Protocols for Mitigating Cladding Risk

PMCR Interventions

F.02 – Interventions to Reduce Cladding Fuel

Interventions are required to mitigate the risk to life safety posed by the presence of combustible cladding on the facades on Class 2 and Class 3 Victorian buildings.

The Victorian Government has developed a method for:

- assessing the risk presented by combustible cladding; and
- introducing targeted interventions to bring buildings to an acceptable level of cladding risk.

The **15** related risk mitigation interventions that may be applied fall into **five** categories:

1. Interventions to suppress fires;
2. **Interventions to reduce cladding fuel;**
3. Interventions to address energy ignitions;
4. Interventions to detect fire and alert people; and
5. Interventions to assist safe egress.

This document provides information about those **interventions designed to reduce cladding fuel**.

It is designed to assist those assessing a building's cladding risk and deciding how to intervene to reduce cladding risk to an acceptable level.

Version 2
Date: 13 March 2024

Aboriginal acknowledgement

Cladding Safety Victoria respectfully acknowledges the Traditional Owners and custodians of the land and water upon which we rely. We pay our respects to their Elders past, present and emerging. We recognise and value the ongoing contribution of Aboriginal people and communities to Victorian life. We embrace the spirit of reconciliation, working towards equality of outcomes and an equal voice.

Application of Minister's Guideline 15

These documents contain information, advice and support issued by CSV pursuant to Minister's Guideline 15 - Remediation Work Proposals for Mitigating Cladding Risk for Buildings Containing Combustible External Cladding. Municipal building surveyors and private building surveyors must have regard to the information, advice and support contained in these documents when fulfilling their functions under the Act and the Regulations in connection with Combustible External Cladding on buildings:

a) which are classified as Class 2 or Class 3 by the National Construction Code or contain any component which is classified as Class 2 or Class 3;

b) for which the work for the construction of the building was completed or an occupancy permit or certificate of final inspection was issued before 1 February 2021; and

c) which have Combustible External Cladding.

For the purposes of MG-15, Combustible External Cladding means:

a) aluminium composite panels (ACP) with a polymer core which is installed as external cladding, lining or attachments as part of an external wall system; and

b) expanded polystyrene (EPS) products used in an external insulation and finish (rendered) wall system.

Disclaimer

These documents have been prepared by experts across fire engineering, fire safety, building surveying and architectural fields. These documents demonstrate CSV's methodology for developing Remediation Work Proposals which are intended to address risks associated with Combustible External Cladding on Class 2 and Class 3 buildings in Victoria. These technical documents are complex and should only be applied by persons who understand how the entire series might apply to any particular building. Apartment owners may wish to contact CSV or their Municipal Building Surveyor to discuss how these principles have been or will be applied to their building.

CSV reserves the right to modify the content of these documents as may be reasonably necessary. Please ensure that you are using the most up to date version of these documents.

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Document Notes

The Protocols for Mitigating Cladding Risk (**PMCR**) is an approach developed by Cladding Safety Victoria (**CSV**) on behalf of the Victorian Government to consistently and systematically address the risk posed by the presence of combustible cladding on Class 2 and Class 3 buildings.

For many buildings, combustible cladding on the facade:

- does not present a high enough level of risk to warrant substantial or complete removal of the cladding; but
- presents enough risk to warrant a tailored package of risk mitigation interventions to be introduced that provide a proportionate response to the risk.

Some buildings may be of a construction type or size or may only comprise limited elements of combustible cladding such that no intervention or removal of cladding is required.

A set of documents has been assembled to describe the purpose, establishment, method and application of the PMCR. The full set of PMCR documents and their relationship to each other is illustrated in a diagram in Appendix A: PMCR document set and flow.

There are **seven** related streams of technical document in the PMCR document set:

A. Authorisation	Codifies the Victorian Government decisions that enable PMCR activation.
B. CRPM Methodology	Specifies the Cladding Risk Prioritisation Model (CRPM) method used for assessing cladding risk and assigning buildings to three risk levels.
C. PMCR Foundation	Defines the PMCR method, objectives and the key design tasks.
D. Support Packages	Captures the relevant risk knowledge and science-based findings necessary to systemise and calibrate PMCR application.
E. CSV Cladding Risk Policy	Establishes key CSV policy positions in relation to cladding risk.
F. PMCR Interventions	Identifies and describes the interventions that the PMCR method can employ to mitigate risk associated with combustible cladding.
G. Implementation	Specifies the standards and procedures that guide PMCR application.

This current document is one of a suite of PMCR Intervention Reports that describe how and when targeted risk mitigation interventions are applied to make building occupants safer.

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Abbreviations

Term	Meaning
ACP-PE	Aluminium Composite Panel with a polyethylene core
CFSR	Cladding Fire Spread Risk
Cladding Cluster	A group of SOUs being connected with combustible cladding as identified by CFSR
CRMF	Cladding Risk Mitigation Framework
CRPM	Cladding Risk Prioritisation Model
CSV	Cladding Safety Victoria
EPS	Expanded Polystyrene
Framework	Cladding Risk Mitigation Framework CRMF
IF-SCAN	Initial Fire Spread in Cladding Assessment Number
MBS	Municipal Building Surveyor
MG-15	Minister's Guideline 15
NCC	National Construction Code
PMCR	Protocols for Mitigating Cladding Risk
RWP	Remediation Work Proposal
RIS	Rise In Storey – as defined in the National Construction Code
SOU	Sole Occupancy Unit - as defined in the National Construction Code

1 Introduction

When a building has combustible cladding on the facade, an **intervention** may be necessary to enhance life safety and reduce cladding fire risk to an acceptable level.

The level of risk created by the presence of combustible cladding varies substantially from building to building. Accordingly, a decision to **intervene** and the extent of **intervention** required must also vary.

The Victorian Government has authorised the use of **15 interventions** to mitigate cladding risk. The authority for their use is contained in *Minister's Guideline 15* (**MG-15**) and supported by the *Cladding Risk Mitigation Framework (***Framework***)*.

The Guideline and Framework are intended to:

- support Municipal Building Surveyors (**MBS**) in rating the cladding risk of a building and determining what level of intervention is required to ensure that the building has achieved an Acceptable Cladding Risk; and
- inform owners about how their building is assessed with regard to cladding risk and the structured way in which Remediation Work Proposals are developed to bring their building to an acceptable level of cladding risk.

Cladding Safety Victoria (**CSV**) is assisting MBSs and owners by providing information about the cladding risk associated with each building and the steps necessary to remedy that risk. This information is provided in the form of a Remediation Work Proposal (**RWP**), that applies the cladding risk methodologies developed by CSV over three years.

A threat barrier analysis can be used to represent how risk-mitigating actions can function to respond to a problem. The CSV method employs this analysis technique to identify the central problem (the 'top event'), in this case a cladding fire, and depict how risk associated with the problem can be mitigated through the implementations of barriers (interventions) designed to control the key hazards identified.

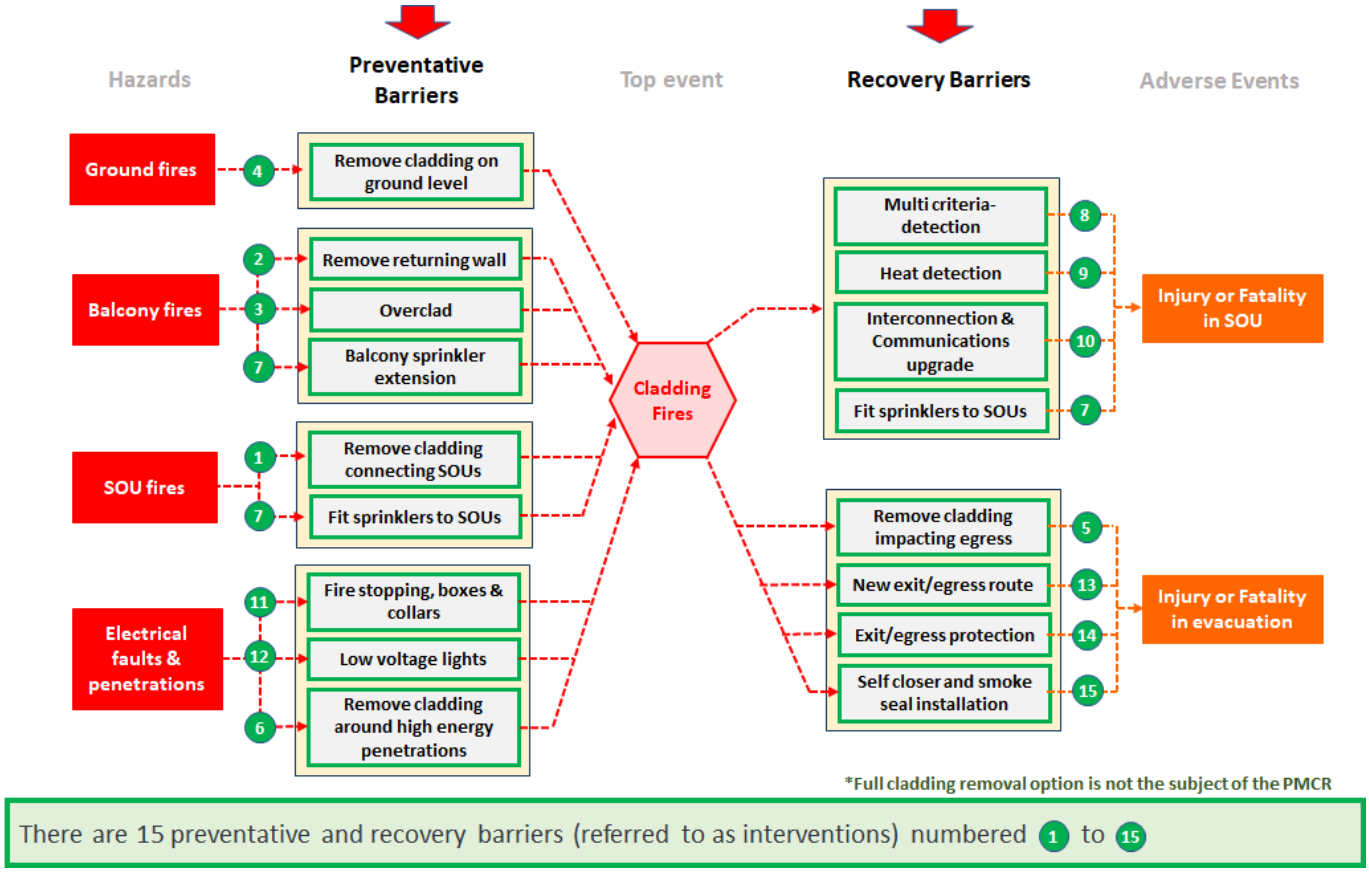


Figure 1: Threat barrier analysis

The 15 interventions in the threat barrier analysis act in different ways to mitigate cladding fire risk.

Each intervention may:

- Respond to one or more of the four identified hazards;
- Function to prevent an ignition source from spreading fire to cladding (i.e. interventions that reduce the likelihood of a fire igniting cladding); and/or
- Function to reduce the adverse impacts for building occupants once a fire has reached cladding (i.e. interventions that reduce the consequences of a cladding fire).

Any risk mitigation solution designed under the Framework must target credible hazards on a building and balance both cladding ignition likelihood and consequence considerations.

1.1 Purpose of this report

This report provides information about interventions that are available to reduce the cladding risk on Victorian multi-dwelling residential buildings (Class 2 and Class 3) to an acceptable level.

The 15 interventions function to reduce cladding risk in one of five discernible ways.

The documentation developed by CSV to support the implementation of the Victorian Government's Framework, includes information to guide MBSs and owners in determining how and when to apply particular interventions.

The information is packaged in five related volumes, one for each category of interventions, as represented in the diagram on the right.

In selecting particular interventions, it is important to understand:

- The ignition hazards that an intervention is responding to;
- The benefit to safety of applying an intervention;
- When an intervention is required to be applied; and
- Any considerations that must be made to guide the selection and installation of an intervention.

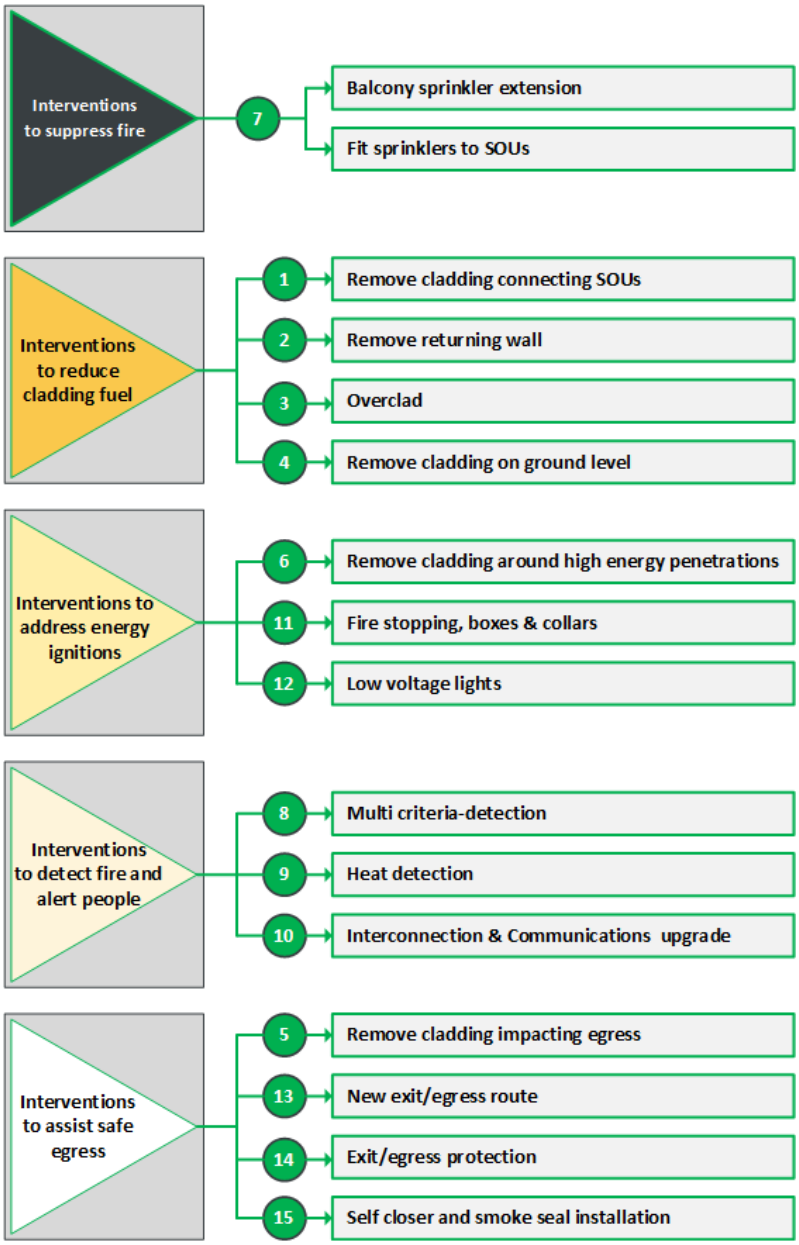


Figure 2: Thematic set of interventions

This report focuses only on interventions to reduce cladding fuel.

2 What are the interventions?

Fire spread prevention constitutes a pivotal strategy in managing the fire risk associated with facade cladding. Reducing the cladding fuel on a building's facade can limit the potential spread of a fire that might otherwise extend externally on the building. A key strategy used by the interventions within this document is to separate larger sections of combustible cladding on a building's facade into smaller sections that limit how far a fire can spread externally on the building. In doing so, the risk classification of the building can either be reduced to 'low', removing the inherent life safety risk posed by the cladding, or reduced to 'elevated' and have additional PMCR interventions applied.

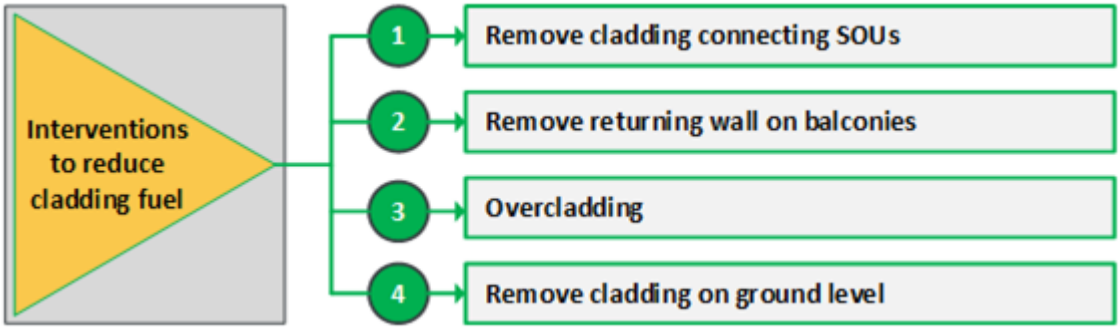


Figure 3: Interventions to Reduce Cladding Fuel

Each of the above interventions seeks to prevent external fire spread, either:

- from an SOU;
- into an SOU;
- or both.

These interventions each utilise a different strategy to achieve these objectives. In doing so, the danger posed to building occupants by the remaining combustible cladding can be significantly reduced, allowing the building's facade to be deemed of 'Acceptable Cladding Risk' as per the Cladding Risk Mitigation Framework (CRMF).

2.1 **Intervention 1** – Remove cladding that provides a pathway for external fire spread between separate sole occupancy units

PMCR eligible buildings will comprise of cladding cluster arrangements that connect SOUs. These connections can consist of vertical and horizontal strips of cladding and cladding external to balconies.

The intent of this intervention is to provide a break in continuous cladding, reducing the risk of cladding fire spread between different SOUs.

As it is the primary factor in Cladding Fire Spread Risk (CFSR) generation, the targeted removal of cladding to exterior connecting walls provides benefit as a form of fire spread potential reduction, subsequently altering the risk classification of that cluster. By removing combustible cladding sections between different SOU the opportunity of fire spread is reduced.

2.2 **Intervention 2** – Remove cladding returning wall on balconies and soffits

Similar to intervention 1, for any cladding that forms part of a cluster, its removal provides benefit through SOU-to-SOU fire spread reduction. When the cladding cluster includes balcony return walls, further removal benefit can be seen through:

- A reduced potential for cladding fire to spread into an SOU via balcony fire transmission; and
- A reduced ignition potential from balcony fire sources; subsequently
- Reducing the likelihood of balcony fire spreading to other external cladding through flashover events.

These act to also provide a life safety benefit for individual SOUs by preventing fire spread back into the SOU itself from a balcony fire, and inherently provide an occupant with increased confidence in the safety of their balcony spaces.

2.3 **Intervention 3** – Overclad and encapsulate enclosed balcony returning walls with fire-rated elements

In some instances, such as the presence of an EPS return wall on an enclosed balcony, the complete removal of the cladding may not be the most cost-effective option.

An alternative option that still maintains the majority of the safety benefit that full removal would exhibit is the encapsulation of the flammable cladding with a non-flammable material.

This solution aims to protect the cladding from an internal fire source, including the balcony itself. In the event of a flashover within the SOU, the cladding should remain protected by the encapsulating material. The same can be said for a fire that occurs within the balcony itself as the encapsulating material should insulate the flammable cladding from the intense heat of the fire.

2.4 **Intervention 4** – Remove cladding from the ground floor level

Cladding that is located at the ground level of a building, and connects to SOUs to form a cladding cluster, impacts building safety as there is an increased potential for exposure to ground-based ignition sources with high perceived fuel load densities. Examples include proximal carparking, loading zones, and wastebin areas.

Removal of the flammable cladding from the ground floor that connects to SOUs can therefore remove the ground-based ignition sources, and if no other ignition sources are present for the remaining cluster, then the CFSR can be reduced to zero.

3 Reducing cladding fuel: When to apply interventions

It is often the case in which the entirety of the combustible cladding on a building does not need to be removed to provide an appropriately safe solution for the building's occupants. It is in these cases that the use of targeted cladding removal could be adopted.

Buildings identified for targeted cladding removal are categorised by CSV to be of an 'elevated' or 'unacceptable' cladding risk, which is generated from an IF-SCAN cladding cluster calculation. Buildings in this category have combustible cladding connecting at least:

a) two SOUs in a non-sprinklered building (IF-SCAN ≥2); or

b) three SOUs in a sprinkler protected building (IF-SCAN ≥3)

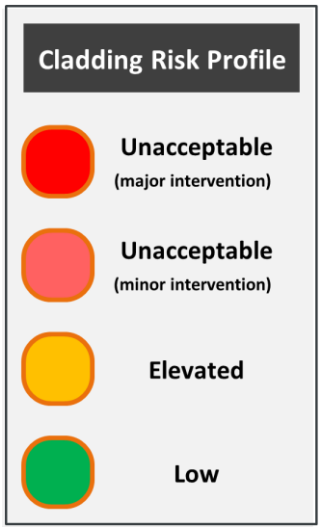
Some areas of an eligible building that do not generate an IF-SCAN, but still elicit a CFSR count, may also have targeted cladding removal employed to reduce the overall cladding fire risk to the building occupants.

The primary purpose of interventions 1-4 is to reduce the CFSR count of all identified clusters on a building's facade to a 'low' risk classification.

In doing so, the danger posed to building occupants by the remaining combustible cladding can be significantly reduced, allowing the building's facade to be deemed of 'Acceptable Cladding Risk' as per the Cladding Risk Mitigation Framework (CRMF).

3.1 When is targeted cladding removal of highest benefit?

To most effectively impact a PMCR solution, targeted cladding removal must aim to provide the greatest benefit whilst remaining proportionate and cost effective to the risk. To achieve this, targeted cladding removal within each cluster would be considered most beneficial when it aligns to the following core principles:



Risk-to-Life Reduction

If there are multiple ways to reduce the risk of a single cluster on a building, then the targeted removal of cladding within the cluster which reduces the immediate consequence of an external fire spread to an acceptable risk classification should be considered, all else being equal. i.e., Where the removal of cladding from a bedroom with an openable window, rather than from the external wall of a bathroom is achievable, then the targeted removal should concentrate on the bedroom (highest consequence value) first.

Cost/Time Reduction

If the removal of one section of cladding within a cluster could take less time than the removal of another, yet provide the same life-safety benefit, then the solution that will take less time should be chosen. Likewise, if the cost of removal of one section is lower than another, yet produces the same life-safety benefit, then the cheaper option should be chosen.

Disruption Reduction

Consideration should be given to the disruption caused to building occupants during solution implementation. If the removal of one section of cladding will disrupt residents less than another option, with all else being equal, then that section should be chosen for removal.

The order of these benefits implies that the primary concern during rectification solution design should be of life safety. Cost/time and disruption reduction should be secondary to any life safety concerns.

3.2 Cluster risk

The aim of specifying a cluster risk type as well as a building risk type is on the basis that the cluster is the most accurate representation of risk, and it is therefore always the primary form of intervention. To determine the cluster typology, reference can be made to the risk response typology that is table 2, where distinguishment is made so a cluster risk is a function of:

- whether a SOU is sprinkler protected;
- the uppermost SOU of the clusters position on a building as a measure in rise in stories; the
- type of combustible cladding present; and the
- Cladding Fire Spread Risk (CFSR).

Table 1: Cluster risk type

Sprinkler Status	Policy Response Type	Cluster Fire Spread Risk (CFSR)	RIS	Cladding Type
SOUs ARE sprinkler protected	A	0-2	ALL	Both
	B1	3	Up to 4	Both
	B2	3	5+	Both
	C1	4-6	Up to 4	Both
	C2	4-6	5+	Both
	D	7+	ALL	Both
SOUs ARE NOT sprinkler protected	E	0-1	ALL	Both
	F	2	ALL	Both
	G	3-4	Up to 4	Both
	H	3-4	5+	Both
	I	5+	ALL	Both

3.3 Building risk

Building Risk refers to the risk incurred via elements of cladding that affect the greater building, rather than any individual SOU's. An example of this is combustible external wall cladding that affects occupants egressing the building, or high energy fuel loads of cladding at ground level exits and egress paths.

3.4 Design Philosophies

Remediation Work Proposals have incorporated design philosophies to simplify the complexity of interventions. At its core, a design philosophy aims to identify the predominant theme of a buildings cluster interventions and allow for this to be scaled to other clusters of the same building where it is viable. It is critical however that a design philosophy, at minimum, provides an equivalent risk reduction as what the corresponding typology would have otherwise.

This classification aids in providing a proportional risk response category so that parity can be maintained between similar buildings and their remediation solutions.

3.5 Standard application – Prescriptive standard policy

Due to the expected repetition of solution designs being overtly similar, CSV has made the decision to apply a prescriptive standard to PMCR solutions so that a greater cohort of designers can act to progress PMCR operations more effectively. For this reason, each of the typologies previously outlined have had prescriptive solutions attributed to them to treat the most commonly observed cluster configurations rapidly and effectively. Table 3 shows the cluster risk types as 'Policy Response Types", and designates the prescriptive methods required to satisfy each risk type.

Table 2: Prescriptive response solutions

Sprinkler Status	Policy Response Type	Cluster Fire Spread Risk (CFSR)	RIS	Cladding Type	Cluster Responses						
					Sprinkler Installation		Detection & Alerting		Penetrations		Cladding Removal
					in SOUs	on balconies	Smoke Detection (bedrooms)	Smoke & heat detection	Remediation of lights, walls, and cladding		Targeted Cladding Removal
SOUs ARE sprinkler protected	A	0-2	ALL	Both	Existing					Or	✓
	B1	3	Up to 4	Both	Existing		✓	✓	✓		✓
	B2	3	5+	Both	Existing	✓	✓	✓			✓
	C1	4-6	Up to 4	Both	Existing		✓	✓	✓		✓
	C2	4-6	5+	Both	Existing	✓	✓	✓			✓
	D	7+	ALL	Both	Existing						✓
SOUs ARE NOT sprinkler protected	E	0-1	ALL	Both							✓
	F	2	ALL	Both			✓	✓	✓		✓
	G	3-4	Up to 4	Both	✓		✓	✓	✓		✓
	H	3-4	5+	Both	✓	✓	✓	✓			✓
	I	5+	ALL	Both							✓

The prescriptive response solutions provided are from G.03 – Cladding Remediation Standards, where greater detail is provided to each solution, for targeted cladding removal and others, so as to provide a holistic view of the solution. Furthermore, the exclusionary and additional events, in section 5 of the same document, may influence the standard response provided and as such should always be referenced when implementing a standard typology as a solution.

3.6 Non-standard application – other solutions

It is acknowledged that the PMCR may not adequately provide a solution for all buildings and/or all clusters, as it was designed to capture the vast majority of similar building/cluster configurations. With this in consideration, PMCR allows non-standard solutions to RWPs so long as it has been through the consistent process prior to implementation. To determine when this type of solution is appropriate, the building must still have been completely marked up, had an IF-SCAN assigned **AND** have had the building and cluster risk types attributed.

If, however, after designating the building and cluster risk there is an alternative low cost and proportionate solution available (regarding risk, cost-time, disruption reduction etc.), a non-standard solution can be recommended. In these instances, the designer has complete discretion in creation of this solution[1], however a registered fire safety engineer must supervise the solution designer during development of the solution before it can be issued as part of an RWP.

[1] The solution designer must still use PMCR intervention material to design the solution.

4 How to apply the interventions

PMCR interventions should act to proportionately mitigate this risk via introduction of either preventative barriers, recovery barriers, or a combination of both. Applying this method allows CSV to control both plausibility of fire events and consequences if fire events are to occur.

From this, it is also important to distinguish that although targeted cladding removal may be implemented in solution design, it is not requisite to a buildings PMCR solution. Adequate risk reduction can be reached using alternative measures. However, when targeted removal is proposed, consideration should be given to a risk-reduction priority framework, where the appropriate quantity of removal is the minimal amount required to mitigate the following:

- Ignition potential prevalence; and
- Fire spread potential.

Minimum requirements

Throughout this section, emphasis is placed on the term ‘minimum’ for each cladding rectification option. For clarification, this term indicates that the specifications given are the minimum values permissible that provide a satisfactory level of risk reduction. If, for example, the removal of a larger section of cladding would be more cost effective or be a simpler solution to apply, then it would be permissible as it exceeds the minimum specification.

4.1 Standard application for targeted cladding removal

Vertical configuration removal

Buildings with **ACP-PE or EPS** as part of the external wall system in a **vertical** configuration, and where the cluster extends only to a RIS of 4 or less, elicit a **minimum** cladding removal of

- A **900** mm strip of cladding spanning between the targeted SOU and the SOU above which;
    - Extends **not less** than **600** mm above the FFL (Finished Floor Level) of the intervening floor; and
    - Extends **not less** than **300** mm below the FFL of the intervening floor; and
    - Extends **not less** than the **full width** of the combustible cladding forming the cluster.

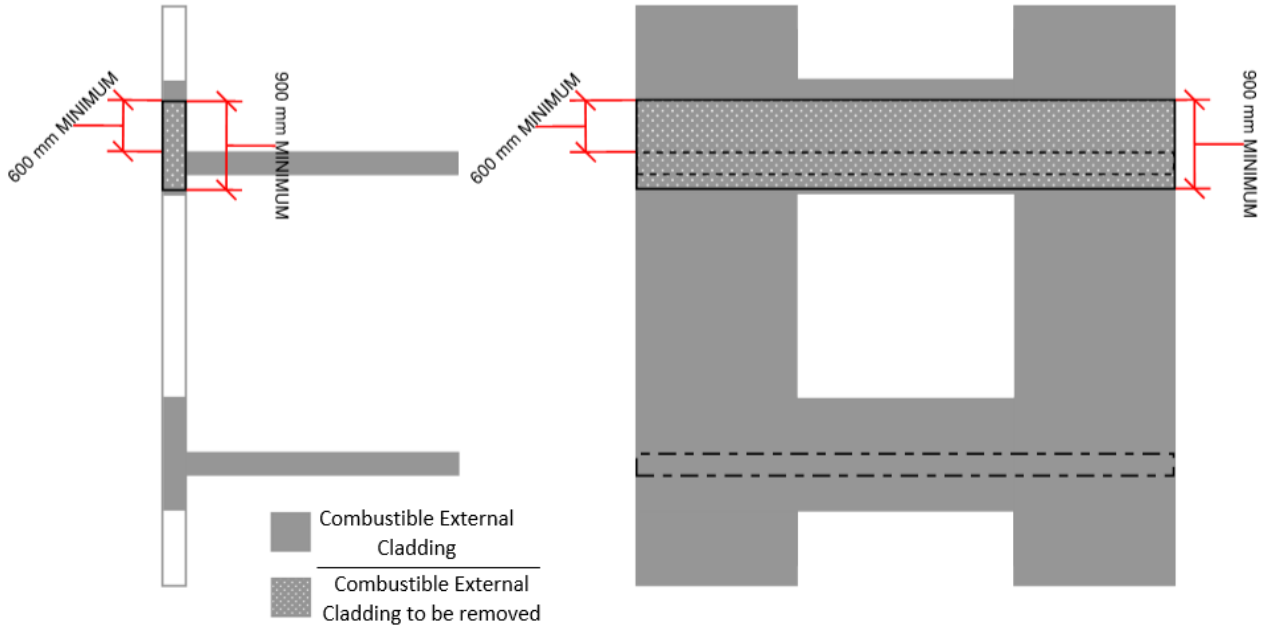


Figure 4: Cross section (left) and elevation view (right) for vertical configuration removal

Horizontal configuration removal

Buildings with **ACP-PE or EPS** attached in a **horizontal** configuration elicit a **minimum** cladding removal of

- **450** mm in width, **centred** on the **internal separating wall** between SOUs which are deemed part of the cluster (except in circumstances where an existing party/separating wall is separating the SOUs and the cladding is non-contiguous).

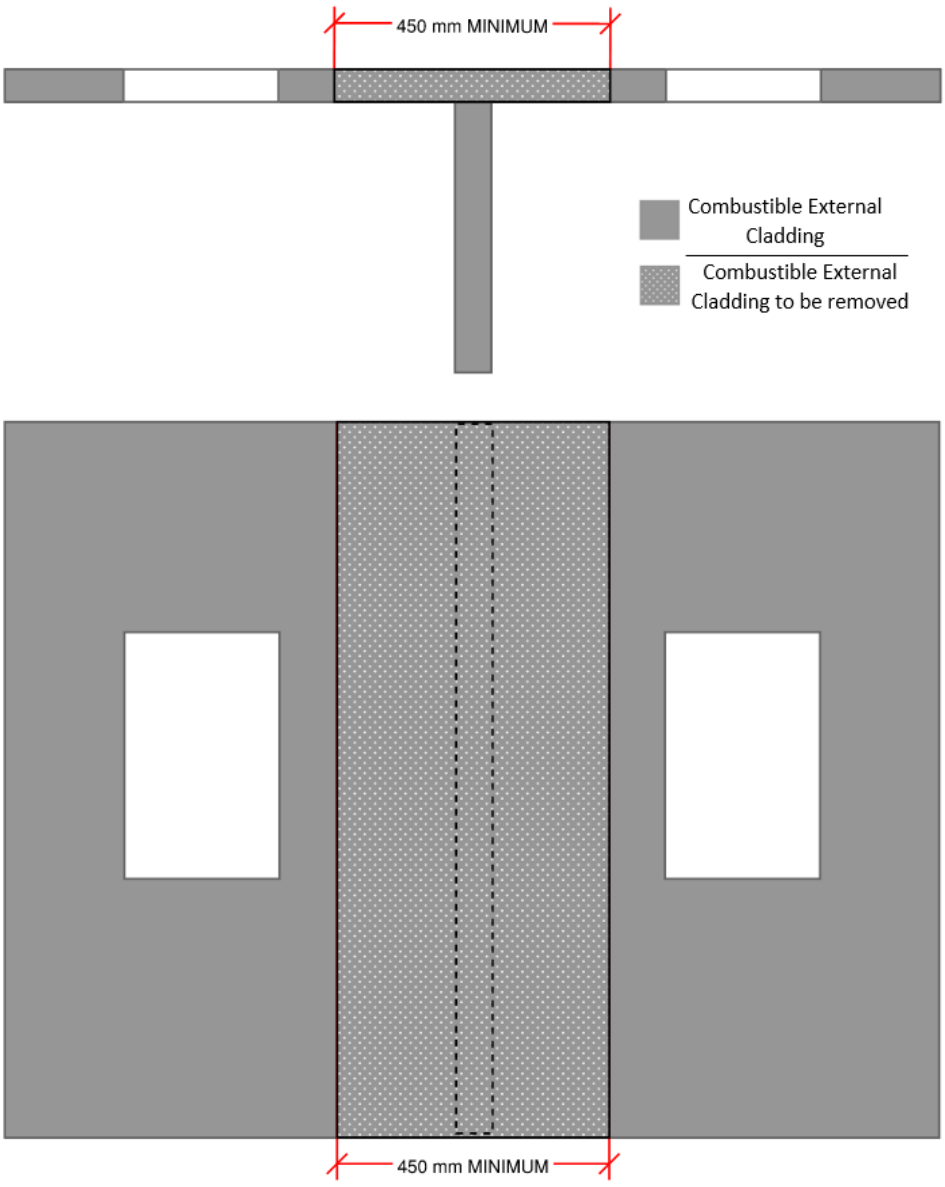


Figure 5: Plan view (top) and elevation view (bottom) of horizontal configuration cladding removal

Combined vertical and horizontal configuration removal

Buildings with **ACP-PE or EPS** attached in a combined **vertical and horizontal** configuration elicit a **minimum** cladding removal of

- **Any** combination of vertical and horizontal configuration removal to sufficiently reduce the CFSR of the cluster to an '**elevated**' or '**low**' rating.

Balcony attachment removal

Buildings with **ACP-PE or EPS** on open or semi-enclosed balcony attachments **only** elicit a **minimum** cladding removal of:

- **All** cladding on every **second** balcony for a **vertical** configuration **only**.

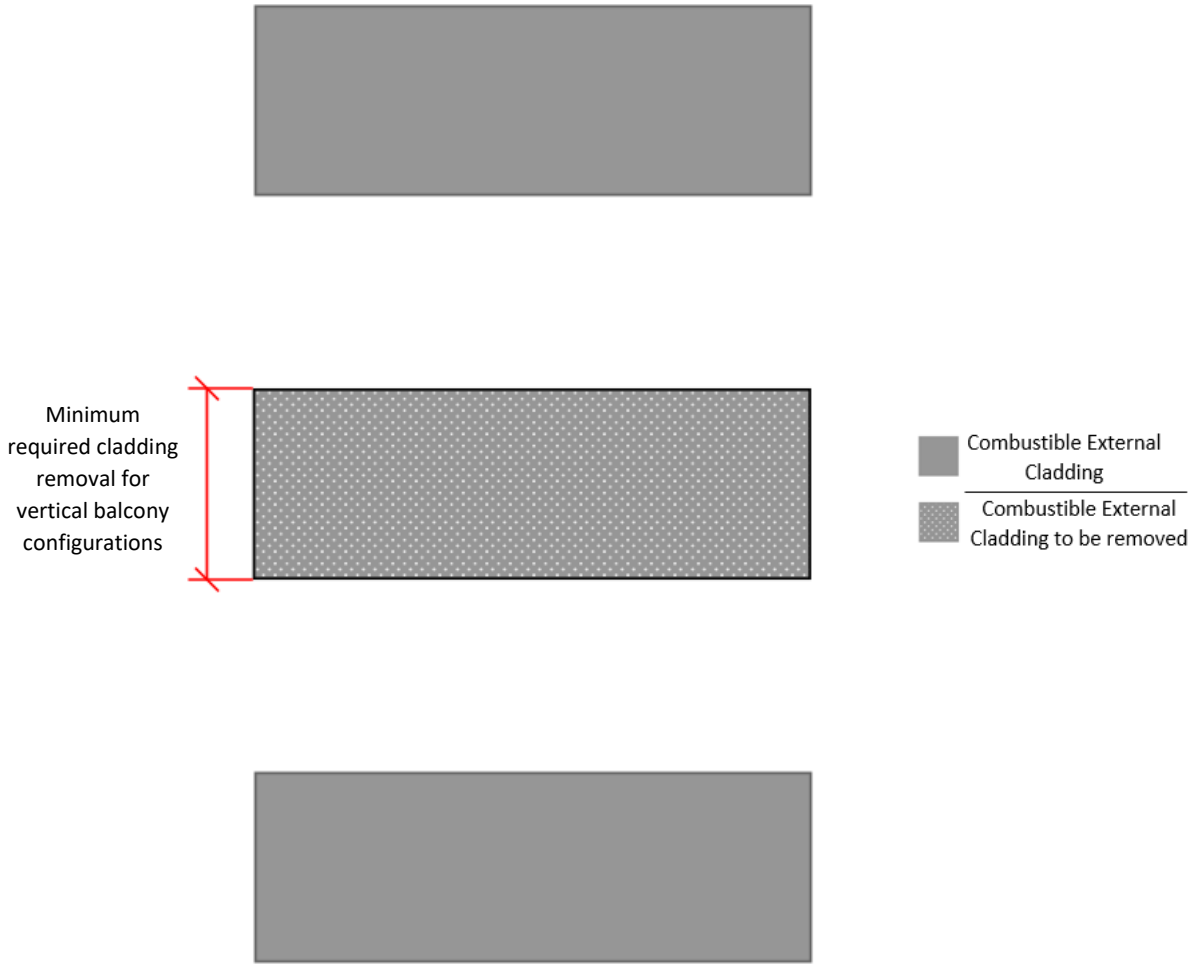


Figure 6: Elevation view of a vertical balcony attachment configuration

Balcony return wall removal/encapsulation

Balconies with **ACP-PE <u>or</u> EPS** return walls elicit a **minimum** response of either:

- Overclad or replace with **Non-combustible cladding** affixed to the **entirety** of the balcony return wall; **with** permitted retention to the **lower 250** mm of the return wall[2]; **and**
- **Removal** of the balcony soffit if clad in combustible material.

<u>Or</u>

- **Removal** of **1500** mm of cladding from the **outside edge** of the balcony return wall towards the SOU for the full height of the wall, with the **exception** of the **lower 250** mm of the return wall; **and**
- **Removal** of the balcony soffit if clad in combustible material.

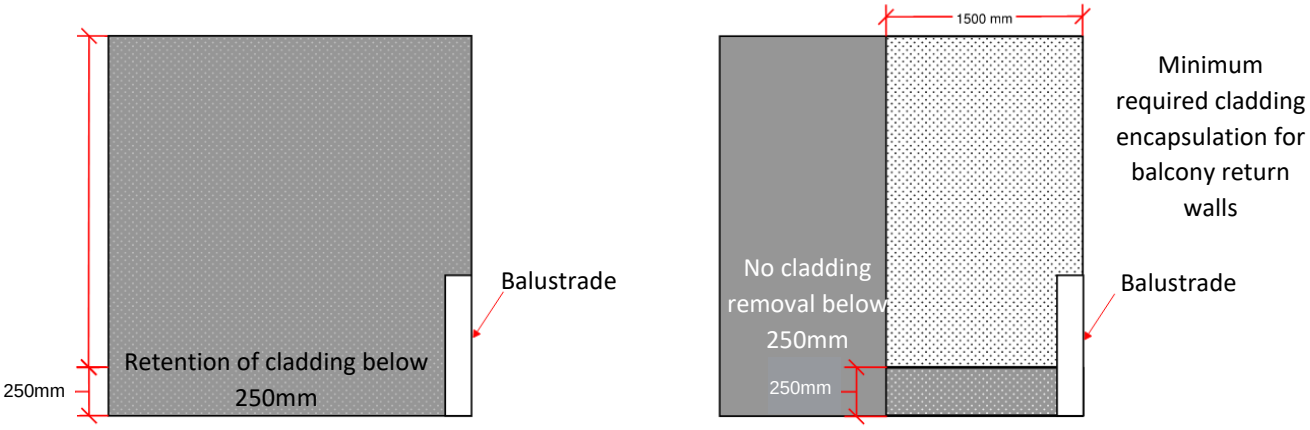


Figure 7: Elevation of balcony return wall cladding encapsulation (left) and cladding removal (right)

[2] Notably, the restriction on the lower 250 mm of the return wall is to prevent potential damage to the delicate waterproofing membrane and the resulting ingress of water to the structure (identified as a key risk in balcony rectification work).

Ground floor cladding removal

Detailed below is both a general implementation guide (general, informative removal statements) and precision removal guide that details the minimum required removal amounts for cladding located at the ground floor level and in proximity to car parking (including loading bays etc..) and/or waste bin areas.

1. The *General implementation guide* provides, in simple terms, the general **minimum** removal requirements where cars and bins are proximal installed cladding.
2. The *Precision removal guide* provides detailed **minimum** removal requirements, to be implemented in accordance with the tables, diagrams and procedures as outlined in the relevant section.

General implementation guide

Buildings with **ACP-PE or EPS** in proximity to the ground floor level that present an **ignition risk** elicit a **minimum** cladding removal of:

- The **H_{safe} & Y_{safe}** values from Tables 3 to 6 in relation to the X value; with
- **X** being equal to the **closest** possible distance between the **relevant fire hazard** and the **combustible cladding** as per Figure 8; and
- **H_{safe}** being the **minimum** height of **cladding** to be removed as per Figure 8; and
- **Y_{safe}** being the **minimum** distance **either side** of the **fire hazard** location as per Figure 8.

Please note that for the Y_{safe} value, the fire hazard location may not be clearly defined (unmarked car spaces along wall, etc.). For these scenarios, the Y_{safe} value shall be measured from the furthest edge of which a car could reasonably be parked.

*Table 3: H_{safe} and Y_{safe} for **EPS** cladding in case of 5 MW **CAR FIRE***

X	H_{safe}	Y_{safe}
Less than or equal to 1m	4.5 m	0 m
Between 1m & 3m	0.5 m	0 m
Greater than 3m	No removal required	

*Table 4: H_{safe} and Y_{safe} for **ACP-PE** cladding in case of 5 MW **CAR FIRE***

X	H_{safe}	Y_{safe}
Less than or equal to 0.5m	6 m	2 m
Between 0.5m & 2m	4.5 m	0 m
Between 2m & 3m	2.5 m	0 m
Greater than 3m	No removal required	

*Table 5: H_{safe} and Y_{safe} for **EPS** cladding in case of 2 MW **BIN FIRE***

X	H_{safe}	Y_{safe}
Less than or equal to 0.5m	4 m	1 m
Between 0.5m & 1m	2.7 m	0 m
Greater than 1m	No removal required	

*TABLE 6: H_{safe} and Y_{safe} for **ACP-PE** cladding in case of 2 MW **BIN FIRE***

X	H_{safe}	Y_{safe}
Less than or equal to 1.5m	4.9 m	2 m
Between 1.5m & 2m	2.3 m	0 m
Greater than 2m	No removal required	

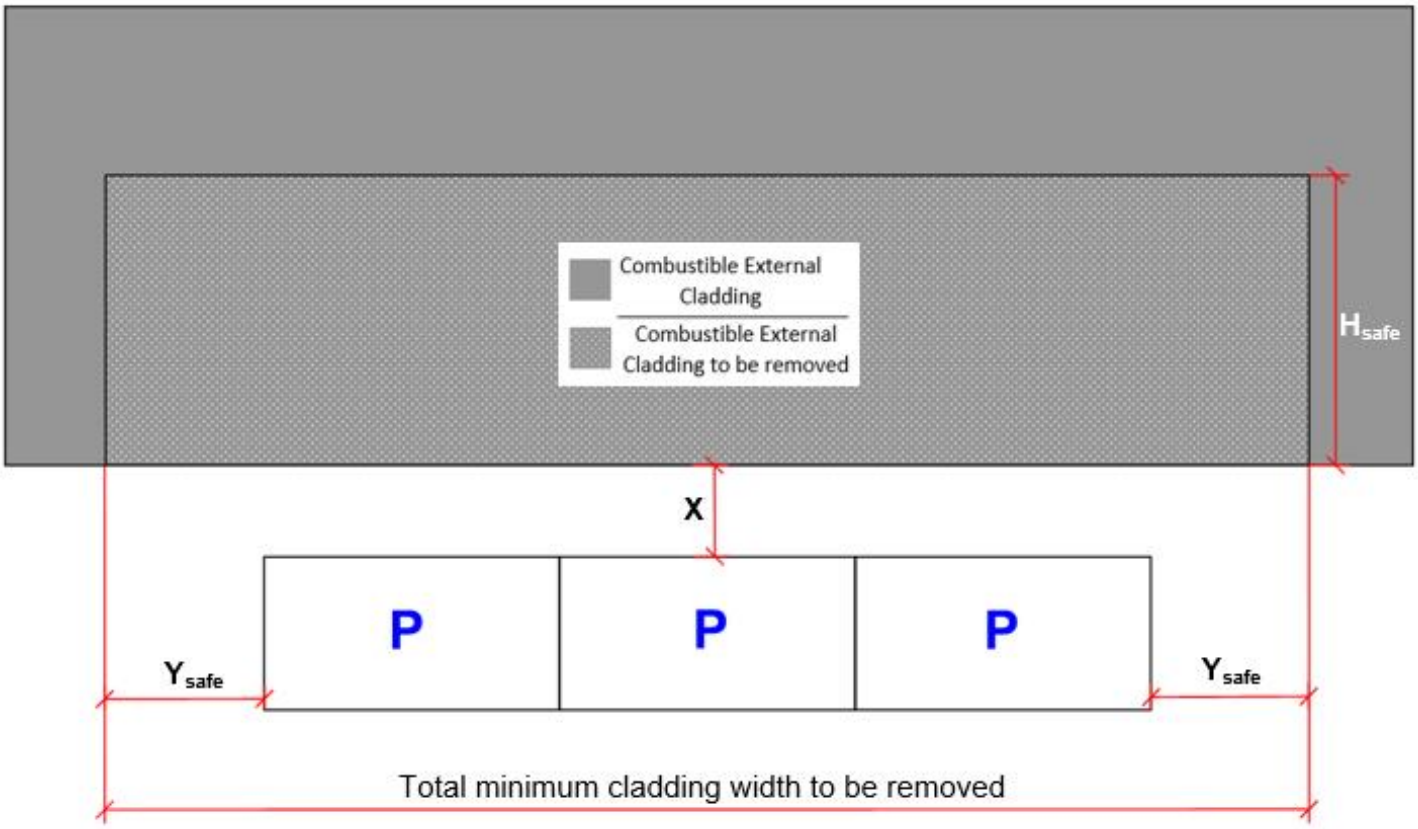


Figure 8: Ground floor cladding removal

Precision implementation guide

Buildings with **ACP PE** or **EPS** in proximity to the ground floor level that present an ignition risk elicit a minimum cladding removal corresponding with the H_{safe}, Y_{safe} and Y_{safe} *at 3m* values from Table 7 and Table 8, where:

- The distance **X**m being equal to the closest possible distance between the relevant fire hazard and the combustible cladding as per Figure 9 and& Figure 10;
- H_{safe} being the minimum removal height from the ground floor level;
- Y_{safe} being the minimum removal width from the centre of the car space; and
- $Y_{safe\ at\ 3m}$ being the minimum width of removal applicable to $\underline{H_{safe}}$ above 3m from ground level.

Procedure:

1. Measure distance horizontally from the fire source feature to the installed cladding (X value)
2. Look up ACP PE or EPS removal tables (Table 7 and Table 8 respectively) to align X value
3. Obtain H_{safe}, Y_{safe} and $Y_{safe\ at\ 3m}$ removal parameters
4. Map removal areas by applying the removal values as indicated in Figure 9 and Figure 10 (vehicles or wastebins respectively)

Vehicles adjacent combustible cladding

The diagram below shows a vehicle measured at 0.5m horizontally away from a ground floor level external wall with ACP PE installed (Figure 9 – left). The value of X in this scenario is 0.5m. Therefore the following values apply, in accordance with Table 7 for ACP PE:

- Where **X = 0.5m**
- $\underline{H_{safe}}$ = **6m**
- $\underline{Y_{safe}}$ = **4.25m**
- $\underline{Y_{safe\ at\ 3m}}$ = **2.75m**

Table 7: Removal table for vehicles or designated carparking in proximity to ground level combustible cladding

X (m)	EPS cladding			ACP PE cladding		
	H_{safe} (m)	Y_{safe} (m)	$Y_{safe,\ 3.0}$ (m)	H_{safe} (m)	Y_{safe} (m)	$Y_{safe,\ 3.0}$ (m)
0.5	4.5	2.75	1.25	6.0	4.25	2.75
1.0	3.5	2.75	1.25	4.5	2.75	1.25
1.5	0.5	1.25	0.0	4.0	2.75	1.25
2.0	0.5	1.25	0.0	3.5	2.75	1.25
2.5	0.5	1.25	0.0	2.5	1.25	0.0
3.0	0.5	1.25	0.0	0.5	1.25	0.0

The removal area values are applied to the wall as indicated in Figure 9 below.

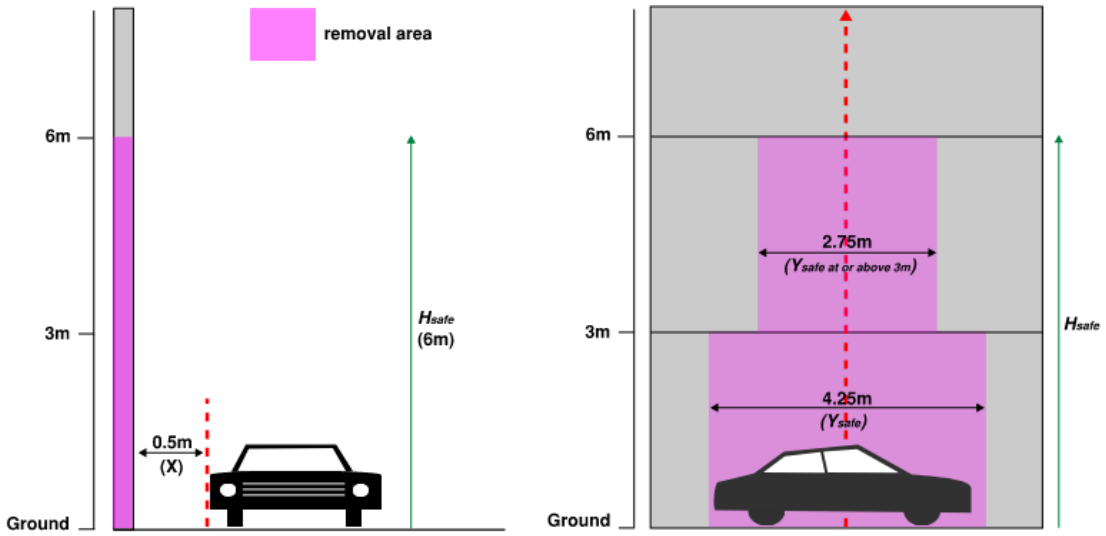


*Figure 9: Example measurements for the removal of cladding, corresponding with a vehicle or carparking at distance **X = 0.5m**, horizontally from walls with **ACP PE** cladding*

Wastebins or designated wastebin areas adjacent combustible cladding

The diagram below shows a wastebin measured at 1m horizontally away from a ground floor level external wall with **EPS** installed (Figure 10 – left). The value of **X** in this scenario is 1m. Therefore, the following values apply, in accordance with Table 8 for EPS:

- Where **X = 1m**
- H_{safe} = **2.7m**
- Y_{safe} = **2.3m**
- $Y_{safe\ at\ 3m}$ = ***No removal required.***

Table 8 Removal table for wastebins in proximity to ground level combustible cladding

X (m)	EPS cladding			ACP PE cladding		
	H_{safe} (m)	Y_{safe} (m)	$Y_{safe,\ 3.0}$ (m)	H_{safe} (m)	Y_{safe} (m)	$Y_{safe,\ 3.0}$ (m)
0.5	4.0	3.4	1.5	4.9	5.2	2.5
1.0	2.7	2.3	0	4.1	3.8	1.8
1.5	0	0	0	3.2	2.7	0.4
2.0	0	0	0	2.3	0.6	0

The removal area values are applied to the wall as indicated in Figure 10 below.

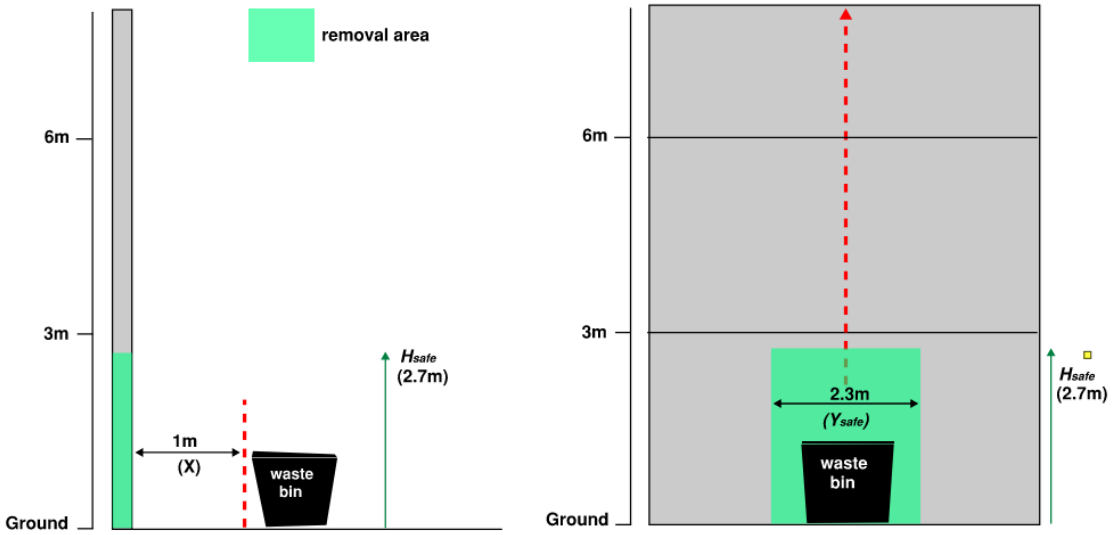


*Figure 10: Example measurements for the removal of cladding, corresponding with a wastebin or designated wastebin area at distance **X = 1m**, horizontally from walls with **EPS** cladding*

Note:

- The heat flux maps developed and detailed in *Support Package document - D.02* do not simply transfer directly to the removal of cladding. It is expected for example that the coverings (render and aluminium skin) protect the inner polymers from direct radiative exposure for some - albeit short - period of time. The figures used for the implementation procedure from ground level cladding removal have been extracted from simulations using exposed polyethylene and polystyrene (ACP PE and EPS respectively) for critical heat flux benchmarks.

Appendices

Appendix A: PMCR document set and flow