of fire and the reaction and behaviour of people and materials.

A fire safety engineer who intends to work in the building industry must be:

- registered as a professional engineer in fire safety engineering pursuant to the *Professional Engineers Registration Act 2019* (Vic); and
- endorsed to work in the building industry in fire safety engineering by the Business Licensing Authority (BLA).

Registration is focused on engineering qualifications and experience. Endorsement is required to provide professional engineering services in the building industry. Endorsed building engineers can perform specific functions under the *Building Act* 1993 as well as broader professional engineering services under the *Professional Engineers Registration Act* 2019. To be endorsed to practice as a professional engineer in the building industry, they must have also demonstrated knowledge and practical application of Victorian building laws and standards, and the operation and use of the NCC as it applies to fire safety engineering

The administering authority for both licensing and endorsement is the Building Licensing Authority (BLA). The BLA has appointed Engineering Australia (EA) as an assessment entity for members and non-members of EA and it is the only approved assessment entity for fire safety engineering.

The registration requirements for a fire safety engineer are a degree in engineering as well as four years relevant post-graduate experience within the last 10 years. The requirements for endorsement are demonstrated knowledge of Victorian building laws and the provisions of the NCC that apply to fire safety engineering. This is demonstrated by obtaining an assessment report from EA. This assessment will be based on the following:

- a CV;
- evidence of any professional development related specifically to the building industry; and
- a short statement showing a minimum of three years of successful, appropriate experience in the building industry, summarising demonstrated knowledge and practical application of both Victorian building laws and standards and the operation and use of the NCC as it applies to fire safety engineering.

There is no guidance available from EA about courses for Victorian building laws or the operation of the NCC for fire safety engineering.

Table 5.5 compares the arrangements for regulating fire safety engineers in Victoria with the other main states. In all reviewed states, except WA (where there are no registration requirements), fire safety engineers are required to hold a four-year tertiary qualification in engineering. The relevant experience differs across the states with Victoria, NSW, and Qld prescribing the amount of experience in terms of years (e.g., minimum three, five and four years respectively). There are police checks and fit and proper person checks required. The

endorsed building engineer – fire safety (Victoria) and the professional engineer – fire safety (NSW) is required to demonstrate knowledge of the NCC as it applies to fire safety engineering. There are codes of conduct and record keeping requirements in all states. CPD requirements are consistent and essentially require 150 hours over a three-year period.

Table 5.5: Fire safety engineer registration requirements by state

Fire safety engineers	Vic		NSW	Qld	WA
Designation	Registered professional engineer – fire safety engineering	Endorsed building engineer – fire safety	Professional engineer – fire safety	Registered Professional Engineer of Qld (RPEQ) fire safety	No requirement for registration fire safety engineers.
Requirement to register	To work on Victorian buildings as a professional engineer and/or designer.	To work on Vic buildings in fire safety engineering and or design.	To undertake fire engineering work on Class 2 buildings.	To undertake a design, or a construction or production activity, relating to engineering, not in accordance with a prescriptive standard.	
Legislation	*Professional Engineers Registration Act 2019* (Vic)	*Building Act 1993* (Vic)	*Design and Building Practitioners Act 2021* (NSW)	*Professional Engineers Act 2002* (Qld)	
Regulatory authority	Business Licensing Authority (BLA)	Victorian Building Authority (VBA)	Department of Fair Trading / Office of Building Commissioner	Board of Professional Engineers	
Qualification requirements	Accredited under-graduate Bachelor of Engineering degree or post-graduate Master of Engineering in the area or areas of engineering an applicant wishes to register or the alternative nominated pathway outlined for fire safety engineering.	Same as for a registered professional engineer <u>Knowledge</u> Demonstrated knowledge and practical application of Vic building laws; standards and operation of the NCC as it applies to fire safety engineering	<u>Qualifications</u> Four-year degree or masters in fire safety engineering or a four-year degree in other forms of engineering with post-graduate qualifications in fire safety engineering. <u>Knowledge</u> *Design and Building Practitioners Act 2020* (NSW)	Recognised tertiary institute with a four-year undergraduate degree in engineering (or equivalent).	

Fire safety engineers	Vic		NSW	Qld	WA
			Design and Building Practitioners Regulation 2021 (NSW) *Environmental Planning and Assessment Act 1979 (NSW)* and regulations relevant to the class. *BCA* (Volumes 1 and 2) relevant to the class Building design including methods, materials and planning relevant to the class of registration.		
Experience requirements	At least five years relevant practical experience in fire safety engineering gained in the last 10 years.	At least five years relevant practical experience in fire safety engineering gained in the last 10 years.	<u>Skills</u> - apply established engineering methods to engineering issues; apply engineering techniques, tools and resources apply systematic engineering synthesis and design processes; - apply systematic approaches to the management of	Gained through experience working as an engineer and carrying out professional engineering services (four to five years post-graduation).	

Fire safety engineers	Vic		NSW	Qld	WA
			engineering projects. <u>Experience</u> *Recent*- at least five years or equivalent part-time, within the last 10 years, including at least two years in Australia. *Relevant* - being experienced relevant to this class of registration.		
Fit and proper person test		Yes	Yes	Yes	
Police check	Yes		Yes	Yes	
National Construction Code (NCC) competency	No specific requirements	Demonstrated knowledge and practical application of Victorian building laws and standards and operation of the NCC as it applies to fire safety engineering.	Yes, two mandatory modules from the Construct NSW learning modules.	No specific requirements	
Professional indemnity insurance (PII)	Yes	Yes	Yes		
Minimum financial requirements	No	No	No	No	
Record keeping	Required by the code of conduct – no obligation to produce for inspection or keep for any specific period.	No	Yes, for inspection for at least 10 years.	Yes, seven years under the code of practice.	
Code of conduct	Code of conduct for		Yes, sch 4 *Design and*	Code of practice statutorily	

Fire safety engineers	Vic		NSW	Qld	WA
	professional engineers (made by Consumer Affairs Victoria).		*Building Practitioners Act 2020* (NSW)	binding.	
Continuing Professional Development (CPD)	150 hours over three years one third of which must relate to engineer's technical area of expertise.		Yes, 50 hours for each year of three-year registration period.	150 hours over a three-year registration period.	

5.5 Fire safety practitioners and installers

There is no legislated role in the Victorian building registration framework for fire safety practitioners, installers or trades involved in the installation and maintenance of PFP systems and elements. Table 5.6 highlights the Qld requirements for fire safety installers – the only state that has this specific registration. Fire safety protection practitioners must hold a certificate and provide an experience declaration in order to install and maintain PFP systems and elements. There are minimum financial requirements.

The requirement for a PFP licence for certification, installation and maintenance, and inspection and testing is part of a new licensing framework operating in Qld since 1 May 2021. It introduces five fire system streams. Passive fire is one of those five streams. The others are special hazard fire system, water-based fire system, portable, and electrical. For each licence stream there are a number of classes covering the different types of work done within each stream from design, through certification, installation, maintenance, and finally, inspection and testing. There are then three licence types for each licence stream and class; contractors, nominee supervisors and fire protection occupational.[67]

For PFP licences issued before 1 May 2021 that are transitioning, there are some key changes. For the certify class, fire protection work now includes the installation and maintenance of fire walls. The new certify class of licences is, 'Certify – fire doors, fire shutters, fire dampers, fire collars, fire rated penetrations, fire rated joint sealings, fire and smoke walls and fire rated ceilings'.[68]

A new 'install and maintain' class for fire and smoke walls and fire rated ceilings reflects the expansion of fire protection work. Builders who wish to continue doing this work will be able to do so during a transitionary period under their current licensees until May 2025. A new fire protection licence class has been added for fire doors and shutters. Carpenters and joiners who currently perform this work may continue to do so under existing licensees until 1 May 2025.

Although in other states and territories there are no specific registration or licensing requirements for the installation and maintenance of PFP systems and elements, specialist firms have been established providing a range of passive fire services to developers, builders and service contractors. These companies provide a suite of services including sourcing compliant products, providing advice, undertaking audits, providing training, and installing passive fire systems and elements.

[67] Queensland Building and Construction Commission (QBCC) website - https://www.qbcc.qld.gov.au/licences/apply-licence/available-licences/fire-protection
[68] Ibid.

Table 5.6: Fire safety and compliance practitioner / installers' registration requirements by state

Fire safety Installers	Vic	NSW	Qld	WA
Designation	No separate role identified - responsibility rests with builder.	No separate role identified - responsibility falls to builder.	Fire safety professionals	No separate role identified - responsibility falls to builder.
Requirement to register			To certify: - install and maintain – fire doors and fire shutters; - install and maintain – fire collars, fire-rated penetrations, and fire-rated joint sealing; - install and maintain – fire and smoke walls and fire-rated ceilings; - inspect and test.	
Legislation			*Queensland Building and Construction Commission Act 1991* (Qld)	
Regulatory authority			Queensland Building and Construction Commission	
Qualifications and knowledge requirements			Certificate level	
Skills and experience			Experience declaration must be made on application.	
Fit and proper person test			Yes	
Police check			Yes	
National Construction Code (NCC) competency			No specific requirements	
Professional indemnity				

Fire safety Installers	Vic	NSW	Qld	WA
insurance (PII)				
Minimum financial requirements			Yes	
Record keeping			No	
Code of conduct			No	
Continuing Professional Development (CPD)			Free voluntary CPD piloted in 2021 – compulsory CPD under consideration.	

5.6 Building surveyors / certifiers

Building surveyors are regulated by the *Building Act 1993* (Vic). A building permit for a Class 2 building can be issued by a person registered in the class of building surveyor (unlimited) or the class of building surveyor (limited) (for buildings not exceeding three storeys). The scope of work of a building surveyor (limited) is restricted to buildings up to three storeys in height and a maximum floor area of 2,000m^2 unless further restrictions have been imposed on the practitioner's registration. The functions of a building surveyor include issuing building permits; arranging and undertaking inspections of building work to determine compliance with the Act, regulations and the building permit; taking enforcement action to ensure building work complies with the Act, regulations and building permit; and approving the use and occupation of buildings (including issuing occupancy certificates and certificates of final inspection). The main role of the building surveyor is to provide oversight of design and building work during construction.

Table 5.7 compares the arrangements for regulating who can practice as a building surveyor in Victoria with the other main states. In all jurisdictions, to be eligible for registration as a building surveyor, a person is required to hold a degree in building surveying and have relevant practical experience. There are fit and proper person requirements to be met and police checks required (for all states except Qld). NSW is the only state that mandates the completion of NCC competency modules. All states require professional indemnity insurance and Qld and Western Australia have minimum financial requirements. All states have record keeping requirements with various prescriptions (Victoria and NSW have 10-year inspection requirements). There are statutory codes of conduct imposed for surveyors in Victoria and NSW, a professional code in Qld and no code in WA. CPD is required in Victoria (under its code of conduct), NSW, and Qld with varying requirements (no specific time allocations or points requirements in Victoria, 25 hours in NSW plus mandatory CPDs, and 20 hours in Qld delivered by a professional association).

Table 5.7: Building Surveyor /Certifier registration requirements by state

Building Surveyors/Certifiers	Vic	NSW	QLD	WA
Designation for Class 2 buildings	Building surveyor (unlimited)	Building Surveyor (unrestricted) Building Surveyor (restricted)	Building certifier – Level 1	Building Surveyor – Level 1
Requirement to register	A building surveyor (subject to any conditions imposed on their registration) may issue building permits; arrange and undertake inspections of building work; take actions to ensure building work complies with the Act and Regulations including issuing building notices and orders and directions to fix building work; approve use and occupation of buildings, and issue occupancy permits and certificates of final inspection.	To do certification work; a certifier specified in section 6.5 of *Environmental Planning and Assessment Act 1979* (NSW); issue strata certificates; other functions of a registered certifier under the certification legislation or under another Act or law.	To perform building certifying functions for all classes of buildings and structures	To sign certificates of design, construction or building compliance under the *Building Act 2011*(WA)
Legislation	*Building Act 1993* (Vic), *Building Regulations 2018* (Vic)	*Building and Development Certifiers Act 2018* (NSW) *Environmental Planning and Assessment Act 1979* (NSW) Note the certifier practice standard prepared by the Commissioner for Fair Trading under section 14 of the *Building and Development Certifiers Act 2018* (NSW) applies to registered certifiers undertaking certification work for new residential apartment buildings, being	*Building Act (1975)* (Qld)	*Building Services (Registration) Act 2011* (WA)

Building Surveyors/Certifiers	Vic	NSW	QLD	WA
		Class 2.		
Regulatory authority	Victorian Building Authority (VBA)	Department of Customer Service / Fair Trading	Queensland Building and Construction Commission	Building Services Board
Qualification requirements	Prescribed bachelor of building surveying	<u>Qualifications</u> Approved bachelor's degree or higher <u>Knowledge</u> • *Environmental Planning and Assessment Act 1979* (NSW); • the Building Code of Australia (BCA) to the extent it is relevant to class of registration; • building fire safety, including fire engineering; • role and responsibilities of a registered certifier, including a principal certifier, • building surveying practices and procedures; • building construction, including methods, materials, planning and design. <u>Application</u> • identify, interpret, and determine compliance with all provisions of the planning legislation relevant to the processing of applications for complying development certificates, construction certificates, compliance certificates and occupation certificates; • interpret, apply, and assess compliance with the relevant requirements of the BCA;	<u>Qualifications</u> Accredited professional association degree. Accredited professional associations include Royal Institute of Chartered Surveyors and Australian Institute of Building Surveyors.	<u>Qualifications</u> Bachelor of surveying and construction (CQU or equivalent) and three years full-time in building surveying work.

Building Surveyors/Certifiers	Vic	NSW	QLD	WA
		• interpret and review relevant documents used as evidence to demonstrate compliance, including reports in relation to performance solutions; • evaluate building construction including methods, materials, planning and design; • assess the fire protection and structural capacity of an existing building; • prepare a fire safety schedule under the *Environmental Planning and Assessment Act 1979* (NSW).		
Experience requirements	At least 3 years of relevant practical experience gained in the seven years prior to the application being made. Experience must be in: • Assisting a registered building surveyor to assess applications for building permits, occupancy permits and temporary occupation of buildings; • carrying out initial and advanced construction inspections for buildings; • identifying and reporting on non-compliance with building control legislation, building regulations and the building permit issued in relation to the work; • preparing written directions	<u>Skills</u> • Assessing construction certificate applications for building work; • assessing complying development certificate applications for building work; • carrying out critical stage inspections of building work; • assessing occupation certificate applications; • carrying out the role of the principal certifier. <u>Experience</u> Three years (unrestricted) and two years (restricted) obtained no earlier than five years from applying.	Skills assessment performed by accredited professional associations	

Building Surveyors/Certifiers	Vic	NSW	QLD	WA
	to fix building work that is not compliance; preparing building notices and building orders.			
Fit and proper person test	Yes	Yes	Yes	Yes
Police check	Yes	Yes	No	Yes
National Construction Code (NCC) competency	Yes, see knowledge requirements above	Yes, two mandatory modules from the Construct NSW learning modules.	No specific requirements	Self-certification on registration application form.
Professional indemnity insurance (PII)	Yes	Commences from 1 July 2022	Yes	Yes
Minimum financial requirements	No	No	Yes	Yes
Record keeping	Required by the code of conduct for inspection for at least 10 years.	Yes, for inspection for at least 10 years.	Yes, by the code of conduct but no specific requirements or time frames given.	Yes
Code of conduct	Code of conduct for RBSs - statutorily binding	Yes, statutorily binding.	Yes, through a professional association.	No
Continuing Professional Development (CPD)	Yes, required by code of conduct but no specific requirements – specific requirements presently under consideration.	Yes, 25 hours per year plus any mandatory CPD required by Fair Trading i.e., two modules (anti-corruption and certifiers legislation).	Yes, 20 hours per year through a professional association.	No

5.7 Service Contractors

There are service contractors (or trades) that in the course of their work interact with PFP systems. These services relate to: plumbing, mechanical services, communications, electrical, and plastering. Pipes, cables, conduits and the like used in the delivery of services, often pass through the walls, ceilings, and floors of a building or apartment, impacting upon its fire protection. Openings in these structural elements need to be appropriately sealed after installation to mitigate the spread of fire and smoke. In Victoria, electrical and plumbing contractors are required to provide certificates in accordance with the *Electricity Safety Act 1998* (Vic)[69] and the *Building Act 1993* (Vic)[70] respectively.

[69] *Electricity Safety Act 1998* (Vic), s 3.
[70] *Building Act 1993* (Vic), Part 12A.

Chapter 6: Research Results and Findings

This chapter provides the results and findings from the analysis of building audit data and practitioner interviews. Audit data was provided by several organisations including the Victorian Building Authority (VBA). Sixteen practitioners participated in the interview phase of this project. Participants were asked about their experience, observations and thoughts on a number of matters relating to passive fire safety systems, products and defects. Quotes have been extracted from the interview data to illustrate these experiences, observations and thoughts. To ensure anonymity, the participant quotes have been given a reference number and their practitioner affiliation. Although several participants were happy not to have their identity anonymised, a decision was made to de-identify where possible to protect other participants in the same practitioner category. The State Building Surveyor, Andrew Cialini, agreed to have his comments identified.

The results and findings section has been divided into three sections. The first provides evidence of Passive Fire Protection (PFP) defects detailing the most common defects identified in limited audit data and by industry practitioners. The second section highlights observations from practitioners as to the likely causes of, contributors to, and consequences of PFP defects. The third section identifies current compliance drivers, suggested solutions and recommendations for change as put forward by industry practitioners.

6.1 Evidencing passive fire defects

6.1.1 Proliferation of passive fire defects

All interviewees conveyed similar sentiments and concerns about the number of defects relating to PFP systems. In Victoria, the inclusion of mandatory inspections for fire and smoke resisting building elements from 2018 together with increased quality assurance measures implemented by some building companies have aided in identifying and therefore rectifying defects during construction. Despite this, many practitioners were of the view that the level of non-compliance was so great that the PFP system was effectively broken. The frustration of constantly witnessing high levels of non-compliance over years with little effective change was highlighted throughout the interview phase.

> *“The system’s broken unfortunately.” (1 – Fire safety engineer)*

> *“The people that are in-the-know, know that the system is broken.” (7 - Fire safety and compliance practitioner)*

An experienced fire safety engineer was so concerned about the number of PFP defects that he was of the opinion that until widespread change is affected, residential Class 2 construction (particularly Class 2 timber-framed buildings) should be halted.

> *“I think we’ve reached a point where it is so bad, we should put a pause button on allowing this construction, full stop. The problem with passive fire protection is that it’s there to protect load-bearing elements. So, if you have a three-storey timber-framed building that has a small fire, and it breaks through the fire-rated skin then the whole structure comes down. And, frankly, I'm surprised we haven't had one of those fires yet. But we will.” (9 - Fire safety engineer)*

In terms of the prevalence of PFP defects, interviewees who regularly inspected Class 2 buildings in Victoria told a rather grim story. The consistent message was high levels of non-compliance across the board.

"I would say that every single building in the country has passive fire issues." (1 - Fire safety engineer)

"I've seen no evidence that defects are improving. I mean, zero evidence. I really struggle to find a point of reference to start from. There are so many problems." (9 - Fire safety engineer)

Again, additional concerns were raised about timber-framed Class 2 residential construction and the number of defects.

"The greatest non-compliance in our building stock is, in relation to passive [fire protection], construction and buildings built between 1995 and 2015, that are timber-framed, low weight - the level of non-compliance is at 95% plus because the people doing the work simply did not know and there was no inspection regime at all." (4 – Building surveyor)

6.1.2 Passive fire defects across the building lifecycle

Interviewees described the different phases of a building's life cycle in which PFP defects were identified. These included the planning and design stage, during construction, and post-construction or occupancy stage (for example, annual maintenance).

6.1.2.1 Planning and design stage

PFP defects have been identified in the planning and design stage by various practitioners engaged to review plans and designs. Interviewees explained that often construction drawings of the passive fire elements, systems and product to be used lacked specificity and would result in a non-compliant building if followed.

"Having designers give basically town planning documents that you're now building off and you've got a builder that's not doing the right thing - the initial design wasn't compliant in the first place." (5 - Project manager)

"I typically get sent a set of drawings for a building from either a contractor or possibly builder who's been asked to price a set of drawings done by an architect. I'd say that 90% of drawings that I look at from architects have got compliance issues in the walls around fire, structure, even acoustics combustibility, things like that, which comes back to fire as well. The architect and design space is even getting it wrong, and they can't even interpret the National Construction Code correctly". (16 - Manufacturer)

"You might have a designer say, "These products must be used in these locations, but don't consider the junction. They might be specifying correctly in a few areas, but then there's three other details that they haven't considered. So then because they don't consider those details, they don't realise actually this product can't actually be used in this application." (5 - Project manager)

6.1.2.2 Construction stage

Multiple interviewees had discovered PFP defects during the construction stage. Table 6.1 identifies these parties, how the inspection was initiated and the nature of the inspections. [71]

[71] Information provided by numerous interviewees assisted in compiling this table.

Table 6.1: Parties identifying passive fire defects and nature of inspection

Party identifying defects	Initiation of inspection	Nature of inspection
The Victoria Building Authority	Proactively inspect and monitor building works underway. Target: - inspect at least 10 per cent of new building permits	Unannounced – sites are selected based on a number of risk factors identified from permit sample.
Building Surveyor	Building owner	Mandatory (legislated) but limited in scope.
Fire safety and compliance specialists	Engaged by developer or builder	Optional – usually multiple inspections undertaken.
Builder – quality assurance team	Building company	Optional – usually multiple inspections undertaken.
Fire engineers	Building owner	Recently arising due to combustible cladding inspections – passive fire defects exposed.
Manufacturers	Builder or contractor	Informal, walk-through to assist with manufacturer installation requirements and conformity.

The purpose of identifying defects in this stage is to allow the responsible practitioner to rectify any identified defects prior to building completion. It is the expectation that a building is compliant at the time the occupancy permit is provided and the building is handed over to the owners.

In identifying the nature of passive fire defects commonly found in residential buildings, two research methods were utilised. Firstly, the VBA's Proactive Inspections Program (PIP) and several fire safety and compliance companies provided raw data (both aggregated and audit reports) to the research team for analysis. Secondly, the interview data from practitioners including fire safety engineers, passive fire and safety practitioners, builders, building surveyors, project managers and manufacturers provided in-depth insights. The results of these analyses provided evidence of the types of passive fire defects commonly identified in the construction phase.

Victorian Building Authority – inspection data results

The VBA's Proactive Inspections Program (PIP) is an early intervention initiative that involves inspecting building and plumbing works under construction throughout Victoria, to identify building and plumbing work under construction that is at risk of non-compliance and ensure it is rectified. The inspection team includes building inspectors, building surveyors and plumbers, who typically inspect sites each month, incorporating both domestic and commercial construction. Inspections are generally unannounced. Inspections focus on either building or plumbing work, and sites are chosen using a variety of methods.

The VBA uses a risk-rating scale to determine the level of scrutiny applied to a potential issue. The scale considers the potential adverse effects on the future safety of building occupants and people nearby, and on the amenity of the building itself. When inspectors identify compliance risks (that is, potentially non-compliant building and/or plumbing work), the VBA writes to the builder, plumber and/or relevant building surveyor notifying them of the non-compliance risks identified during the inspection and requiring them to either provide evidence to demonstrate the work is compliant, or to provide proof that the non-compliance

risk has been rectified. Once notified, the practitioner is required to respond to the VBA within three days for serious issues, and within 14 days for moderate or lesser risk issues.

The VBA under its PIP, during the period 1 July 2018 to 30 September 2021, identified 134 BCA Class 2 buildings under construction at risk for non-compliance in terms of passive fire safety.[72] Overall, 241 non-compliance risk observations were made based on this sample. As outlined in Table 6.2, the parts of the NCC that the non-compliance risk relates to (as identified by the VBA) are ranked according to the frequency of non-compliance observed. Approximately 30% of all identified non-compliance risks relate to fire resistance and stability. Other notable areas of non-compliance risk included compartmentation and separation, protection of openings, and provision of escape. Table 6.3 provides examples and commentary for each of the NCC related elements affected as detailed by the VBA's inspectors.

The majority (approximately 85%) of identified non-compliant risk elements were assigned a risk rating of medium. According to the VBA's risk rating matrix, a medium risk rating means that if the non-compliance risk element is not rectified then an adverse safety outcome could result, and financial loss or loss of structural integrity is a possible outcome. Approximately 11% of the identified non-compliance risks were assigned a risk rating of high, which means if the non-compliance risk is not rectified, there is a higher certainly it would cause an adverse effect on safety and the structural integrity of the building would be significantly compromised.

Table 6.2: VBA Proactive Inspections Program – affected elements and assigned risk

NCC related element	Non-compliance risks identified (number of)	Risk rating assigned	Non-compliant risks identified by risk rating assigned (number of)
Fire resistance and stability	71 (53%)	High	14 (20%)
		Medium	57 (80%)
		Low	0
Compartmentation and separation	39 (29%)	High	4 (10%)
		Medium	33 (85%)
		Low	2 (5%)
Protection of openings	38 (28%)	High	3 (8%)
		Medium	34 (89%)
		Low	1 (3%)
Provision of escape	30 (22%)	High	0
		Medium	27 (90%)
		Low	3 (10%)
Fire separation	23 (17%)	High	5 (22%)
		Medium	18 (78%)
		Low	0
Construction of exits	22 (16%)	High	0
		Medium	20 (91%)
		Low	2 (9%)
Emergency lighting, exit signs and warning systems	12 (9%)	High	0
		Medium	10 (83%)
		Low	2 (17%)

[72] It is important to note that when undertaking these inspections, the VBA inspector will not have access to building permit documentation including fire engineering reports, and therefore may not know whether a performance solution has been used.

NCC related element	Non-compliance risks identified (number of)	Risk rating assigned	Non-compliant risks identified by risk rating assigned (number of)
Dimensions of exits and paths of travel to exits	3 (2%)	High	0
		Medium	3 (100%)
		Low	0
Fire doors, smoke doors, fire windows and shutters	2 (1%)	High	0
		Medium	2 (100%)
		Low	0
Openings in fire-isolated lift shafts	1 (1%)	High	0
		Medium	1 (100%)
		Low	0

Table 6.3: Examples and commentary of non-compliance risk identified for each NCC-related element affected

NCC related element	Examples and comments of identified non-compliance risk[73]
Fire resistance and stability	Timber used within Type A construction, building has been constructed to Type C in lieu of Type A construction required for a Class 2 of three-storeys, timber used internally to strengthen door jambs, fire collars not installed, fire-isolated stair shaft was mainly constructed of concrete however some walls had plasterboard, some non-fire rated.
Compartmentation and separation	Use of fire stopping material used in areas not incorporated into the relevant fire tests, request testing for penetrations from the carpark into the SOUs [sole occupancy units], aluminium brackets not installed to both sides of shaft liner, penetrations in shaft liner, penetrations without fire protection.
Protection of openings	Protection of openings has not been considered by the Relevant Building Surveyor (RBS) as the building has been incorrectly determined as two-storey in lieu of three-storey and therefore the incorrect type of construction has been applied, fire doors to fire stair will need fire rated plaster around them as gap between door frame and concrete panel, pipes closer than 200 millimetres, fire doors not tagged, multiple penetrations made into floor slabs between fire compartments.
Provision of escape	Fire stair is not providing 1m clear, door swings against the path of egress without being listed on the permit as a performance solution.
Fire separation	Various issues relating to the party wall system. No mineral fibre at wall junctions and no clips, inadequate fixing of the shaft liners between all dwellings, fire rated plaster poorly installed, damaged sheet, mould on sheet, fixings direct to plaster.
Construction of exits	Riser heights inconsistent, door open against egress.
Emergency lighting, exit signs and warning systems	Exit sign is too high and exceeds 2.7m, exit sign has an obstructed view.

[73] It is important to note that these comments are short-hand notes used by VBA auditors and should not be interpreted as final assessments. The purpose of including these notes is simply to highlight the general types of identified non-compliance risk.

Dimensions of exits and paths of travel to exits	**Not 1m clear near ground floor toilet and within fire stair.**
Fire doors, smoke doors, fire windows and shutters	Provide evidence that the door to the sprinkler isolation valve room is not a fire door.
Openings in fire-isolated lift shafts	Enclosure beneath stairs is not fire rated.

The common examples highlighted in the PIP inspection reporting related to: timber being used incorrectly on particular construction types (issue around combustibility), incorrect building type (class of construction) applied, unsealed penetrations, use of fire stopping material used in areas not incorporated into the relevant fire tests, gaps in fire rated doors and walls, inadequate clips and fixings on fire rated plaster and shaftliners, poorly installed fire rated products including walls, fire doors not tagged, incompatible products are junctions (where non-fire rated products intersect with fire rated products).

Fire safety and compliance companies – audit data results

Company A provides passive fire auditing services to various development and building companies. Data from 12 buildings was provided. As multiple inspections were undertaken for each building site throughout the construction stage, 92 inspection reports were analysed. Table 6.4 highlights the 12 building case studies, the number of storeys (including basements) for each site, the number of inspections undertaken, and the number of defects recorded by the auditor. On average (based on this sample), seven inspections were undertaken per site and 275 defects identified.

Table 6.4: Company A - case study inspections and number of defects identified

Building case study	Number of storeys	Number of inspections	Number of defects
A	4	5	67
B	7	6	138
C	8	7	252
D	5	5	110
E	5	14	356
F	12	17	756
G	7	8	334
H	4	6	165
I	10	8	348
J	3	3	144
K	9	6	218
L	10	7	418

Overall, 3,306 defects were identified across the building sample. Company A provided the data based on the building structure affected (floor, wall, soffit, ceiling) and the service

responsible for the defect. The following results are based on the services responsible. As highlighted in Graph 1, hydraulics, electrical and plaster are the services identified by Company A as contributing to most of the defects identified (collectively 66% of the identified defects).

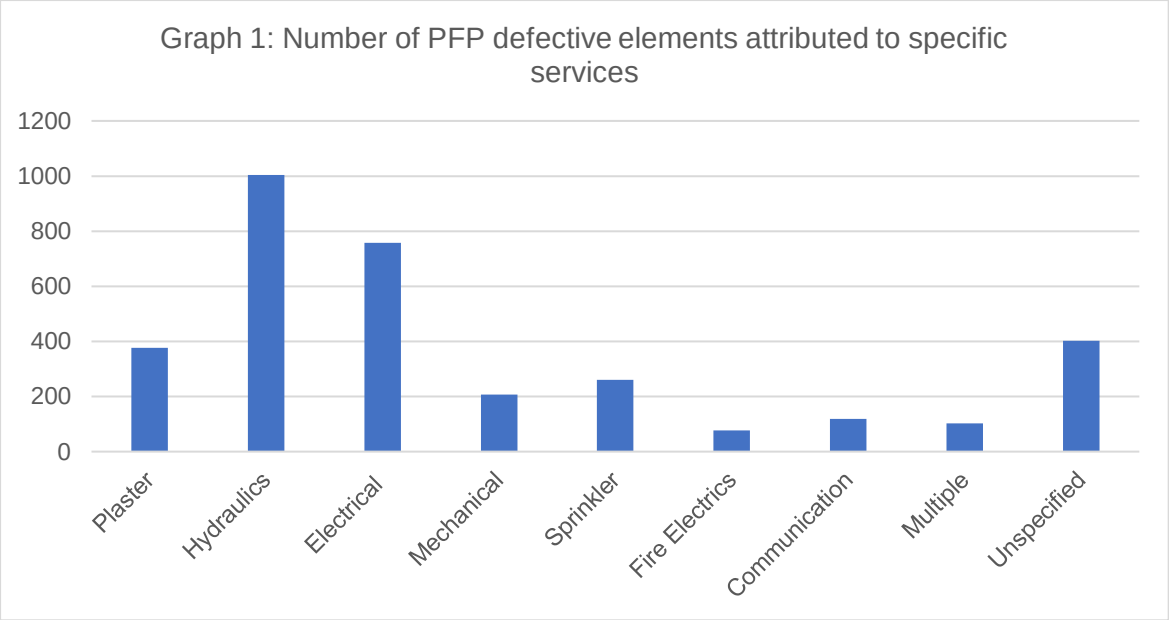


Table 6.5 provides examples of the defects identified based on each service. Consistent defects related to pipes not being sealed, incorrect sealant or fire collar used, lack of caulking, firewalls installed incorrectly or damaged, non-insulated systems, multiple pipes/ cables in penetrations, empty core holes, and combustible material used.

Table 6.5: Examples of non-compliance for each service

Passive fire defects attributed to specific services	Examples of passive fire defects
Plaster	Incomplete/gaps in caulking, firewall junction not caulked, plaster wall needed to return into precast, firewall not running to underside of soffit, incomplete firewall, inside of studs not sheeted, insulation not suitable for application, plaster shaft wall was too short, empty core, damaged firewall
Hydraulics	Copper pipes sealed with incorrect product or not sealed, empty cast-in collar, PVC pipe not sealed / no collar, sealant incorrectly applied, collars not caulked, collar incorrected fitted to wall, redundant cast-ins not filled
Electrical	Electrical cables required smoke sealing, cables required caulking, incorrect sealant used, unsealed penetrations
Mechanical	Non-compliant installation of fire box, smoke seal absent from duct, duct not caulked, unsealed pipes and penetrations, split system back plate fouls firewall, unsealed paircoil, fire damper not in line with wall, conduit breached firewall
Sprinkler	Sprinkler pipe not sealed / non-insulated system, no fire wrap installed, sprinkler pipe with no Armaflex, lagging required, Supawrap only on one side of wall
Fire Electrics	Cable caulking missing, conduit running through same penetration as sprinkler, unsealed cables, incorrect sealant used
Communication	Unsealed conduit, incorrect sealant used, pillows installed incorrectly
Multiple	Incomplete firewalls where truss passed firewall, all services in service cupboard not smoked sealed, cables required caulking, incomplete wall with multiple unsealed penetrations, NBN and sprinkler in same penetration, penetrations incorrectly sealed, firewall construction

Passive fire defects attributed to specific services	Examples of passive fire defects
	incomplete, cable tray penetration into box without Supawrap, no separation of CP exhaust shaft and gas rise
Unspecified	Window frame caulking missing, blockwork caulking missing, empty core hole, firewall damage, wall frame fouling firewall, uncaulked door frame, firewall junctions not caulked, combustible formwork / material, fire wall doesn't run full height

Company B also provides passive fire auditing services to various building practitioners. Data for two buildings was provided. Table 6.6 highlights the number of inspections undertaken, the number of storeys for each building and the number of defects detected during construction. Overall, 260 defects were identified. Graph 2 presents the number of defects identified by service type. Plaster, hydraulics, communications and electrical were the responsible services identified as contributing most to the PFP defects.

Table 6.6: Company B - case study inspections and number of defects identified

Building case study	Number of storeys	Number of inspections	Number of defects
A	9	6	227
B	3	3	3

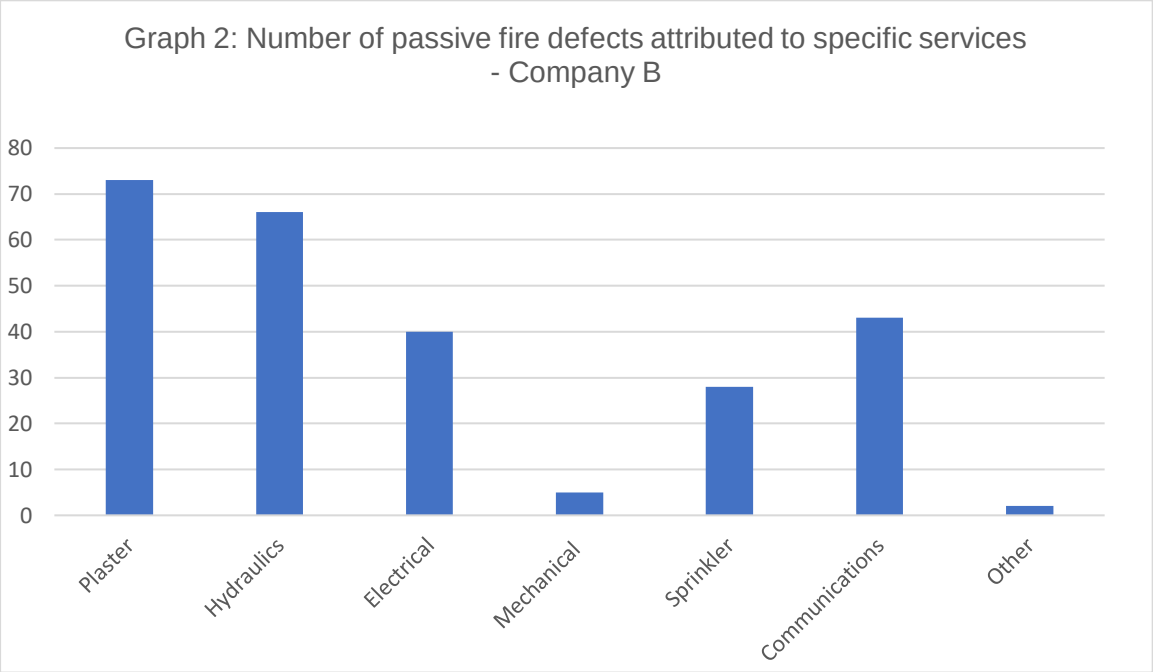


Table 6.7 provides examples of defects for each service as identified by Company B. Consistent defects relate to unsealed penetrations, service penetrations too close together, sealant incorrectly used, and incorrect installation of fire walls.

Table 6.7: Examples of non-compliance for each service

Passive fire defects attributed to specific services	Examples of passive fire defects
Plaster	Intersection not in accordance with product guidelines, screw spacing not in accordance with specifications, sealant not appropriately used, no fixing installed, fire wrap required

Passive fire defects attributed to specific services	Examples of passive fire defects
Hydraulics	Services installed too close to other services, fouling of fire wall
Electrical	Penetrations not sealed
Mechanical	Penetrations not sealed
Sprinkler	Penetration not sealed
Communication	Sealant dislodged requiring re-sealing
Other	Penetrations not sealed

Interview data - Industry practitioners experiences and observations of non-compliance

Overwhelmingly, interviewees highlighted fire rated walls and penetrations as the most problematic for PFP defects in the construction stage.

In terms of fire rated walls, interviewees identified several common non-compliance issues. These included:

- lack of continuation of firewall to slab;

  "I know of buildings where the firewall in apartment buildings stops at the false ceiling level and doesn't hit the slab. You look up through hatches and you can see across into other people's apartments and just shouldn't." (1 – Fire safety engineer)

- incompatible firewall intersections with other non-fire rated products;

  Often you'll open up a service cabinet and it needs to have fire rated plaster and you'll see grey plaster on one wall and fire rated plaster on the other. And then you'll have huge gaps and you just think to yourself, 'Well, this is so bad, what's going on?' (13 - Fire safety and compliance practitioner)

  "Non-compliant installation of specified products, not knowing what system someone's put in. Mismatch of different systems that aren't compliant with each other. For example, you have a [named company] system intersecting with a [different named company] shaft liner system over multiple levels where the shaft liner is something that has to be vertical, it can't intersect with anything unless it's concrete." (5 – Project manager)

- installation not in accordance with manufacturers specifications (particularly around number and placement of screws);

  "So each plaster manufacturer has a handbook, which essentially form part of their bible that they work towards, and that'll list out all the required spacings for fixing and how walls delineate on each other. And you might find one plastering company knows one system so well, and they'll get onto a new job and the architects expect a new wall system, so you'll come through, and something that was a tiny difference between spacings they just won't be getting right. So that's a big defect, is the actual construction of the wall system itself." (11- Fire safety and compliance practitioner)

  "It might be as simple as there's not enough screws holding the plaster board to the stud." (16 - Manufacturer)

- lack of consideration to ensure the structural stability of the fire wall.

  "There's a lot of problems around the structural stability of that wall. So the stud within that wall, the steel stud, is it actually strong enough for the imposed loads? In Australia,

unfortunately Queensland's the only state which is imposing the Australian standard for loadings on the walls. So Victoria and New South Wales, South Australia, WA, no one else is actually going through and designing the studs for the appropriate loads. The reason being is they're saying it's an internal wall, doesn't need any loads. But under the Australian standard 1170. 2, you'd have internal wind pressure which then puts a lateral load onto the wall and pushes the wall like that, like laterally. And then you also got seismic loads, so earthquakes. Queensland's the only state that's doing that, even though it's in the National Construction Code and in the Australian standard." (16 - Manufacturer)

"Again, it's enforcement. AS1170 series tells you, you have to deal with wind loading and you have to deal with seismic. It's there. Nothing has changed. It's not like all of a sudden everyone is going to go, "Oh, we now have to do seismic. This is what is happening in passive fire protection." (10 - Manufacturer)

The high level of PFP defects in terms of fire rated walls was highlighted by many interviewees but succinctly captured by the following observation:

"I haven't seen a complying plasterboard fire-rated wall in more than a decade. Not one. And I audit a lot of buildings. It's the first thing I go to when I look at a building for any reason. I will open up every access hatch with a ladder and stick my head up and take photos. So, I'm not looking at anything that was more difficult than any competent inspector should have done. And I find catastrophic non-compliance in almost every case." (9 - Fire safety engineer)

In terms of penetrations, interviewees identified defects including:

- unsealed pipes and penetrations;

"I can go out to a site and I can see that things are completely unsealed." (2 – Fire safety and compliance practitioner)

"For the lower rise buildings where you're mixing concrete and then timber framing above, I tend to see either no fire collars or no separation of passive floor holes through services covers. So, services covers that are not fire-rated and are open." (9 - Fire safety engineer)

- incorrect collars / pillows used or installed;

You then start to look at products and then you can see that there's issues where a particular product is installed but it's not installed correctly." (2 - Fire safety and compliance practitioner)

"I think penetrations is a big problem. The penetrations through, say, concrete slabs for hydraulic pipes or services, electrical services, I think that's a major issue. Often when the slabs are poured, the fire collars are cast into the slab. But what happens typically is the accuracy of that can change. So they put a penetration through the slab and then when the walls go up they realise hang on a minute that penetration is not in the middle of the bathroom or the toilet is now off centre. So they have to then core another hole and then they've got to retrofit a fire collar underneath the slab because the slab has already been poured. So then often when the second pipe goes in, they realise that sometimes they can't fit the fire collars on because the bend, they need the elbow, like the elbow needs to be probably 150 millimetres below the slab for them to fit the collar. But often because ceiling height is a problem, the bend or the elbow is directly beneath the slab so you technically can't retrofit a fire collar to that pipe." (12 - Building surveyor)

"When they put, say pillows, in, there's a particular method how you should put pillows in for a particular situation and half the time nobody knows." (13 - Fire safety and compliance practitioner)

- incorrect mastic or sealant used;

> *"It could be that a subcontractor substituted a caulking material perhaps because they've run out and they've just got something from down the street…" (6 - Builder)*

> *"It's the services that are running through them [walls]. They're sealing them with the wrong products. Now, 98% of apartments that we walk into they're either not sealed at all or they are sealed but they're only sealed for smoke, not fire. 98%. And we might do 30 inspections a month." (7 - Fire safety and compliance practitioner)*

- multiple service cable penetrations too close together.

> *"Electrical penetrations through plasterboard need a fire rated mastic but there are regulations about the maximum size of that hole and how many cables can penetrate the one hole. Electricians that aren't aware of those regulations will cut a huge hole in the plasterboard, put 50 cables through it, it doesn't comply." (4 - Building surveyor)*

> *"There's a gas pipe running into an apartment with hot and cold water. And it's just a slot in the plasterboard." (9 - Fire safety engineer)*

> *"It could be services that are too close together, they're not reaching their minimum distance requirements for how the products have been tested." (6 - Builder)*

Interviewees also highlighted failures relating to shaft liners and fire doors:

> *"Shafts create chimneys where fire can travel throughout the building really quickly and that's your really rudimentary mistakes" (2 - Fire safety and compliance practitioner)*

> *"And of course, the plasterer and the door people are completely independent, and we've discovered that most fire door sets, the jambs, in the old days always had to be solid backfilled with concrete. But when you put it into a lightweight construction stud wall, it's to be fitted in a certain manner and checked right into the jambs and I'm sure that half the plasterers don't even know. So, the doorframe would go in and then the fire check goes in and of course - yeah. I think there's a complete failure on understanding insulation techniques and standards." (13 - Fire safety and compliance practitioner)*

These results and findings highlight a consistency across the data analysed. Generally, PFP defects relating to fire walls and penetrations were identified as most prevalent. Image 1 provides photographic evidence of some of these identified defects.

Image 1: Photographic evidence of passive fire protection defects (provided by Company A)

Image description:

1: Gaps around sprinkler pipe not sealed

2: Collar missing on PVC pipe

3: Collar missing on floor waste pipe

4: Copper pipe not wrapped

5: Unsealed penetration

6: Fire wall exposed

7: Fire wall exposed - wall is required to be continuous

8: Unsealed penetrations

6.1.2.3 Post-construction/occupancy stage

In the post-construction stage, once the occupancy permit has been issued and the new building owner(s) are on title, responsibility for any liabilities arising as a result of building defects continues to rest with the builder until the statutory time period concludes. Responsibility for building repairs and maintenance (that are not construction defects or arise after the statutory liability period ends) rests with the individual lot owners or the collective ownership (usually the owners corporation). Legislation that regulates owners corporations require the entity to repair and maintain the common property – it is a statutory duty that it cannot avoid. Although in this post-construction/occupancy stage, the main focus in terms of PFP is on the maintenance inspections (commonly known as essential safety measures (ESMs)), construction defects are currently and regularly being identified as a result of the combustible cladding removal and rectification process. This section of the report will therefore discuss the types of passive fire defects being identified through the combustible cladding removal process and then discuss the ESM defects.

Combustible cladding removal and rectification

Several interviewees explained that PFP defects were discovered in the process of removing combustible cladding from the exterior of Class 2 buildings. These defects often arose in and around building elements that were not observable (without destructive testing) post-construction including fire walls and penetrations. The following remarks highlight the existence of PFP defects that have not been remedied in the construction phase and which lay dormant, sometimes for years, until the building is exposed through rectification works:

> *"So once they started to take off cladding - "Well, we've got services in the wall and this is a firewall, and they're not stopped as they come out of the wall." (1- Fire safety engineer)*

> *"I'm never there to look at the plasterboard, but my job is to decide if the building is sufficiently compliant to take it to a Building Appeals Board or a tribunal to get approved. And, if not, what remediation work do we need to do? And I'm usually the only person who has the reason to do a holistic review of the whole building. Council [building] surveyors, they look at the cladding, it complies, walk away. Doesn't comply, serve a notice. So, I'm the only one who ever pulls down the access hatches, gets up in the roof. I'll pull roof sheets off regularly to have a look at what's actually happened. It's amazing, but the fire-rated wall between apartments is meant to go up to the underside of the roof covering. And that hardly ever happens." (9 – Fire safety engineer)*

> *"We have seen defects in the flammable cladding space - the intersection of the EPS with the fire rated wall." (5 – Project manager)*

A fire research engineer in New Zealand discussed similar experiences when removing and rectifying combustible cladding and unearthing multiple PFP defects. When explaining one building, he suggested that if the owners knew the extent of the defects, the more cost-effective approach would have been building demolishment.

> *"But as they were tearing it apart to fix cladding issues they were finding all these issues of passive fire and the problem is once they'd exposed them - so you keep digging and then as you dig further you find more stuff so basically, if you look at some of the press the costs of fixing some of the passive issues was as much as doing the weather tightness and actually when you add it all up and if people would have known how many issues there were at the start they probably would have just demolished and started from scratch sort of thing. But the problem is, you start putting money into it and then it's like how much further do you keep going? (8 - Fire research engineer)*

A fire engineer interviewee explained the bewilderment of owners corporations when faced with a report that identified other fire-related defects aside from the cladding. He suggested that the risk of not rectifying internal fire-related defects was worse than the cladding risk but most ignored this advice.

> *"I've put in my reports [to the owners corporations] in addition to the cladding and said, "This needs to be fixed." And then everybody gets confused, "Well, but we're looking at the cladding." Well, frankly, this is worse than the cladding. This is inside the building. And no one knows what to do and then I don't hear from them again." (9 - Fire safety engineer)*

Maintenance of Essential Safety Measures

Australian Standard 1851:2012 (AS 1851) is the requisite standard used for the routine service of fire protection systems and equipment. It is a 165-page document with a number of appendices and provides the processes, procedures, frequency and service schedules for the maintenance of various systems and equipment. Only one section of the 14-section document is dedicated to passive fire and smoke systems. The limited references to passive fire systems in the standard is perhaps predicated on the fact that the AS 1851 is a maintenance standard and not a construction standard. As discussed by one interviewee:

> *"So AS1851 2012, which is a maintenance standard, makes the assumption that at occupancy permit sign-off, that 100% of the penetrations are compliant. And unfortunately, they are not. So what we're doing is – maybe the building is 12 months old, two years old, three years old, we're picking up construction penetration defects that haven't initially been done correctly. That's not what AS1851 was all about. And that's not what it is designed to do. However, we can't, as a duty of care to people using the building, we can't just go well that looks like from construction so I'm not going to pull it up." (7 - Fire safety and compliance practitioner)*

Raw audit data from 434 residential buildings was provided by a company that undertakes ESM inspections across Victoria. For this sample, 44,497 PFP defects were identified, with an average of 102 per building (defects per building ranged from one defect to 3,006 defects). Graph 3 highlights the categories that the identified defects have been allocated. The majority of ESM defects (41%) relate to fire doors. Table 6.6 provides examples of the types of defects for each of the identified categories.

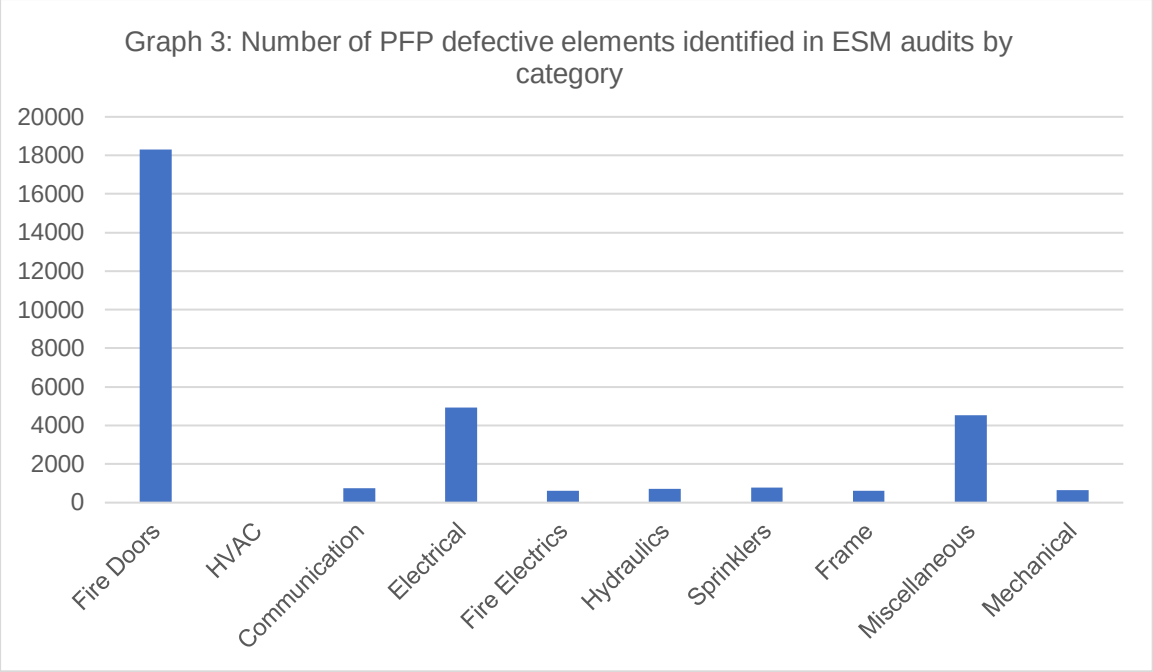


Table 6.6: Examples of defects for each identified category

Passive fire non-compliance attributed to identified categories	Examples of non-compliance
Fire doors	Back check closing incorrect, control arm missing screws, damage to fire door / closer, door not self-closing, door fouling on frame / floor, drop down smoke seal damaged, fire door signage missing, FRL certification door or frame tag missing or not installed, gaps around door frame, holes in door frame, non-fire rated handle installed
HVAC	No fire damper grill installed
Communication	No passive system installed around cables
Electrical	No passive system installed around cables
Fire electrics	No passive system installed around cables and conduits, empty core holes
Hydraulics	Pipes with no sealant or passive system installed
Sprinklers	No passive system installed around sprinkler pipe, foam-a- fill used
Frame	Frame not fire rated, frame hollow
Mechanical	Damper caulking required, duct appears no damper installed
Miscellaneous	Empty cast-in collar, caulking required, threshold gap exceeding limits, wall does not extend to soffit

Interviewees in ESM maintenance highlighted similar defects as those identified in the construction stage section of this report. Although, they only identified those defects that are visually observable when the building is open and exposed (for example, fire walls and fire doors).

Those specialising in passive fire discussed the high level of non-compliance (usually around 90% of buildings) in PFP systems.

> *We probably manage between 150-200 buildings in Melbourne, and probably 90% of them are non-compliant. There's probably 10% that we can go in each year and be confident in what we're seeing, and be confident enough to say that they're compliant and sign them off, which is pretty scary." (11- Fire safety and compliance practitioner)*

"I would say about the 90% rate are non-compliant. And I would say that of that last 10%, 5% are compliant because they've previously been inspected under an AS1851 inspection and been repaired. And only 5%, the remaining five, were actually done correctly the first time." (7 - Fire safety and compliance practitioner)

Aside from the construction defects identified post-construction, interviewees also highlighted high levels of non-compliance that arose during occupancy. Many issues related to telecommunication services that pierced fire rated walls and elements post the certificate of occupancy for the building being issued by the building surveyor.

So the protection of penetrations through passive fire rated elements is a major problem. And the same in this most recent job, after the builder had finished, obviously everyone wants to have NBN connected and TV, free-to-air TV. So, of course, the aerial companies come along and they just go down the service shaft and they just punch holes in the walls and they just leave them. So then, of course, that really should be picked up on in the annual passive ESM, or the Essential Safety Measures inspection. And then there's a bunfight on who fixes it. So, look, it's a big issue." (12 - Building surveyor)

This section has illustrated the types of PFP defects identified by practitioners in the planning and design, construction and occupancy stages of Class 2 buildings. Most notably are defects that relate to firewalls, penetrations, and doors. The next section details observations from practitioners as to the likely causes of, contributors to, and consequences of PFP defects.

6.2 Causes, contributors and consequences of passive fire-related defects

Based on their experience, interviewees provided insights into the potential causes of, and contributors to PFP defects in Class 2 buildings. The potential consequences for buildings and residents were also highlighted. The overwhelming majority of comments related to a lack of knowledge of passive fire safety requirements by multiple practitioners, poor construction management practices leading to uncoordinated installation processes, testing and verification issues around systems and products, poor documentation delivery, the limited nature of mandatory fire inspections, and rectification reluctance by building owners.

6.2.1 Lack of knowledge

As succinctly put by one interviewee:

"Everyone needs further education, absolutely everyone." (5 - Project manager)

6.2.1.1 Builders

Builders are the practitioners responsible for construction and comments about their competencies varied. Interviewees acknowledged that there were several larger building companies taking proactive steps to better manage PFP defects. A number of tier one and tier two building companies were identified as having implemented quality assurance processes and practices aimed at minimising the number of defects and as a result produced a higher quality and compliant product. These quality assurance processes were either implemented in-house via dedicated quality assurance compliance teams or via the external engagement of passive fire safety and compliance practitioners. This quote highlights the practice in a tier one building company:

"Generally the contractors will have standard systems and standard products that they will use, and they put them forward as a sample at the start of the project, to say, "This is how I will penetrate a wall", and we get details about how they're going to penetrate through, and then the relevant caulking and sealing or collars or whatever they need to do, as a submission. And then, once they construct them on site, we do an inspection just to make sure that they are compliant So, setting the standard early on the project and making sure there is agreed detail that the trades are working to. And then, we do reviews on the site from a quality point of view as we work up or out on a project, to make sure that that detail is maintained, and it doesn't get closed up. The building surveyors wants a fire penetrations register at the back of the project and so each fire penetration has a tag on it to give it a numbering, and then some photos as well, just to make sure that they are compliant. We actually do our own internal reviews to make sure they are compliant, before we actually close out areas, as in our walls and ceilings and those sorts of things." (14 - Builder)

Interviewees acknowledged that many builders were trying to be compliant, but they simply didn't have the depth of knowledge required to successfully comply with the PFP requirements. Much of the commentary related to the lack of product knowledge.

"I think all these builders are building out of absolute ignorance. They just don't know what's going on and I don't blame them because there is no real guidance. There's no depth of knowledge, no guidance at all." (13 - Fire safety and compliance practitioner)

"I get quite frustrated with builders because they don't know how to do it and it's very frustrating for me, from an inspection point of view. I can see potentially that they've sealed all these up and they look beautiful and they've spent all the time doing it, but they've only smoke sealed them and they need to be fire. Now, that builder is trying to do the right thing. He hasn't spent all that time and effort making all the fire rated mastic look all beautiful and nice – because he's got pride in his work, I can tell that by looking at it – he just lacks the knowledge to know that that requires intumescent sealant, not acrylic sealant. He's just used the wrong product. And I can tell that he's trying to do the right thing, he's not trying to dodge the system, but he just lacks the education." (7 - Fire safety and compliance practitioner)

Many interviewees were concerned about domestic builders working in Class 2 construction and suggested this was a major contributor to the number of defective buildings.

To me the biggest problem area is the residential apartment space, in particular that low to midrise space. Because in their great wisdom the Victorian Government decided that a person registered for domestic building work, a DBU who's only ever done house extensions can build an apartment building. And in Victoria until the mid to late nineties, we've hardly had apartments and the ones that were done were tier one builders. And all of a sudden, apartments started popping up everywhere. It was exploding and we had a strong international market to buy these apartments. And the registration category, instead of being a separate category for apartments because it's a completely different volume of the Building Code, was the DBU. We had all of a sudden a builder that's been building house extensions for twenty years, was building three and four-storey apartments and they are a complete mess. They are shambolic, they are all non-compliant and as you can appreciate those trades that worked on houses, have no idea what the regs were for the apartments. It is extraordinarily insane. Always has been insane from day one and the main reason we have such problems with apartments." (4 - Building surveyor)

"And then you go down to the tier fours that are building these apartments, they've got a residential licence and they've learned how to build Class 1 buildings, and suddenly they're able to do up to three, four-storeys no questions asked. And so they don't understand the commercial systems, they're suddenly going into multi-res, and don't have the knowledge, don't have the quality systems, don't have the safety systems in place to be able to properly deal with it because they're a different ball game."(5 - Project manager)

"Because if a builder thinks they can build a three-storey apartment building for the same price as a three-storey house, then their profit goes through the roof. So, this transference of domestic builders into commercial apartment buildings is where these dilemmas started." (9 - Fire safety engineer)

6.2.1.2 Service trades

Interviewees consistently referenced service trades as the group that required urgent training. The complexity of PFP systems and the array of PFP systems and products on the market coupled with limited education and training pathways had clearly contributed to a large number of installation failures.

"Most people are decent, hardworking and want to do the right thing, but they don't know what the right thing is and looks like. And that's a combination of overly complex building codes and poor training on site, poor apprenticeship training." (9 - Fire safety engineer)

"Mr Plumber might have four different types of pipes that are going through a wall; he thinks that the collar he's used on one is applicable to all." (11 - Fire safety and compliance practitioner)

Interviewees suggested that many service trades learned incorrect methods on the job and these methods were passed down over time from mentor to apprentice.

"They have learnt off the guy who has learnt off the guy who has learnt off the guy. I say to people, "What is the smallest plastic pipe that you can put through a wall or a floor without a fire collar?" Some people will say 50 millimetres. Some people will say 25. I go, "Where does that come from?" There is no smallest. You have got to test." (10 - Manufacturer)

"[Contractors] will install it how they've always installed other things, so why would they do that one any differently. And really, we're getting more and more technical with our systems because we want to make it faster, but not necessarily easier to install inside. But then they're misleading with what you need to do to achieve that fire rating, it makes it really hard for the guys on site. " (5 – Project manager)

The complexity and voluminous nature of manufacturer product specifications were considered as a potential barrier for trades installing various PFP products correctly.

"I think half the problem with the installation comes back to the manufacturers and their description of the nominations within the literature. Is their literature clear? Is their literature covering all the possible installations or anticipated installations? (16 - Manufacturer)

"Contractors need to read a manual that is that [very] thick to understand the nuances of how you install it" (5 – Project manager)

Interviewees suggested that PFP installation should be a trade on its own and requiring other service trades (like electricians, plasterers, plumbers etc) to understand the intricacies of passive fire systems without formalised education and training was, as one interviewee suggested, illogical.

"Someone certified to do plumbing should not be the one signing-off the passive fire. It doesn't even make logical sense if you think about it. It's a different thing. Do I hold it against the plumber for not knowing about an intumescent product? No, I don't. It's not his trade. This is my trade" (7 - Fire safety and compliance practitioner)

6.2.1.3 Building Surveyors

Building surveyors and building inspectors did not escape criticism from other building practitioners regarding their understanding of PFP systems and products.

> *They [inspectors] are looking but they don't know what they were looking for. The pipe may have been fitted with a fire collar - so it looks fine to the untrained eye but to the trained eye, you can see that the collar has been installed with no compliant fixings or it was a collar that was not approved for the particular pipe. That's the sort of things that we are picking up. (2 - Fire safety and compliance practitioner)*

> *"Now, they don't really have the experience, in my opinion, the building inspectors that we've seen, to have the necessary technical I suppose experience with those passive fire treatments to know if they're compliant or not." (6 - Builder)*

> *"I don't think they do [when asked if building surveyors have the requisite passive fire protection knowledge]. I definitely agree that it's very challenging, especially in the evolving construction industry where we've got lots of new products, lots of innovative methods of achieving construction outcomes and it is really hard for a building surveyor to be across that with everything else. There's I think a move now to have specialists within building surveying organisations, the bigger ones because they just can't have a person that can actually look at everything. So you've got energy efficiency, disabled access, fire so there's lots of different areas that are becoming more and more complex and more layered." (3 - State Building Surveyor)*

Building surveyors acknowledged that they were not specialists in every field and were reliant on third parties (trades and builders) to provide them with the necessary evidence of compliance.

> *"But for example, mastic, fire rated for electrical penetration, it's a mastic sealant that you apply. The truth is, I don't know if that's fire rated. It can look fire rated but I have absolutely no idea. I'm pretty good with experience at knowing what doesn't look to be fire rated, and we will raise that and say, "Well this doesn't look to be fire rated." And the builder will give me a certificate from the manufacturer that says it is, and I accept that because the building surveyor is not a specialist in any of these fields. And again, the system to my mind can only work if there is and there always has been - that there is an obligation on the builder to ensure that the contractors and products and materials are compliant with the Australian standards." (4 – Building surveyor)*

6.2.1.4 Maintenance contractors for Essential Safety Measures

A lack of education and training of maintenance contractors for ESMs was also identified as a concern.

> *"The difficulty with the maintenance perspective is that no one's trained. No one's trained." (13 - Fire safety and compliance practitioner)*

> *"There's a lot of fire companies that do their own [ESM] passive inspections and they believe that they have the skillset to do these inspections because they've done the [named] course or they've sent their technician to do the [named] course. You do a little module in a course and then you go out there. And passive fire is a lot more complex than they have in this little [named] course that they run. It's actually a trade upon itself. And without that level of updating and continuous training in this field, you'd fall behind so quickly because new products come out, test reports expire, buildings are forever changing in how they're being designed and you have to keep your finger on the pulse." (7 – Fire safety and compliance practitioner)*

Interviewees commented that many ESM maintenance contractors either focused on active fire systems (and in some instances subcontract the PFP components to a specialist), or inserted terms and conditions into their contracts that effectively excluded the inspection of many passive fire system elements.

> *In some instances, we do find that contractors hide behind terms and conditions in so far as they say that their inspections are limited to walk-through inspections. They do not inspect concealed spaces, valve access panels, anywhere that's too hard to get to and essentially don't uncover any of the issues that are there. When we inspect those areas and we uncover defects, which then creates an issue because the building owner or the owners corporation says, "It was fine last year. What's the problem now?" You say, "It wasn't fine last year. It just never got looked at. Ignorance is the other half of it. They're not deliberately not picking things up. They just don't know what's right and wrong." (2 – Fire safety and compliance practitioner)*

An additional aspect, that centred on roles and responsibilities contributed to the lack of knowledge. This was particularly evident when product compliance was discussed. A builder interviewee suggested that ultimately it was the responsibility of the building surveyor to verify that selected products are compliant.

> *"The products that we're looking at, we'll get them reviewed by [passive fire company] or a passive fire consultant to ensure that they've been tested to the right test standards and they're compliant. We will also get them reviewed by the RBS. But as soon as we get that reviewed by the RBS, the RBS is the engaged building surveyor, so it's on them to provide comment on whether these products are compliant or not. So they check all the test reports and they have to review and approve." (6 – Builder)*

A building surveyor commented that it was the responsibility of the builder to ensure that products were compliant and fit for purpose. The building surveyor suggested that it would be impossible for any building surveyor to be across the specifications of the thousands of building products on the market.

> *"It was never in my experience an expectation or a requirement for a relevant building surveyor to satisfy him or herself or to know everything about the particular products. Because there are hundreds if not thousands of products that go into the building. The obligation has always been and meant to be and practically can only be with the builder who is a registered practitioner and should/must use products that are compliant and fit for purpose." (4 – Building surveyor)*

The State Building Surveyor weighed in on this issue explaining that currently the system relied on the building surveyor to review each product including test and certification documentation. He suggested this burden on building surveyors was contributing to the problem.

> *"The system currently relies on individual building surveyors approving individual projects to actually review the individual products right back to the tests and the certificates. Productively, it's really poor that you've got this happening repeatedly on every project. And then you've got the risk that it's assessed differently by different building surveyors that have different levels of understanding, different levels of risk appetite and so you're getting some that are pushing back on products and saying, 'Well, this is not acceptable', and others are not really doing much assessment at all and just ticking it, saying, 'Yeah, I've got something from the manufacturer', and not actually reading it or seeing whether it actually meets the evidence of suitability requirements. And that's where I think we're in the position we're at with a lot of products being used inappropriately, because you'll have more and more that are not doing that assessment." (3 – State Building Surveyor)*

6.2.2 Poor construction management practices

A recurrent theme in the research interview phase was that a holistic approach was required to rectify many of the problems associated with PFP defects. One specific contributor to PFP defects, as observed by many interviewees, focused on construction management and the seemingly uncoordinated approach when trades are intersecting and the lack of quality control.

> *"So you have one trade that builds the wall, which would be your ceiling and partitions, or C&P contractor, and then your plumber puts a pipe through. So that plumber's responsible and then the electrician put one through, so that's the sparkie. And then the mechanical contractor. So this one penetration area about the door could have five, six, seven contractors who are responsible for their penetrations. It gets more complex in that we typically sell our systems to the wall installers, the C&P contractor. He's well gone off that floor by the time everyone pumps their penetrations through" (16 – Manufacturer)*

> *"I don't think that things are necessarily staged correctly on the building site. You might have a system that you must install in a particular way to achieve the FRL, but is that wall on site built in a way that accommodates the way it was tested? Then, who comes first? The tradies aren't programmed appropriately, what goes first? The pipe work through where the wall frame is and then the wall gets sheeted or do you sheet the wall and then penetrate the wall with the pipe work? Depends whoever's on site. It's first come, first serve. It's just crazy." (1- Fire safety engineer)*

> *"Or you might find it's the other way where you don't have enough space between the electrical and the plumbing, and then the electrician comes in after the plumber, or the plumber comes in after the electrician, and then they've made their system non-compliant because their penetrations are too close to each other. So there's a whole bunch of things that lead to the reason why they're defective, and it comes down to even just the way a builder will allow subbies to come through, they're punching holes everywhere and whose doing the quality control?" (5 - Project manager)*

6.2.3 Testing and verification issues of passive fire protection systems and products

Interviewees had, to some extent, differing opinions regarding the manufacturing, testing and verification of PFP systems and products. It was evident throughout these discussions that some Australian-based manufacturers were transparent in providing test and data reports, invested heavily in product testing and took a collaborative approach by providing well-developed installation manuals, training and onsite inspections capabilities.

> *"So you'll find that the companies are very good and they'll provide you the test reports and they'll give you instructions on how to install it correctly. They're actually really, really good. The companies themselves, in my opinion, are really, really good and they really want their stuff installed correctly because they don't want to be that photo on Instagram or LinkedIn of poor installation. So they'll do anything and everything to try and help you to put their product in and put it in right. So I find that they're definitely doing their bit on their end. It's when the product leaves their warehouse is where it falls down." (7 – Fire safety and compliance practitioner)*

> *"Fire-rated plasterboard products are exceptionally well tested. The good manufacturers like [named brands], they have their own small test laboratories. They do their own initial testing before they take it to a NATA accredited test laboratory. They write some of the best product manuals." (9 - Fire safety engineer)*

However, most interviewees raised concerns about the testing and verification processes for PFP systems and products. Untested products; testing processes and protocols; product intersections, and testing report transparency were areas of concern for interviewees.

6.2.3.1 Untested sale of products

Interviewees raised concerns about products sold in hardware stores that purport to have a fire rating but have not been tested in Australia. As highlighted by many, these products were being widely used in residential buildings.

> *"Here we are selling your fire rated foam through [named hardware store]. Everyone is using it. It says four hours on the can." (10 - Manufacturer)*

> *"Now you could go today into any [identified hardware store], and 90% of the fire stopping devices they sell are garbage, like they've got four-hour fire foam in a can, and it's like a gap-filling foam. It shouldn't even be sold in Australia. It's not even tested." (16 - Manufacturer)*

6.2.3.2 Testing processes and protocols

As explained by interviewees, the manufacturer must specify the outcome it wants directly to the test laboratory. The test laboratory tests according to that request. A manufacturer suggested this had led to holes in the testing regime.

> *"So you don't just take a product to the test laboratory and say, "Test'. You've got to go there and say, "We want this [for example, FRL at 90 minutes or non-combustible]." You've got to give a bit of information. The biggest hole in the industry comes back to it's up to each manufacturer. So there's lots of fire-device manufacturers or passive fire-devices in Australia which have got holes in their testing." (16 - Manufacturer)*

Interviewees raised concerns about testing facility capabilities, particularly the limits of wall testing and outdated testing standards.

> *"For someone to think that plaster could provide a fire rating was – 30, 40 years ago, you would never have thought of that, whereas everything is basically lightweight now. And the manufacturers' product information is good and those products are tested in the laboratories, which as we all know, has a limited scope in terms of sample size and application. Technically, any variance from that test report should be assessed by a fire [safety] engineer. So if the test panel has got a maximum height of, say, three metres for a lightweight fire rated wall, if someone wants to build the wall at 3.2 metres or 3.6 metres, it should be assessed by a fire [safety] engineer because it exceeds the limitations of the test. So those aspects I don't think get addressed correctly because it would be almost impossible to get a test." (12 – Building surveyor)*

> *"I think the other challenge, too, is the whole product certification system and process. There's a real issue even starting with the testing standards. A lot of the testing standards aren't appropriate for some of our modern materials and they haven't been reviewed with this in mind and your manufacturers are all about selling a product and if it passes the test that's mandated, even though they know that it doesn't actually feel right or it's not right, and they say, 'Well, I've ticked my box and I can sell this product' (3 – State Building Surveyor)*

6.2.3.3 Product intersection and testing

Two of the consistent issues raised by interviewees were the compatibility of different products when they intersect, and the costs associated with ensuring compatibility. This was particularly relevant when pipes and other penetrations intersected with fire walls. As the whole system was required to achieve the same FRL, each product that intersected must

meet the same standard. It appeared that constant innovation had led to the creation of new fire wall systems, placing additional burdens on the manufacturers of products that intersect with fire walls (for example, penetration seals and door sets). The testing costs were high and prohibitively expensive for smaller manufacturers.

> *"It's a lot of work to test every single type of pipe, cable, penetration through every different diameter, every different substrate, plasterboard, concrete, whatever, in every FRL that's required. It's not easy to do. It's an awful lot of work." (1 - Fire safety engineer)*

> *"What has happened now is, sadly, every single week, almost, there is a new wall on the market. People will go, "I have got this great idea. I am going to get a new wall." So, they go and do a three metre by three metre wall test. They get one hour FRL of 60/60, and then they launch it, and then it goes to the market and a certifier goes, "Where is the door?" So, the poor old door industry has got to put their hand in their pocket and go and do a door test because there is a demand. They go, "Where are the penetrations?" So, we have to do the penetration tests." (10 - Manufacturer)*

> *"Now we have got data cables, we have got fibre cables, we have got aluminium core cables, and they are not covered. So, you have got to go and test them uniquely. The biggest change now is that every different wall type has to have the penetrations, all the doors, all the openings, tested in that wall type. As these new walls appear, and no sooner do we test for those walls." (10 - Manufacturer)*

> *"We rely on [other manufacturers] having their own test data where it actually says it can be used in such and such situation with certain acceptable variations and certain limitations. So then what we tend to do – instead of our own testing, we go to Mr ABC and say, "Well what do you have for this scenario? Can you give us some evidence of suitability to show that that's actually compliant and suitable for this application?" (16 - Manufacturer)*

In addition, interviewees (including manufacturers) commented that many fire walls were not being tested to ensure structural integrity.

> *"The potential outcome for that is you could build a nice wall between my unit and your unit, and we could treat it with the appropriate fire rating on both sides to give us the fire protection from my unit to your unit, but if the wall's not structurally adequate to stay up, the wall could fall over through wind or seismic, and then we don't have any fire rating at all. Buildings move. Buildings rotate. Even floors, you get inter-storey drift, so your floors can actually go laterally different to each other, things like that. One hundred percent. So if it's not designed correctly, you could even get a massive crack in your wall. If your wall cracks, it's meant to be fire rated, then your fire rating's gone as well. You've got no fire rating between the units. And, if that gets a crack in it you might not know, because your plasterboard on the outside looks pretty, it's still smooth, your paint looks nice, and there could be a latent defect in the middle that you don't know about." (16 - Manufacturer)*

> *"I've come across situations where the fact that the building has needed to move as per section B [of the BCA volume 1], has actually compromised the fire rating between units because people - you're putting in effectively a construction joint that needs to move 50 mill [mm], or it needs to move whatever it is, so over the lifetime of its existence not being properly detailed in the place - it is stuffed with products that does not allow that joint to move. The structural integrity of the wall, I'm not a structural engineer but if a wall needs to stay put for a period of time, obviously it needs to be built to deal with that [movement]." (5 - Project manager)*

6.2.3.4 Lack of transparency - testing reports and data

Interviewees spoke of their frustration in getting access to test reports from some manufacturers. Some questioned the genuineness of the reports that were provided.

"The biggest issue we have is about efficacy of data. Even the [product] certifiers have to sign a non-disclosure [agreement] to get a test report. A test report is a statement of fact. It is the biggest marketing tool you have got. You have to ask yourself, why aren't the other people showing their test reports? It is because there is something there?" (10 - Manufacturer)

"Yes, there's some ambiguous test reports and there's some – you wouldn't call it fraud, but it's bordering on that when you're doctoring up test samples and cut and pasting PDFs and the like." (6 - Builder)

"There are players in the industry that will not give you their test reports. The difficulty in getting that is you can't really go to a manufacturer who wants to sell these products and say, "Hey, I've got a problem. Can you fix this?" And then they say, "Well, yeah, our website says" – I can write anything on a website - that's not good enough for evidence of suitability. So we ask them for data sheets that they've written - it's just a hard copy of a website. There's no difference. So we ask them for third party information and then that could be a test report. It could be a regulatory information report which is the minimum things that you need to provide. The issue is that certain players claim IP, "We can't give you that because it has our IP in it and if we give you that and it comes out of your hands, then our competitors can copy our systems." (1 - Fire safety engineer)

6.2.4 Poor documentation delivery

As experienced by many interviewees, the ability to access relevant and complete documentation was dependent on the stage of construction. Post-construction document handover was the most problematic.

6.2.4.1 Design phase

The State Building Surveyor highlighted that document handover in the design phase was a big issue. Building surveyors were often provided with inadequate documentation and specificity relating to PFP systems and products to be used in construction.

"[In the] document assessment and approval [phase]. It's basically assessing the documents to see that they comply with the minimum requirements of the building code, and so that would be looking at the specifications on the wall systems, penetrations, et cetera. And I've just come from a meeting now on design documentation standards, so we're looking at having a working group around the minimum level of documentation. That's a big issue in this space, that building surveyors are not pushing back on inadequate documentation, so they'll not look for actual product specifications et cetera; it'll be a broad FRL to 60 minutes and then you don't know how they're actually achieving that, and then that leaves it to the builder to achieve." (3 – State Building Surveyor)

6.2.4.2 Construction phase

There appeared to be more appetite for sharing documentation in the construction phase. The reasoning for this is highlighted below:

"At construction phase, getting a [Fire Engineering Report] FER for the building is very easy. At construction phase, getting fire compartmentation plans is very easy. At construction phase, it's very easy to talk to the RBS about the job because he hasn't been paid yet. Once everyone has been paid and retention has been paid and everything is gone, good luck getting in contact with anyone. I've sent emails to building surveyors that the building is 14 months old and I've sent five emails and they won't reply to your email." (7 - Fire safety and compliance practitioner)

6.2.4.3 Post-construction/occupancy phase

One of the perennial issues in residential building management has been the lack of document handover from developers to the new building owners. It appeared that little, if any, improvements had been made in this regard. As highlighted by interviewees below:

> *"The baseline document is just not available. I don't know the numbers but I'd say we maybe get documentation for 20% of the buildings and that's asking for it. If an ESM company doesn't ask for it they're not going to get provided it. They don't have it there to reference against and they're not going to do an accurate inspection. Baseline data is an issue" (2 - Fire safety and compliance practitioner)*

> *"We'll ask for as much documentation as we can, which again, can be quite hard to find; even in buildings that can be completed within the last 12 months, it's very hard to get a set of drawings or a fire engineer's report, just to ensure - when we're going out and doing our inspections - that we're looking at everything from a DTS perspective, so ensuring that everything is deemed to satisfy. But we don't know if Mr Fire Engineer's implemented anything during construction, so that can be challenging, at times." (11- Fire safety and compliance practitioner)*

> *"Another issue is there is a requirement for baseline data in a building. These people have built $10 million, $20 million, $100 million buildings and I can't find very basic building information on it. So treating a normal AS1851 inspection and what we do is more often than not, I would say 60% to 70% of the time, we don't have compartmentation plans, we don't have fire engineering requirements and we might have an occupancy permit." (7- Fire safety and compliance practitioner)*

> "*One of the first things that we'd be asking from the owners corporation is, "Can you provide us with a set of plans so that we can understand where we are and where your issues are?" If the building was 10 years old, you'd get the plan of subdivision, and saying, "Here's the plans. A full set of plans." Like, "No, that's not a full set of plans". So we'd go through the process of going through the council to try and obtain the plans if it was an older building. If it was a younger building you generally found that if you went to the developer or if you went to the builder you've got a lot of walls up because it's opening them to liability, or if you were able to get plans they're very simplified, they're generally the fit-out plans and they don't tell you how the building's gone together." (5 - Project manager)*

> *"[Fire Engineering Reports], they're very, very hard to get. You can't even get them from council, you can't get them from the developer, so that's a cost and a problem. (13 - Fire safety and compliance practitioner)*

A complication to the lack of document handover results was an inability to accurately determine the types of products used in construction. As identified by interviewees, it was very difficult to identify some passive fire products and their manufacturer post-construction.

> *"Unless you've been provided the documentation. I know by the class of buildings, and by relevant standards, what areas require certain fire rating levels, but to look at a lightweight construction wall, a lot of the time you're reliant on the fire door itself that will have a tag that will reference the actual FRL. But the manufacturer? No, because it's all pink plaster." (11 - Fire safety and compliance practitioner)*

Building maintenance and rectification became arduous when building documentation was not handed over or accessible by other means.

> *"{Documentation is] pretty critical. So if you don't understand what construction or what systems that you're dealing with, then you can't break it down or understand how it's gone*

together or understand how it may be defective. So you're guesstimating at what system. We're actually asking builders to provide systems, like, "What system are you going to use? How does it intersect with the floor or wall junction," whereas that level of information is never in the docs, very rarely, so not never, very rarely in the documentation that was provided to you." (5 - Project manager)

6.2.5 Limited nature of mandatory fire inspections during construction

In 2018, a passive fire-related inspection was legislatively mandated in Victoria. Since then, building surveyors have had to ensure that fire and smoke resisting building elements in Class 2 buildings were inspected in new construction prior to the occupancy permit being issued. However, the inspection regime only required at least one of each element to be inspected. These elements are outlined in the legislation. The confusion caused by the inspection regime, was explained by interviewees:

"The important question is: what's the intent of the inspection because it's really just a spot-check at a point in time. The traditional inspections are footings, frame and final, that's it. Our whole regulatory framework is based around those three mandatory inspections which means that building surveyors are onsite for less than one, one thousandth or one ten thousandth of the time of the project and has absolutely no idea what happens on that site. That's largely because we have a set of regulations that are a carry-on from the old uniform building regulations and in my opinion are largely targeted at domestic construction. And rather than have two sets of regulations which is what we need, we are just trying to accommodate those regulations to deal with both housing and commercial, which are two totally different beasts. Now we have an inspection on passive fire, but it's not – the footing and frame and final are absolute inspections: they are all of the footings, all of the frame, all of the final but the passive inspection is one sole occupancy unit per storey in the building. You could have ten apartments; I'm only required to inspect one apartment at two different stages of the construction of that apartment and never set eyes on the other nine. There is a clear imbalance and confusion about what an inspection is meant to mean. I can't see 90% of those penetrations when I do a final inspection. I have no idea what the builder has installed. There are some penetrations we can see. And typically, the builder will give a statement saying that all the penetrations comply with AS1530.4 and there might be a couple of statements for mechanical, for electrical. The point of this is that I go back to, what do the regulations intend? If the regulations intended for the RBS to check every penetration, why not make it a mandatory inspection?" (4 – Building surveyor)

The rationale for the inspection limitation was explained by the State Building Surveyor:

"We need to bring back more rigour into the system but we just don't have the resources - Class 2 buildings and it's only one example of the particular type of construction so it's not an audit inspection if you're multi-storey, looking at multiple levels. It's framed around "well hopefully if you got it right once you're going to get it right for the rest of the building". ... there's definitely the issue of the initial installation but then there's other trades coming through at a later date and punching holes through walls and not appropriately treating the penetrations. If the building surveyor is only looking at a point in time compliance could change between when they've actually looked at it and when the building's finally occupied." (3 - State Building Surveyor)

Many interviewees commented that the new inspection regime was a good first step and that builders had dedicated more concentrated supervision to ensure these elements were compliant.

"But I think now with the change to the inspection requirements for these, there's more inspections being done on this element. So potentially it will tighten up the whole system. So

the contractors are going to be more concerned about making sure it's done properly, the builder will be supervising better because if they have to start pulling stuff off because it hasn't been installed correctly, then that's obviously time and money. So if it's now getting inspected, and that inspection has been done properly, then overall the outcome should improve." (12 – Building surveyor)

6.2.6 Rectification reluctance

If PFP defects were not rectified by the time the occupancy permit was issued or within the statutory liability period (where builders are responsible for defect rectification), there appeared to be reluctance by building owners (owners corporations) to rectify defects particularly if the costs were significant. One fire safety engineer suggested the reluctance stemmed from a mindset that the probability of an apartment fire was low while ignoring that an incident could be a high consequence event. As discussed by many interviewees, cost is a factor in delaying or ignoring passive fire protection rectification needs.

"Not one of these buildings [interviewee showed a number of photos of buildings with defects] is fixed. The owners don't have the money, the builders have gone broke. No one's fixing it." (9 – Fire safety engineer)

Many interviewees explained that often the trigger to initiate rectification works was a building notice from the municipal building surveyor within council.

"You'll have owners corps that'll sit on these for years. I'll give you an example. We had one in [named suburb] not long ago, and we've been managing the building for four and a half years, and it was only six months ago that the council went out and did an independent check, noticed there were issues; they raised a building notice on the building and then all the defects that we've been listing, and they asked for all the essential service upkeep, and said, "Oh, you've had [named company] managing this building for how many years, and each year there's 100+ defects you haven't actioned." And then within 30 days everything was fixed." (11- Fire safety and compliance practitioner)

"I would say that it depends on the level of defects that the individual building has. So I'll generally find if there's less than $5,000 worth of defects maybe within a three year period, eventually the owners corporation will allocate some money towards the budget and do it. But once you start getting over $5,000 in terms of repair costs, I find that the drop-off rates like a cliff. When it gets around $10,000, $15,000, $20,000, $30,000, whatever it is in terms of that repair quote, whether it is going to be a fix all the issues that are there, that it goes into the too hard basket. And it's not until a council order notice is put on the building that they get repaired." (7 - Fire safety and compliance practitioner)

The financial consequences of not identifying and remedying PFP defects early in the design and construction phase can become prohibitively expensive post-construction. As illustrated by one interviewee:

"It is a pyramid of costs - you find the problem, if you fix it at concept stage it costs $1, if you fix it at detailed design it costs $10, if you fix it during construction it's $100 and if you try and fix it after the fact it's $1,000." (8 – Fire safety engineer)

This section highlighted the potential causes of, and contributors to, PFP defects and the consequences for building owners. The next section discusses the compliance drivers and interviewee solutions and recommendations for change.

6.3: Compliance drivers, solutions and recommendations for change

This section looks forward and identifies the drivers for potential change, solutions advocated by the project interviewees and their recommendations for change.

6.3.1 Compliance drivers

There was a consensus across the various interviewees that most practitioners and trades working on Class 2 buildings were striving for compliance. They also acknowledged that there were developers and builders focused on profit over quality. There were those in the market that simply didn't have the requisite skills to work on more complex construction. Also, it was evident that reputable builders were taking proactive quality assurance steps to mitigate non-compliance. One of the steps was the engagement of passive fire and compliance practitioners. Although there were relatively few dedicated companies in the Victorian market, it appeared they were providing an additional oversight and compliance service to developers, builders and building surveyors. Their services were explained in the interview process as:

> *"There'll be a design element, typically, from the start. So before we even attend site, we'll get issued a set of drawings and we'll work with a couple of the consultants to identify if we see any areas at risk. You've got an architectural drawings package listed, and in line with the fire engineer's brief at that time, we'll go through and assess the brief in line with a lot of the service layout drawings, to ensure there's not going to be any clashes. And from that, we will typically build a penetration register, or matrix, for the building surveyor to sort of stamp off, which is usually a condition on the building permit. So there's a bit of a process, and again, you see that a little bit more at the top end of town" (11 - Fire safety and compliance practitioner)*

> *"There's a few different avenues that we find ourselves sitting in. One, we can find ourselves for the developer, so as a bit of a peer review over the builder. We also get engaged by the builder, to ensure that all the service trades and everyone are doing the right thing. And then, of course, there's the service trades that get us to seal their work, as well." (11 - Fire safety and compliance practitioner)*

> *"Your more proactive builders will engage us at the start of fit out to do a sample wall, to review the products that the subcontractors intend to use, approve them. Package it up into an Excel spreadsheet with one tab for each contractor. Attach all the fire test reports because notoriously the subcontractors are poor at providing them. It is very hard to get the correct test reports. We have most of these test reports on file and we have avenues to be able to get them. To package together to send it to the building surveyor looks a bit neater than seven or eight contractors trying to put a pack together." (2 - Fire safety and compliance practitioner)*

One of the builder interviewees explained the process they undertook and the engagement of passive fire compliance companies to ensure compliance.

> *"We will then get all of our different treatments reviewed and approved by a consultant like [named company] who we engage to review and approve the penetration schedule. We then make a sample on site with the correct installation methodology of each of those approved passive fire treatments, and then once the subbies have all had that ticked off, we use that as a template to make sure that they're installing that correctly on site. And then furthermore, once we get to site - in the interim there, that will be reviewed and approved by the building surveyor also to ensure that they're happy with the passive fire treatment, the passive fire types installation methodology et cetera. Then when we get to site, we will actually engage [named passive fire company] to come around then and inspect all of our passive fire treatments before the walls are sheeted, and they'll do a defect inspection report, that will get*

issued to subcontractors, they have to close out those defects and get an approval from [named passive fire company] before we actually sheet the ceiling." (6 - Builder)

"There are actual passive companies that offer a service to provide the product and actually inspect the contractors doing the work and certify and sign-off the work there, and some really reputable companies. But if it's not mandated or legislated, it's largely voluntary and builders often won't expend money on something they don't have to spend money on." (4 - Building surveyor)

The cost of engagement to perform this extra service appeared negligible given the potential costs of rectifying defects post-construction.

"It's anywhere from sort of probably $10 to $15K, plus any rectification work that we get them to do. That's just roughly for sorting around 50 apartments. That's just the inspection auditing, and the odd fix this little bit up here sort of thing." (6 - Builder)

In addition, a manufacturer interviewee advised that top tier builders, in particular, often requested site inspections to ensure that their product was installed correctly.

"Most of those upper builders welcome the extra audit, the extra set of eyes to look at things. The bottom end of the market, the bottom end of the builders' level, they don't want people walking the floor. Typically they want to roll the project through as quick as they can, they don't want me coming through pointing holes out, "Mate, you shouldn't have done that, you shouldn't have done that. They're the ones running the risk. Whereas the upper end like the tier one guys, they want to get it right, because they know they're going to be around for another 10, 20 years, they don't want like a crumbling tower." (16 - Manufacturer)

6.3.2 Solutions and recommendations for change

6.3.2.1 Education and licensing

Education and licensing were considered a high priority area for reform because they were considered a cause of, and contributor to, high levels of non-compliance. Most believed that all practitioners and trades involved in PFP work including inspections and auditing required more education. Interviewees comment:

"What we need to do as an industry is licensing and registration and consequences for people that are found not to be doing the right things."(1 - Fire safety engineer)

"I think licensing of trades is a good thing." (4 – Building surveyor)

"I think more education so there needs to be a better understanding of what complies and what are the key risks and that's for all parties, the regulator included. I think because of the complexity we struggle to keep up with all the different products and their suitability, so I think it is developing those specialist skills to be able to identify and then communicate where the issues are. (3 – State Building Surveyor)

All of the passive fire and safety compliance practitioners interviewed wanted a better education and registration pathway linked to a dedicated trade. Many viewed the Queensland model that required licensing of trades as a good step forward.

"I guess, there's the education, the need to go to its own sort of stand-alone trade [passive fire trade]." (11 - Fire safety and compliance practitioner)

"This is the problem with consensus in states and territories. It is ridiculous. Queensland, miles ahead. Still got a long way to go, but it's got licencing so you can't even have fire on your card if you are not licenced. Everyone says it's a wonderful thing. Anyone [in Victoria]

can get a gun, start caulking sealant, no knowledge, and they are in charge of people's life safety or property protection, no skills." (10 - Manufacturer)

The State Building Surveyor was cautious about introducing more registration and licensing for trades. His concern was the lack of resources available for review and enforcement.

> *"Yes, I've got two trains of thought on this. I think from an expertise perspective it's really important that we have practitioners that are experts in particular areas because of that complexity. I suppose my concern from the registration and licensing perspective, is it's good in theory and I support it, but my observation is we're registering more and more practitioners and parties without the appropriate mechanisms to review and control them. I'm seeing more and more of the unregistered practitioners flying under the radar. They don't pay the registration fee, they don't have to hold their insurance. They can actually undercut those that are registered so it potentially discourages people from becoming registered in the future. So I definitely support it, provided we get better systems for actually being able to regulate those that are unregistered and the ability to penalise them appropriately so that it actually discourages it. (3 - State Building Surveyor)*

The current avenue for accredited training is the Fire Protection Accreditation Scheme (FPAS). As discussed by a representative, the Fire Protection Association of Australia is, amongst other things, a registered training organisation (RTO) that delivers the FPAS. It appears that the uptake has been mostly in New South Wales since the introduction of legislation mandating this training requirement.

> *"We have a training - an RTO. A lot of that's for New South Wales because they've got the legislation that's already in place for the requirements for what we call as FPAS. So that's for your inspection and tests. In New South Wales, everybody who wants to test and inspect fire systems, they have to. They're legislated to do it. So anyone who's really doing fire protection in New South Wales has to have some form of accreditation done." (15 – FPAA representative)*

Some interviewees who had gone through the FPAS were of the view that trades, should at least, be required to undertake the FPAS.

> *"It would be great to have some sort of legislated pathway to state that anyone, probably installation ones, needs to be at least FPAS accredited." (2 - Fire safety and compliance practitioner)*

Many interviewees discussed the need for education and training for post-construction/occupancy maintenance from an ESM perspective. The interviewees also discussed the importance of ensuring that building owners and resident managers understood the need to protect and maintain the integrity of PFP systems.

> *"Astounds me that there's such a lack of appreciation of where the fire and smoke walls are in a building. So it's just having appropriate documentation so when you come into a building you know where the fire and smoke walls. So that's a key component of actually identifying where fire rated construction is and then having an understanding from the owners, facility managers and maintenance personnel that these are key components of the building's performance and that if they've got any trades that work in those areas and may be putting services through they need to have a process of either getting signoffs or inspecting afterwards to make sure that those walls have been appropriately treated for any of the penetrations that may go through them. (3 – State Building Surveyor)*

6.3.2.2 Testing, accreditation and verification of passive fire protection systems and products

Many of the interviewees discussed the need for change in product testing, accreditation and verification. Much of the commentary focused on more transparency in testing and reporting, and the creation of a centralised product certification system.

> *"I think that's really important [transparency with testing data], it's people that are relying on – it's like somebody's installing a system that's meant to comply and there's all this test data which shows why it complies, they should have access to that in my opinion." (8 – Fire safety engineer)*

Several interviewees discussed issues with the current CodeMark certification system.[74] Manufacturers acknowledged the need for such a system but commented that many iterations of the scheme were needed before confidence was restored. As one manufacturer explained:

> *"[Need a renewed CodeMark system] where it talks in totality, where it talks about the intended purpose of a building material. So what is your intended purpose of that ceiling tile, whatever you're putting up? Okay, well that ceiling tile's going to be used for this purpose. So specifically for that intended purpose, this ceiling tile satisfies the building code in all its glory essentially, all its detail. I think that would be the best way to ensure the materials that are getting made are suitable." (16 – Manufacturer)*

Many interviewees endorsed a centralised product certification system. They considered that an environment has been created where people responsible for verifying products and systems were overwhelmed and not confident. This was due to the large volume of products in the market, difficulties in obtaining test data and reports, misunderstandings about the intended purpose of products, and the need for building surveyors to be satisfied with the suitability of a product. As suggested by the State Building Surveyor:

> *So, it is resetting that whole process but, to me, we need that centralised product certification system so that it's done once by a body and then the building surveyors can actually accept that. They'd be checking whether it's fitting the criteria and the conditions of the certification for that particular use but they don't have to go back and satisfy themselves on its full evidence of suitability so that you've got the major component of the assessment done and dusted and then they can actually concentrate on other parts of the building assessment." (3 - State Building Surveyor)*

Additionally, the State Building Surveyor was of the opinion that manufacturers had a bigger role to play in ensuring compliance. He highlighted the constraints in laboratory testing and the need for onsite verification.

> *So I think once again to me the solution is that we need to bring in the manufacturers and the suppliers into that process and make them accountable for the installation as well as the front end testing and suitability of the products, that they should be held accountable also for the installation and I think that would improve their whole process. So that currently they don't have any accountability at construction, they have an opt out in that "well it wasn't built in accordance with the tested and approved process" and so it's almost in their interest to make*

[74] According to the ABCB (the administrator of CodeMark), the CodeMark Certification Scheme is a voluntary third-party building product certification scheme. It supports the use of new or innovative building products in specified circumstances, by providing a nationally accepted process for demonstrating compliance with the National Construction Code.

it too difficult to build onsite so that they don't have any liability down the track. My observation is that a lot of the systems are laboratory-constructed in a highly controlled environment so they maximise the test success. Then you're expecting builders and trades to replicate that in site conditions unrealistically so that's often not going to actually be achieved." (3 - State Building Surveyor)

6.3.2.3 Document handover

A better pathway that ensured all the relevant documents were provided throughout construction and post-construction was discussed. The building manual highlighted in the 2018 Building Confidence Report authored by Peter Shergold and Bronwyn Weir was considered by many interviewees as a necessary step.

> *"It should be a recommendation that the occupancy permit is not issued until this [building] manual/folder is complete. It is basically for the owner to understand in a sensible, summary format, any future building manager is able to find everything they need in that. It would show the two-dimensional compartmentation layout, the mechanical system, a brief one-part explanation of the fire engineering performance solutions. That is one of the recommendations. At the moment, there is nothing. You have nothing." (4 – Building surveyor)*

The State Building Surveyor advised that this reform was being considered by a Building Reform Expert Panel established by the Victorian Government to lead its review of the building legislative and regulatory system.[75]

> *The Victorian Expert Panel on building system reforms is considering a building manual so there is more rigour around developing documentation so hopefully things like compartmentation as I've just mentioned will form part of that. Also the improved availability of performance solution documentation and understanding of those moving forward are really key components. (3 – State Building Surveyor)*

6.3.2.4 Shared responsibility and liability

Some interviewees discussed the need to share the responsibility and liability more equally across practitioners. The State Building Surveyor suggested the system had unfairly evolved leaving a disproportionate share of responsibility and liability on the shoulders of building surveyors.

> *"There's now a real understanding of the consequences of not getting it right and the liability and insurance consequences around those decisions. So now they're [building surveyors] looking at all of the areas and having a better understanding of where they're exposed and what the liabilities are and how they can better share that liability. I think the system has unfairly evolved to rely on the building surveyor as the gatekeeper at the end of the process of the documentation and then the construction and at the benefit of the other practitioners in the process. So they've shed liability and heaped that onto the building surveyor more and more so I think for a successful system it really needs that shared liability and accountability for the individuals or the parties that are actually responsible for delivery of the particular components of the building." (3 - State Building Surveyor)*

[75] For more information, see: Expert Panel's Comprehensive Review of Victoria's Building System | Engage Victoria and Building, Planning and Heritage Legislation Amendment (Administration and Other Matters) Bill 2022

6.3.2.5 A national approach to reform

Some interviewees were disinclined to hope for major reforms in this area. The feeling was that until a major catastrophic fire event occurred in Class 2 buildings, governments would be reluctant to take proactive action.

> *"The problem they've got now is that the community has reached the cry wolf stage. Because nothing bad has happened. And I've actually tried to explain this to lawyers. Building codes evolve from a really bad thing happening and then governments fixing that. Until the bad thing happens governments won't write regulations for things that are maybe a problem. They'll only write things that are actually a problem." (9 – Fire safety engineer)*

The State Building Surveyor was a little more optimistic pointing out that progress had been made albeit slowly. He believed more progress could be made if the different jurisdictions shared resources and developed collaborative approaches to solve the problems associated with building defects. He was frustrated by the lack of national support and the inability to solve these issues collectively.

> *"Because I think that's a really frustrating thing for me, coming from private practice, is the differences between the states and the inability to work across borders easily and learn from each other too because you're restricted to your little environment. Victorians don't learn from South Australia and New South Wales and other areas because we don't talk at the same level across the practitioners because of the differences. Whereas, if you open it up, all resources could be shared to develop new ways of doing things and fixing up the problems that we've actually got. There's strength in numbers because every time we come up with a position on something you get that negative, there'll be a group that would lobby against it. Whereas, if you've got all states that have actually sat down and said, 'Well, no, this is what we're all doing on a national basis', it's pretty strong and I think that you support each other then, too. You can actually support each other with those decisions and once again sharing all the intel so that you're making better decisions as well; you're not making isolated decisions. So, that's where I'd hope we'd work towards, bit by bit. I think we've definitely made progress but I think it's frustrating that we haven't made as good inroads as we should have off the ABCB BCR [Building Confidence Report] work and there's still a lot of separation there." (3- State Building Surveyor)*

This section of the report has highlighted some of the compliance drivers and their uptake by the building industry, and the solutions and recommendations for reform suggested by interviewee practitioners.

Chapter 7: Discussion, conclusions and recommendations

It is evident from undertaking this research that investigating Passive Fire Protection (PFP) defects in residential buildings in Victoria is indeed a complex and onerous task. The exploratory nature of this research has allowed the researchers to make unanticipated discoveries along the way. By delving into the nuances of this topic in the interview phase, further insights have been uncovered that require further exploration in order to truly understand all the intricacies associated with PFP defects in residential buildings. Therefore, although some outcomes from this project are clear and articulated in recommendations, others require further work. This research does not capture every aspect of PFP defects but provides a solid starting point for further exploration. Like all research relating to building defects, we are in our infancy in terms of knowledge acquisition and the researchers of this project implore governments to further invest in building defects research, in particular, fire safety defects.

Before discussing the findings as they relate to the specific objectives outlined for this project, it is helpful to discuss ten key insights since the commencement of this research project.

1. Although difficult to quantify, there is evidence to suggest that a large number of Class 2 buildings in Victoria are likely to have PFP defects. Most of these defects are likely to relate to fire walls and penetrations.
2. It is essential that PFP defects are identified and remedied during the design and construction stages. The risk of non-detection of PFP defects is extremely high post-construction. Therefore, rectification is difficult and can be prohibitively expensive particularly if access to these defects is hindered by other construction elements or systems (e.g., walls).
3. There are limitations on PFP product testing and verification. The volume of PFP systems and products in the market that need to intersect makes testing all possible combinations prohibitively expensive. This is especially true for small to medium sized manufacturers. Testing is limited in terms of sample size and application. Therefore, any system that extends testing capabilities requires additional verification that is not frequently undertaken. Access to and interpretation of testing data and reports is problematic. Complex installation manuals can inevitably deter compliance if they are too difficult to understand.
4. Mandatory inspections of PFP systems are limited and building surveyors do not necessarily have the requisite skills to identify all passive fire non-compliance.
5. Building documentation and information transfer from the developer to the owners corporation is poorly undertaken. This leads to complications with Essential Safety Measures (ESM) maintenance and rectification works.
6. Builders, developers and service contractors are engaging unregulated passive fire practitioners to identify PFP defects, monitor defect rectification and install PFP elements and systems. This highlights a need in the marketplace for skilled practitioners to be included in practitioner registration schemes and for an education and training pathway to be provided.
7. Some large building companies are proactively implementing quality assurance programs to minimise the risks of PFP defects. Installation and verification protocols are set down early in the planning stage to ensure compliance during construction.
8. Owners corporations appear reluctant to rectify costlier PFP defects until ordered by a local government authority. A fire in a building with a number of PFP defects

carries a high risk (of death or injury) but the probability of a fire seems low so rectification is not prioritised.

9. Unregulated ESM maintenance contractors may not have the expertise to identify PFP defects. They also may contract out the inspection of PFP systems and elements leaving owners corporations exposed.
10. More research is required in key areas identified in this project. At the end of this chapter, some suggestions are highlighted.

The overall aim of this research was to better understand PFP defects and the regulatory environment associated with this construction system. The objectives were to:

1. add to the existing database on PFP defects in order to gain a better understanding of the types and prevalence of PFP defects in existing residential buildings;
2. review the regulatory system to identify the rules and standards for PFP. This review identified and examined the laws (legislation and regulation) and code regulating PFP systems in Victoria. An additional comparative overview has been provided, highlighting the various approaches undertaken by the states with substantial apartment supply (New South Wales (NSW), Queensland (Qld), and Western Australia (WA));
3. identify any regulatory gaps in Victoria relating to practitioner skill and competencies. This review was a cross-jurisdictional comparative analysis of registration and licensing regimes for industry practitioners relating to PFP systems including, builders, architects/ designers, fire safety engineers, building surveyors/certifiers, and fire safety and compliance installers; and
4. propose recommendations for reform or changes in policies.

This next section discusses the findings in respect to objectives 1, 2 and 3 and provides recommendations, where relevant.

7.1 Understanding the types and prevalence of passive fire defects in existing buildings

Industry participants (registered or not) who regularly inspected residential buildings and had expertise in PFP systems, were extremely concerned by the quantity of PFP defects and the lack of action taken by governments and agencies to mitigate the safety risks arising from these defects. Some were fearful about the real potential of a fatal fire. Many commented that governments were generally reactionary and until there was a catastrophic fire (like Grenfell) reform would be slow.

Although accessing data was extremely difficult, fire rated walls, penetrations and fire doors were the areas consistently highlighted as most problematic for PFP defects. Lack of continuation of firewall to slab, incompatible firewall intersections with other non-fire rated products, incorrect installation of walls, lack of structural stability of fire walls, non-rated fire walls, unsealed penetrations, incorrect collar or pillow installation, incorrect mastic or sealant (including non-compliant pink foam), multiple service cable penetrations that are too close together, incorrect installation of fire doors, caulking missing, incorrect installation of fire boxes, and fire wrap not used or incorrectly used were the most common PFP defects identified.

For many, a real concern was the PFP defects located in timber-framed low to mid-rise buildings.

However, it was pleasing to see that some building companies were actively taking steps to identify areas of risk by establishing quality assurance protocols in-house or engaging external specialists to identify and remedy any defects prior to construction completion. Providing evidence of such risk minimisation strategies would provide a higher level of confidence to the purchasing public. It was difficult to determine the number of building companies actively pursuing such a strategy. However, evidence suggests that larger Tier 1 and some Tier 2 building companies have implemented such strategies.

The main causes of, and contributors to, PFP defects included; lack of knowledge (across the board); poor construction management practices on site; testing and verification issues of PFP systems and products; poor document delivery to end-users (owners corporations) hindering maintenance and rectification works; and limited mandatory inspections. The most consistently highlighted cause of PFP defects by interviewees was a lack of knowledge across all practitioner types. Surprisingly, there are limited specialist courses in the marketplace that focus specifically on PFP.

Recommendation 1: That further investment is made to better understand the prevalence of PFP defects in residential buildings in Australia including the costs associated with rectification throughout the lifecycle of a building. Furthermore, work to identify the building companies that are actively incorporating quality assurance protocols is valuable to not only build confidence in the market but also to demonstrate to other building companies the benefits of incorporating such strategies early in the planning and construction phases.

7.2 Identifying the rules and standards for passive fire protection

The difficulty in identifying and discussing the rules and standards for PFP is that an understanding of the broader regulatory environment is required before drilling down to the specific requirements relevant to PFP.

As stated in Chapter 4, the National Construction Code (NCC) is the main regulatory mechanism regulating building work and construction processes and includes a number of performance requirements specifically relating to PFP. It is important to note that the NCC takes a holistic approach. Therefore, all sections of the code need to be considered including Section C that provides the fire resistance requirements. Section A provides rules and instructions for using and complying with the NCC and includes provisions relating to classes of buildings, assessment methods and referenced documents (e.g., Australian standards). Section B provides structural reliability performance requirements ensuring that fire wall systems perform adequately under certain actions. Section D is important to PFP as it provides the requirements to allow egress from the building in the event of a fire.

Although interviewees generally considered that the NCC was a well-formulated code, many discussed issues that arose due to misinterpretations of the code and standards that apply. Again, this highlights that education is needed so that practitioners have the requisite skills to interpret the code and standards accurately and adequately. Ensuring that building practitioners involved in PFP work are competent in interpreting the relevant provisions of the NCC is fundamental and should be incorporated into registration requirements. There also appeared to be much confusion in the industry regarding Section B requirements and its application to fire walls.

Recommendation 2: That a practice direction be issued by the relevant authority regarding the application of Section B of the NCC to PFP systems.

In addition to the NCC, each Australian state and territory also has laws that regulate building work and construction processes. As a result of broader issues relating to building defects (including combustible cladding), some states have been more proactive than others in implementing laws in an effort to curtail the harmful effects of defects in residential buildings. NSW has enacted legislation to better regulate practitioners, ensuring better compliance at the design stage, and creating a statutory duty of care (*Design and Building Practitioners Act 2020*). NSW has also enacted the *Residential Apartments Building (Compliance and Enforcement) Act 2020*, which is intended to prevent serious defects by ensuring that defects are rectified prior to an occupation certificate being issued. There have also been a number of amendments made to the relevant strata legislation in NSW, which is aimed at making developers more accountable. The most significant legislation in Qld has been the *Building and Construction Legislation (Non-Conforming Building Products – Chain of Responsibility and Other Matters) Amendment Act* 2017, which amends the *Queensland Building and Construction Commission Act 1991.* This Act, inter alia, introduced various duties regarding building products on participants (designers, manufacturers, importers, supplies and installers) in the supply chain. Interviewees in this project, advocated for a more equal distribution of liability and accountability.

The inclusion of new rules aimed at better regulating building practitioners, curtailing the impacts of defects and ensuring accountability across the board are all essential objectives. Victoria can certainly learn from the work undertaken in these other jurisdictions (and indeed internationally). However, simply adopting a pathway without evaluation may lead to a cycle of future reforms that obstruct effective change.

Recommendation 3: That investment in research is made that thoroughly reviews and evaluates the laws (both in Australia and internationally) that regulate building work and construction processes relating to PFP prior to setting any future reform agendas.

7.3 Practitioner regulatory gaps in Victoria

The competency of building practitioners to engage with PFP was a consistent issue raised in the interview phase of this project. The concerns of interviewees, to a large extent, mirror the broader points made by the independent Building Reform Expert Panel appointed by the Victorian Government to review the state building system. This panel identified that the current registration and licensing schemes were limited and not fit for purpose, and that there were gaps in practitioner competence which were not currently addressed by education and training.[76]

Two other points made by the Panel resonate with the findings of this research. Firstly, the Panel suggested that accountability issues stem from that fact that:

> "the current building regulatory system does not provide sufficient oversight of building industry participants and practitioners across the construction process from design through to project development and to building and maintenance."[77]

Secondly, that the practitioner registration system does not take into account the complexity and added risks associated with high rise construction. As highlighted by the panel,

[76] Victoria State Government, 'Framework for reform: Modernising Victoria's building system' (2021), https://engage.vic.gov.au/expert-panels-comprehensive-review-victorias-building-system
[77] Ibid, 42.

> "[s]ome stakeholders suggest that the lack of specialisation in building practitioner registration classes allows practitioners without the necessary skills to carry out complex or high-risk work they are not qualified to do, particularly in relation to multi-storey apartments."[78]

This statement reflects the concerns raised by many interviewees regarding the domestic builder registration category.

For convenience, discussion points regarding each specific practitioner are outlined.

Architects / Designers

Unfortunately, resourcing and time restraints hindered the researchers' ability to interview architects and designers. It was evident from discussions with other practitioners that ensuring the design accurately and compliantly facilitates PFP is one of the first steps in overcoming issues related to PFP. Essentially, if the design is not right, problems will manifest through construction and may ultimately lead to lifelong PFP defects. Interviewees raised concerns that construction drawings often lacked specificity in relation to PFP, that if built in accordance with drawings, some buildings would be non-compliant, and that inadequate documentation is often handed to building surveyors in the planning stage.

Further research should be conducted to determine, more accurately, the issues relating to design documentation and designer knowledge of PFP.

Fire safety engineers

When investigating the role of fire engineers in the process, it was surprising to the author to learn that generally, fire safety engineers were only engaged if a performance solution was required. If only Deemed-To-Satisfy (DTS) performance requirements were used, then a fire engineer would not, necessarily, be engaged. Some interviewees suggested that regardless, fire engineers should be more involved in the construction process including inspections.

Shergold and Weir recommended that where there are performance solutions, fire engineers should be more involved in inspecting, and work in conjunction with building surveyors.

> "Where there are performance solutions on fire safety performance requirements, a registered fire engineer should be required to certify that the work complies with the fire safety engineering design. The registered fire engineer may need to inspect the building at various stages in order to be able to issue a final certificate."[79]

Builders

Many concerns were raised in the interview phase of this research regarding the competency of domestic builders to construct Class 2 buildings. As discussed by interviewees, the complexity of building multi-storey residential construction is very different from stand-alone domestic homes and requires additional expertise particularly for fire safety.

As highlighted in the Shergold and Weir report:

> "Whilst there is some crossover, the skills required for the design and construction of commercial buildings [meaning Class 2 to 9] differ significantly from the skills required for the

[78] Ibid.
[79] Peter Shergold and Bronwyn Weir, 'Building Confidence: Improving the effectiveness of compliance and enforcement systems for the building and construction industry across Australia' (2018) 35 - https://www.industry.gov.au/sites/default/files/July%202018/document/pdf/building_ministers_forum_expert_assessment_-_building_confidence.pdf?acsf_files_redirect

> design and construction of domestic buildings Class 1 and 10]. Many practitioners specialise in, or have capabilities limited to, either the commercial or domestic sector. Unfortunately, in many jurisdictions the scope of work that can be performed by some categories of registered practitioner is not limited to the type of design or construction work they have the capability to perform. This results in registered practitioners taking on building work for which they are not fully competent."[80]

Currently, under Victorian registration requirements, a domestic builder in the unlimited category can construct to any height or floor size. In addition, there are no requirements for commercial or domestic builders to: prove that they are competent in interpreting the requirements of the NCC; undertake Continuing Professional Development (CPD); keep records; report or advise any minimum financial requirements to the VBA; hold professional indemnity insurance; or adhere to any code of conduct.

In Victoria, there are a large number of registered builders in the domestic (unlimited) category. There are also variations of PFP in Class 2 buildings that exist (depending on the construction type). Therefore, it is imperative that all builders have the knowledge, capabilities, and competencies to work on Class 2 buildings in all construction type categories or registration limitations should apply for particular construction types or categories.

Further research should be undertaken that evaluates the relevant provisions in the *Design and Building Practitioners Act 2020* (NSW) and the *Building and Construction Commission Act* 1991 (Qld) to determine whether like provisions should be incorporated (or amended) for inclusion in Victoria.

Recommendation 4: Ensure that all builders have the requisite knowledge, capabilities and competencies (including for PFP) required to work on Class 2 buildings in each construction type (A, B or C) or restrict the registration categories based on class and construction type. In addition, and after a review of the relevant legislation in NSW and Qld, consider the inclusion in the registration requirements for CPD, professional indemnity insurance, financial and other reporting requirements, and a code of conduct.

Building surveyors

The complexity of PFP and the volume of products used in PFP has led to challenges in terms of knowledge acquisition for building surveyors. Building surveyors acknowledge that it is difficult (if not impossible) to have the expertise needed in every field. There is a reliance on other practitioners to provide building surveyors with the necessary evidence to ensure compliance.

In addition, the reliance on building surveyors to review individual products including their test reports had led to, as described by the State Building Surveyor, an environment of risk where products are being inconsistently assessed by building surveyors who all have different levels of knowledge and varying appetites for risk.

It is evident that there is some confusion that exists in terms of the roles and responsibilities of building surveyor when it comes to PFP compliance. Further research is needed to understand the work that building surveyors are doing in verifying products, their reliance of third-party compliance certification and to gauge their knowledge of PFP particularly when undertaking inspections.

[80] Ibid, 15.

Services trades

This research highlighted numerous concerns about the knowledge of various service contractors interacting with PFP systems. Trades that can certify that their work complies (self-certification) with the NCC requirements should have the requisite skills and competencies to undertake such work. For other practitioners though, the knowledge, capabilities and competencies of PFP need to be embedded in registration requirements.

Emerging Passive Fire Protection specialists

One of the regulatory gaps in Victoria is the lack of recognition of PFP specialists. They are playing a role in detecting PFP defects in the design and construction stages and they have expertise in PFP system installations. They are also providing essential services in the occupancy stage by ensuring that PFP systems are inspected. Recognition as a stand-alone practitioner group should be considered and a registration and professional pathway outlined.

As recommended in the Shergold and Weir report, fire safety practitioners should be a registered category of building practitioner. The report identified two sub-categories for this practitioner class in terms of installation and maintenance: fire safety system installers and fire safety system maintenance contractors.

Although still evolving, Queensland's registration system for this practitioner class should be evaluated and included as a new building practitioner category in Victoria.

The model guidelines outlined in the National Registration Framework[81] for building practitioners recommends two levels of licensing for passive fire and smoke systems installers. It appears that the higher-level licence allows these practitioners to install fire systems, make declarations in relation to installation work, and inspect systems.[82]

In addition, any person undertaking ESM maintenance of PFP systems (occupancy stage) should be registered and possess the necessary skills and competencies to undertake such work. In the interview phase of the research many concerns were raised about the skill level of maintenance contractors. As stated in the Shergold and Weir report,

> "[m]ost commercial buildings include complex fire safety systems that require maintenance and testing to ensure that they will operate as intended in the event of fire. Many key stakeholders believe that the standard of maintenance of fire safety systems post-occupancy is poor. However, most jurisdictions do not require fire safety system maintenance contractors to be registered."[83]

[81] The National Registration Framework is a response to the Building Confidence Report recommendations. Building Ministers established the BCR Implementation Team (within the Office of the Australian Building Codes Board) to work with governments and industry to respond to the recommendations made. The aim is to establish nationally consistent best practice models.

[82] Australian Building Codes Board (ABCB), 'National Registration Framework for building practitioners Model guidance on BCR recommendations 1 and 2' (2021) - https://www.abcb.gov.au/resource/guidance-materials/national-registration-framework-building-practitioners

[83] Shergold (n 79) 15.

In a NSW industry report on reforms to improve fire safety in completed buildings, one of the recommendations was to ensure the effective regulation of fire safety practitioners.[84]

Although as cautioned by the State Building Surveyor, implementing new registration categories also requires sufficient resourcing to enable monitoring and enforcement. Resourcing in this area needs to be a priority due to the consequences that can occur if unregistered practitioners working in PFP are not competent or held to account.

Recommendation 5: That a new practitioner category (including sub-categories) be established in the *Building Act 1993* (Vic) for PFP practitioners and the necessary resources provided to the VBA for registration and enforcement.

7.4 Other findings from the research and recommendations

7.4.1 Education and training

It is unsurprising that interviewees called for better education and training programs in PFP across all practitioner groups, given the gaps outlined in the previous section. The majority of interviewees considered this a high priority area for reform.

Recommendations 2 and 3 of the Shergold and Weir report endorse the need for training and prescribe two specific requirements that:

1. certified training including NCC competencies is undertaken by all practitioners; and
2. all practitioners undertake compulsory CPD on the NCC.[85]

> "Regulators need to have mechanisms to identify common non-compliances which may indicate systemic misunderstanding of the requirements of the NCC."[86]

Aside from NCC training, education and training programs need to include specific modules that take into consideration all aspects of PFP. It is apparent that the education and training sector as a whole has limited education pathways for PFP. Therefore, industry practitioners specialising in PFP should be utilised as a resource to facilitate such a program.

A good and immediate first step could be the mandatory inclusion of the Fire Protection Accreditation Scheme (FPAS) for all trades interacting with PFP systems.

Discrete training programs should be designed for ESM maintenance contractors and managers engaged by owners corporations to facilitate ESM inspections. The EMS program for maintenance contractors should be mandatory providing an additional safeguard for building residents.

Recommendation 6: That building regulators and fire protection industry representative groups work with PFP practitioners to formulate and facilitate a bespoke training program for PFP.

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[84] NSW Government, 'Construct NSW: Improving Fire Safety (Industry report on reforms to improve fire safety in new and existing buildings)' (2021) - https://www.nsw.gov.au/building-commissioner/building-and-construction-resources/research-on-fire-safety-reforms
[85] Shergold (n 79), 17 & 18.
[86] Ibid.

7.4.2 Documentation

Poor documentation handover post-construction has been a perennial problem faced by owners corporations for decades.[87] Strata legislation requires initial owners (developers) to hand over prescribed documents to owners corporations at the first Annual General Meeting (AGM) of a new scheme. Rarely will an inspection of the owners corporation records result in the unveiling of the whole suite of relevant construction documentation. Owners corporations often don't realise this requirement or pursue a developer because the importance of these documents isn't always apparent until repairs and maintenance are needed. This can arise several years' post-registration of the scheme. It is critical that reforms are introduced guaranteeing the turnover of essential construction documents early in the life of a new building. It is evident that relying on the provisions in the *Owners Corporation Act 2006* (Vic) is not sufficient to compel compliance. Documentation handover needs to occur prior to the issuance of the occupancy permit.

The need for reform in this area was detailed in a number of recommendations in the Shergold and Weir report (specifically 12 and 20) including the lodgement of a comprehensive building manual and the establishment of a building information database. [88] A central repository of building information is an important recommendation and should be encouraged. Relying on owners corporations (even those with professional managers) to retain these documents has its drawbacks. A repository that allows prescribed interested parties (those engaged by the owners corporation) to easily and cost effectively access construction related documents is a must. Crommelin et al also favoured the strengthening and enforcement requirements for developers to hand over a building manual.[89]

Recommendation 7: That consideration be given to making it a requirement that developers hand over prescribed documents prior to the occupancy certificate being issued. Further, consideration should be given to a centralised repository to hold essential construction related documents.

7.4.3 Testing, accreditation and verification of passive fire protection products

Although some interviewees described confidence in the testing and accreditation processes for PFP systems, others had concerns regarding testing information and data transparency, the processes employed to test products, and testing laboratory capabilities. The use of untested products in the market was also a concern.

It appears that the sheer volume of PFP products and the complexities surrounding product intersection has created an environment of confusion for practitioners installing and inspecting elements that require PFP. The Senate Inquiry into non-conforming building products recommended that the Australian Government consult with industry to determine

[87] Nicole Johnston, 'An examination of how conflicts of interest detract from developers upholding governance responsibilities in the transition phase of multi-owned developments: A grounded theory approach' (2016), PhD Thesis.

[88] Shergold (n 79) – recommendation 12 states that each jurisdiction establishes a building information database that provides a centralised source of building design and construction documentation) and recommendation 20 states that each jurisdiction requires that there be a comprehensive building manual for Commercial buildings that should be lodged with the building owners and made available to successive purchasers of the buildings.

[89] Crommelin (n 15).

whether a national database of conforming and non-conforming products was feasible.[90] Many interviewees endorsed the creation of a centralised product certification system.

Given the issues around combustible cladding products and the problems identified by the Independent Building Quality Centre (points raised in Chapter 2), a more detailed examination of the product testing regime in Australia and the manner in which testing information is shared with building practitioners is required.

Recommendation 8: That investigations are undertaken to determine whether the Australian Government has consulted with industry regarding the feasibility of a national database.

7.4.4 National approach

Given the complexity of PFP, the number of practitioners and suppliers involved, the proliferation of defects, and the devastating consequences that could result from a major fire incident, a more collaborative and nationally consistent approach to all aspects of PFP should be undertaken. Although this project focused primarily on issues raised in the Victorian context, given the similarities in building defects across multiple jurisdictions, it is highly likely that similar PFP defects are problematic across the country. A united and concerted effort is required to overcome the multitude of problems associated with PFP.[91]

7.4.5 Future research

As highlighted in the introduction to this chapter, the exploratory nature of this project has unveiled areas in the PFP space that require further research.

1. More data is required from multiple sources to enable a larger sample of buildings to be analysed (including buildings of various heights and construction types /methods). This will enable a more conclusive result in terms of defect prevalence to be determined. Furthermore, data on rectification costs across the lifecycle will assist in determining the economic impacts related to PFP defects.
2. A more in-depth legislative review and evaluation is required to determine the best approach to reform. This should be a national and international review.
3. A review of design documentation is required to assess the level of PFP non-compliance.
4. The work undertaken by building surveyors to verify PFP products and inspect PFP systems needs to be better understood.
5. The processes and outcomes related to PFP system and product testing, verification and certification needs to be further researched. Investing in this area should be a priority for governments. Given the expertise of the committee for the International Building Quality Centre, research collaboration should be formed to progress research in this specific area.

[90] Senate (n 34).
[91] It is acknowledged that the Building Confidence Report and subsequent national frameworks that have been drafted support a nationally consistent approach to building reform.