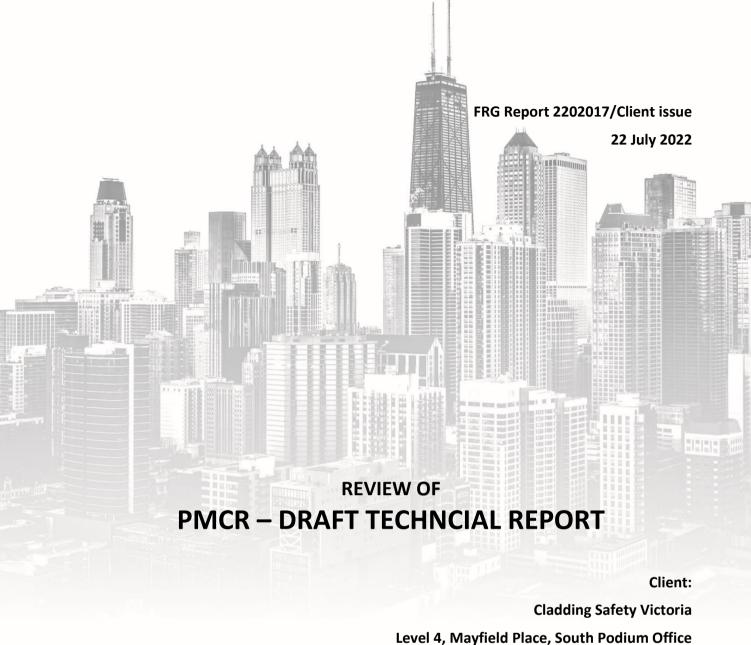


FRG Report 2202017/Client issue 22 July 2022





717 Bourke Street

Docklands

VIC 3008

Australia





Quality Control

D	Author	Signature	Reviewer		Approved to Issue		
Rev.			Name	Signature	Name	Signature	Date
Draft for initial review	GB		NA	NA	GB		29 June 2022
Revised draft	GB		NA	NA	GB		22 July 2022
Client issue	GB	Jugg Bahr	NA	NA	GB	Jugg Bahr	22 July 2022

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1. Introduction

1.1. Report Author

I, Dr Greg Baker, am the author of this report. I am a fire research engineer and director of specialist fire research consultancy, Fire Research Group Limited (FRG), based in Wellington, New Zealand.

I have a BE (Civil)(Hons) from the University of Auckland, a ME (Fire Engineering) and PhD (Fire Engineering), both from the University of Canterbury.

I am a Chartered Professional Engineer (CPEng) and on the National Engineering Register (NER – Fire Safety Engineering, Leadership and Management) in Australia and a Fellow of Engineers Australia (FIEAust).

I have extensive experience with external envelope (both wall cladding and roofing) materials and systems over a period of more than 30 years. During this period, I have been involved with manufacturing, design and specification, contracting, testing, R&D, scientific research, and expert witness work involving various external cladding products.

My Master of Engineering research report related to ignition of external envelope materials (polystyrene insulated panel) and my PhD involved the development of a quantitative risk analysis tool for use in performance-based fire safety engineering.

Full details of my experience are included in my professional CV.

1.2. Instructions

I have been provided with a copy of a draft seventy-seven-page Cladding Safety Victoria (CSV) report entitled *Protocols for Mitigating Cladding Risk – Draft technical report for review*, version 1.0 dated 1 May 2022 (Draft Report).

I have been asked by CSV to review the Draft Report and to make "high level comments in a written report to respond to these three questions:

- 1. Is the methodology of the protocols fit for purpose? This is an overall comment on section three (Scope and Principles, page 27-35). Additionally, do you agree with the tolerable level of risk presented on page 29?
- 2. Is the dynamic comparative criterion suitable? Specifically, please provide your opinion on the concept of "Comparable Prototype" building presented in 3.3.
- 3. Is the design of interventions based on the threat-barrier reasonable? What is your overall comment on the interventions in section 4?"

It should be noted that this is the second piece of related work that I have undertaken for CSV. Earlier in 2022, I undertook an initial review of the Protocols for Mitigating Cladding Risk (PMCR) and provided a number of informal comments about the PMCR framework at the time. My opinions and comments in this report should be considered in conjunction with my earlier review.

It should also be noted, that due to the nature of the work, this report has not been subject to independent peer review by an FRG colleague, as would normally be required by the FRG Quality Management System, prior to being issued.

2. Response to Instructions

2.1. Section 3 – Overall Methodology and Tolerable Level of Risk

The scope of the PMCR is elevated risk (ER) buildings where the risk has an upper bound of an IFSCAN rating of 2 (non-sprinkler-fitted buildings) or 3 (sprinkler-fitted buildings) where the cladding rectification options described in the PMCR are "principally about reducing the expectation of human injury or fatality to levels that are comparable with that which applies across the comparable building stock as a whole."

In my opinion, the theory of the scope and principles, i.e., the methodology, as described in Section 3 of the Draft Report is a reasonable approach to mitigating the risk combustible external cladding on the in-scope buildings. As to whether the methodology of the protocols is fit for purpose, in my opinion it is difficult to provide a definitive opinion in this regard at this point in the development of the PMCR.

To clarify, my expectation is that the end users of the PMCR are primarily MBSs in larger metropolitan areas of Victoria. The success of the PMCR, as a useful tool for MBSs to make a decision on cladding rectification for the in-scope buildings, will be almost entirely dependent on the simplicity and usability of the PMCR. In other words, if the PMCR is too theoretical, etc., the MBSs for whom the PMCR has been designed, will simply revert to a conservative and undesirable 'replace all cladding' approach.

With regard to the tolerable level of risk subsection in Section 3 of the Draft Report, there is one potential undesirable artefact of the PMCR as it currently stands, in relation to IFSCAN 1 buildings. My initial interpretation of the PMCR, based on what is described in Section 3 of the Draft Report, is that it is possible for an MBS to require full or partial removal of cladding for a hypothetical IFSCAN 1 building, but permit partial (or possibly even full) cladding retention in an IFSCAN 2 building. If this interpretation were indeed correct, then in my opinion changes to the PMCR would need to be considered. However, the correct interpretation in my opinion of this 'potential undesirable artefact of the PMCR' is that the PMCR only deals with the minimisation of the risk of fire spread via combustible cladding. In contrast, the MBS has broader responsibilities with regard to life safety, and there may be IFSCAN 1 buildings where the MBS decides that cladding needs to be removed for other reasons, such as where cladding is located in the vicinity of required exits in a building and may therefore render such an exit unsafe in the event of a fire.

2.2. Subsection 3.3 – Comparable Prototype Buildings

The concept of some sort of 'base-case' building, that meets the deemed-to-comply provisions in all respects, is not an uncommon approach in comparative performance-based fire safety engineering. The concept can either be necessitated by the actual performance requirements not being sufficiently quantified so as to be able to undertake an absolute analysis that demonstrates compliance directly with the BCA, or as an alternative option for the designer to the latter.

It is not entirely clear to me what the description of the CP building being an 'abstraction' and 'hypothetical' means. If the mathematical representation for the 'cladding risk premium' is to

hold, then presumably the concept of the CP building is quantifiable to some extent, i.e., the risk associated with it is able to be quantified to some extent.

If the intent is to quantify the risk associated with the CP building 'to some extent', then in my opinion, the CP building concept is a useful concept in the context of the PMCR, as being a tangible yardstick against which to quantify the gap between the SB and CP buildings, and to determine whether proposed additions to the existing fire safety systems in the SB adequately compensate for some or all of the combustible cladding on the SB being retained.

If the quantification is to be carried through to its logical conclusion, then an analysis of what fire safety features are required for the CP building equivalent of the SB to achieve DtS status must be undertaken, as it would be dangerous to assume that the SB "starts in an otherwise excellent fire safety state." There is quite a high likelihood that any SB that is within the scope of the PMCR also has a number of alternative/performance solutions associated with the fire safety of the SB, and as a result any possible safety margin has been eroded already.

The other philosophical aspect to consider with regard to the 'cladding risk premium', is that the safety margin between the DtS provisions and the performance requirements of the BCA is either unknown or unquantifiable and may even be negative. If, for example, the latter situation applies, then any positive 'cladding risk premium', is simply increasing the gap between true compliance and a lack of (fire) safety.

2.3. Section 4 - Interventions

In Section 4 of the Draft Report, details of 13 interventions (aka 'barriers') are provided, being either 'preventative' or 'recovery' interventions, where preventative interventions "seek to remove the risk of a fire hazard becoming a cladding fire hazard", and recovery interventions "seek to reduce the adverse impacts of a cladding fore to occupants of SOUs or when egressing a building."

The 13 interventions are further categorized into four groups, namely: 1. Cladding removal (6 interventions, 5 preventative and 1 recovery interventions); 2. Active fire safety system upgrades (4 interventions, 1 preventative and 3 recovery); 3. Passive fire safety upgrades (3 interventions, 2 preventative and 1 recovery); and 4. Exit and egress protections (2 recovery interventions).

The various interventions are then classified as being either 'obligatory' or 'optional'.

I agree generally with the classification of the 13 interventions except for the following cases:

- 1. The need for Intervention 4 (Remove cladding on ground floor to 3m above ground floor level) to be 'obligatory' is not clear. There will potentially be some situations where limitations on proximity of an external fire source to ground floor external cladding will be sufficient mitigation in of itself.
- 2. The need for Intervention 6 (Remove cladding around penetrations) and Intervention 11 (Install fire box where cable penetration through cladding exists) to both be 'obligatory' is not clear. In my opinion, Intervention 11 should be obligatory, and then Intervention 6 be optional.
- 3. The need for Intervention 12 (Replace lighting with low voltage units) to be 'obligatory' is not clear. I do not know what the research shows, but will

- malfunctioning non low voltage lighting be an ignition source of sufficient intensity to ignite combustible cladding?
- 4. In my opinion, Intervention 14 (Install exit/egress protection (canopy)) should be 'obligatory' for all/multiple relevant exits.

It should be noted that my preceding comments are based on an interpretation of 'obligatory' as being obligatory in all cases, rather than only in some circumstances, so perhaps this distinction needs to be made clear.

Generally, in my opinion, the design of the interventions based on the threat barriers is reasonable, with the possible exception of Intervention 11 in two ways. The emphasis with Intervention 11 should be on two-way fire stopping (a generic terms for the various solutions proposed) to prevent a fire entering the external wall cavity from either the interior or the exterior, and that any fire stopping solution that is adopted should be a fully tested/certified fire stopping system.

Overall, in my opinion the 13 interventions described are systematic and comprehensive, within the context of both the scope of the PMCR and the comments noted above.

There are, however, in my opinion two possible 'gaps' in the interventions, as follows:

- 1. Other combustible components of the external wall system play a very important role in vertical fire spread between SOU's. For example, removing sections of combustible external cladding, but leaving combustible insulation in place may defeat the purpose of removing the cladding.
- 2. Effective cavity barriers are an extremely important method of limiting/preventing fire spread within the external wall cavity between SOU's. Have cavity barriers been considered in the PMCR?

In noting items 1 and 2 above, it is acknowledged and understood that the PMCR only allows for interventions that strike an appropriate balance between cost and benefit, which will generally exclude any form of intervention which involves more than a moderate level of cost and construction works.

A third more general aspect to consider is that an internal SOU fire does not need to reach flashover (i.e., become fully developed) for there to be a significant fire safety issue in relation to external vertical fire spread. For example, the fire in the compartment of fire origin in the Grenfell Tower fire incident, did not reach flashover. Has this type of scenario been adequately dealt with in the PMCR?