MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

File No. 1819-1041

Gillian Stopford
fyi-request-9408-ed6a58c7@requests.fyi.org.nz

Dear Gillian

Thank you for your email of 16 January 2019 requesting the following information under the Official Information Act 1982 (the Act):

> *With regard to the MBIE Guidance Document 'Fire Performance of External Wall Cladding Systems' issued via email to selected parties in the Industry in December 2018 please provide the following information that underlies the recommendations in the Guidance:*
>
> *(i) all correspondence between Auckland Council, BRANZ and MBIE and MBIE's contractors/experts, and other industry experts on external wall assembly compliance issues and in particular in relation to the perceived danger of timber framed exterior wall assemblies.*
> *(ii) information on which consultants were engaged for this work and selection criteria for consultants engaged. Information on fees charged by consultants in relation to preparation of the Guidance Document.*
>
> *Also please provide information on:*
> *(iii) any details of impact statements and cost benefits analysis in relation to the release of the Guidance*
> *(iv) MBIE's policy on the issuing of S.175 Guidance.*
> *(v) Full details of and any analysis of feedback in relation to industry consultation on the Guidance*
> *(vi) Full details of and any analysis of feedback in relation to legal advice on the Guidance*
> *(vii) Full details of and any analysis of feedback in relation to public consultation on the Guidance*

(i) I have conducted a search under the names of individuals from each of the entities you named, in regards to external wall assembly compliance issues. The search resulted in more than 1900 documents in scope. Therefore I am refusing this part of your request under s 18(f) – as the information requested cannot be made available without substantial collation or research.

(ii) The consultants who engaged with MBIE for this work were Ed Claridge from Auckland Council and Colleen Wade from Building Research Association New Zealand (BRANZ). The contract for Colleen Wade is attached (see attached document schedule). Some information in this document such as fees charged and the selection criteria has been withheld under

s9(2)(a). Ed Claridge was not formally employed by MBIE, as Auckland Council is regularly involved in supporting MBIE (and vice versa) in the production of guidance documents.

(iii) Formal analysis of the cost benefits of the release of the Guidance was not undertaken.

(iv) MBIE's policy is to issue the S.175 Guidance whenever is necessary to do so to aide compliance with the Building Act.

(v) Industry consultation on the Guidance is covered in the attached documents. Please see attached document schedule.

(vi) Legal advice on the Guidance is covered in the attached documents. Please see attached document schedule.

(vii) There was no public consultation on the Guidance, only targeted consultation, which is covered in response to (v).

In terms of section 9(1) of the Act, I am satisfied that, in the circumstances, the decision to withhold information under section 9 of the Act is not outweighed by other considerations that render it desirable to make the information available in the public interest.

You have the right to seek an investigation and review of my decision by the Ombudsman, in accordance with section 28(3) of the Act. The relevant details are:

The Ombudsman
Office of the Ombudsman
PO Box 10152
WELLINGTON 6143

0800 802 602
www.ombudsman.parliament.nz

Yours sincerely

Dave Robson
Manager, Building System Performance
Ministry of Business, Innovation and Employment

Document Schedule

Document Name	In response to	Information withheld under
Guidance for fire testing requirements for cladding systems Service Schedule – Statement of Work	(ii) (Contract between BRANZ and MBIE)	s 9(2)(a) – protect the privacy of natural persons, including that of deceased natural persons
Emails 26.11.18-29.11.18 (Subject: SFPE review of draft cladding guidance) and attachment: Fire Performance of Cladding Systems – Draft for Comment	(v) Industry consultation	s 9(2)(a)
Emails 26.11.18-30.11.18 (Subject: Fire Performance of cladding systems – draft for review)	(v) Industry consultation	s 9(2)(a)
Emails 26.11.18-4.12.18 (Subject: Fire performance of cladding systems – draft for review) and attachments: Fire Performance of External Wall Cladding Systems – Draft for comment (tracked changes and clean)	(v) Industry consultation	s 9(2)(a)
Emails 26.11.18-6.12.18 (Subject: Fire performance of cladding systems – draft for review) and attachment: Fire Performance of External Wall Cladding Systems – Draft for comment	(v) Industry consultation	s 9(2)(a)
Emails 29.10.18-1.11.18 (Subject: Guidance for cladding systems – Fire) and attachment: 20181031 DRAFT Guidance for Cladding Systems for comment 19.10.18(legal1)	(vi) Legal Advice	s 9(2)(a)
Emails 11.12.18-14.12.18 (Subject: Guidance for Cladding Systems for Approval Draft 1012.18 (3)) and attachment: 20181214 Guidance for Cladding Systems for Approval Draft 06.12.18 (2)	(vi) Legal Advice	s 9(2)(a)

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

Guidance for fire testing requirements for cladding systems
Service Schedule — Statement of Work #00007076

Enter contract number generated by CMS above

Date: **15 March 2018**

Duration: From 15 March 2018 to 30 June 2018

Client:	Ministry of Business, Innovation and Employment
Business Group:	Building Resource Markets
Branch:	Building Systems Performance
Business unit contact:	David McGuigan
Contact Title:	Engineering Team Leader
Contact telephone:	s 9(2)(a)
Contact email:	Dave.McGuigan@mbie.govt.nz
Contractor:	**Building Research Association New Zealand (BRANZ)**
Contact name for Contractor:	Colleen Wade, Senior Fire Scientist
Contractor contact telephone:	s 9(2)(a)
Contractor contact email:	Colleen.Wade@branz.co.nz

This Service Schedule — Statement of Work (SoW) is subject to, and forms part of, the Umbrella Technical Services Master Services Agreement between the Ministry of Business Innovation and Employment and BRANZ.

Purpose

This confirms that the Ministry of Business, Innovation and Employment – Building Systems Performance Branch wishes to engage you to provide the following services under our Master Service Agreement.

Specific Instructions:

BRANZ are requested to provide specific fire science advice on the technical topic of fire performance of building cladding systems.

Deliverables

Deliverable/Milestone	Due Date
Reference Group Meeting Attendance	21 March 2018
Technical Input to DRAFT fire safety guidance for building cladding systems	30 June 2018

Timeframes and Milestones for Services

Reporting Requirements	Due Date
Technical input to DRAFT fire safety guidance for building cladding systems	30 June 2018

Specified Personnel	Component of Deliverables/Services Personnel responsible for
Colleen Wade	Fire science advice relating to performance of cladding systems
Peter Whiting	Fire testing knowledge of international Standards

Charge for Services

Cost Centre **6411** *General Ledger code*

The fees for the provision of services will be charged on an hourly rate in accordance with the rates set out in the table below.

Name	Position	Hourly Rate (excl. GST)
Colleen Wade	Senior Fire Research Scientist	s 9(2)(a)
Peter Whiting	Senior Fire Safety Engineer	s 9(2)(a)

The maximum anticipated cost for these deliverables for the period of 15 March 2018 to 30 June 2018 is s 9(2)(a) exclusive of GST.

Invoice Terms

Invoice at the end of each month for Services and Deliverables provided during that month to the Ministry's satisfaction. The invoice will contain an itemised list of the work undertaken during that month.

Invoices to be scanned and emailed to: mbie.invoices@mbie.govt.nz for the attention of: David McGuigan.

Expenses incurred in providing Services and Deliverables

Actual and reasonable — general Expenses

The Ministry will pay the Contractor's actual and reasonable Expenses incurred in delivering the Services up to a total maximum amount of s 9(2)(excluding GST provided that:

I. the Ministry has given prior written consent to the Contractor incurring the Expense
II. the Expense is charged at actual and reasonable cost, and
III. the claim for Expenses is supported by GST receipts.

Please confirm your acceptance of this engagement.

Signed

Signed for and on behalf of HER MAJESTY THE QUEEN in right of New Zealand by David McGuigan, Team Leader Engineering, Building Systems Performance Branch, Ministry of Business Innovation and Employment:)

David McGuigan
BSP Team Leader, Engineering
Date: 19 April 2018

Signed for and on behalf of Building Research Association of New Zealand by: Colleen Wade, Senior Fire Scientist)

Jacquie Harper
Better Buildings Team Leader
Date:

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

Conflict of interest statement

To: David McGuigan BSP Team Leader, Engineering

I, Colleen Wade declare

I am not aware of any potential or actual conflicts of interest between

BRANZ

(Name of company or business)

and the Ministry of Business, Innovation and Employment.

Or I am aware of the following potential conflicts of interest

and/or the following actual conflicts of interest

between

and the Ministry of Business, Innovation and Employment

I agree to disclose any conflicts of interest that may arise in the future.

Signed by Colleen Wade

(Name of person authorised to sign on behalf of the company or business)

Date:

Outside of Scope

From: Colleen Wade <Colleen.Wade@branz.co.nz>
Sent: Thursday, 29 November 2018 2:18 p.m.
To: Ed Claridge; Jenni Tipler; Antony Walker
Subject: RE: SFPE review of draft cladding guidance [UNCLASSIFIED]

Hi all, I spent a bit of time yesterday looking through, editing and trying to improve on the draft guidance document taking on board the SFPE comments and other comments from my colleagues here, as well as the previous comments that had been made on the draft. Hope I'm not overstepping my role, but will try to finish and send it around this group tomorrow for further consideration by you all and hopefully to kick-start this next stage.

Regards, Colleen

Colleen Wade
Senior Fire Research Scientist

BRANZ
1222 Moonshine Road, RD1, Porirua 5381, New Zealand
Private Bag 50 908, Porirua 5240, New Zealand
s 9(2)(a)
Email: Colleen.Wade@branz.co.nz | Website: branz.nz

Inspiring the industry to provide better buildings for New Zealanders

From: Ed Claridge <ed.claridge@aucklandcouncil.govt.nz>
Sent: Thursday, 29 November 2018 1:59 PM
To: Jenni Tipler <Jenni.Tipler@mbie.govt.nz>; Antony Walker <Antony.Walker@mbie.govt.nz>; Colleen Wade <Colleen.Wade@branz.co.nz>
Subject: RE: SFPE review of draft cladding guidance [UNCLASSIFIED]

Hi Jenni,

Are you able to update us as to when we are likely to see the next round or publication of the document?

Also as I understand it the new edition of NFPA 285 will be published between now and the end of the year.

I will be commenting on the cladding issues as they remain within the new proposed C/AS2 document and would assume that the guidance and any further movement in this area may impact what the future Acceptable solutions may say on the issue.

Regards

Ed Claridge | Principal Fire Engineer
s 9(2)(a)
Auckland Council, 35 Graham Street, Auckland
Visit our website: www.aucklandcouncil.govt.nz

From: Jenni Tipler [mailto:Jenni.Tipler@mbie.govt.nz]
Sent: Tuesday, 27 November 2018 7:18 AM
To: Antony Walker <Antony.Walker@mbie.govt.nz>; Colleen.Wade@branz.co.nz; Ed Claridge <ed.claridge@aucklandcouncil.govt.nz>
Subject: FW: SFPE review of draft cladding guidance [UNCLASSIFIED]

Good morning Ant, Colleen and Ed,

Attached are the comments on the draft guidance from SFPE. I'm following up with FENZ.

Kind regards,

Jenni

From: Michael James [mailto:mike.j@originfire.co.nz]
Sent: Monday, 26 November 2018 3:35 p.m.
To: Jenni Tipler
Cc: Martin Feeney (martin.feeney@holmesfire.com); Keryn Goble (Keryn.Goble@holmesfire.com)
Subject: RE: SFPE review of draft cladding guidance [UNCLASSIFIED]

Hi Jenni,

I sent comments back to Christine and the rest of the group a while back. Here they are again with a few additional comments added. The comments are tracked changes.

Regards,

Michael James
President
NZ Chapter Society of Fire Protection Engineers (SFPE)
Engineering a Fire Safe World
s 9(2)(a)

From: Jenni Tipler <Jenni.Tipler@mbie.govt.nz>
Sent: Monday, 26 November 2018 10:27 AM
To: Michael James <mike.j@originfire.co.nz>
Subject: SFPE review of draft cladding guidance [UNCLASSIFIED]

Good morning Michael,

Regarding the attached draft guidance, can you please confirm whether SFPE have provided comments on this or if further comments are expected?

Kind regards,

Jenni Tipler
BA/BE (Hons), MSc (EU), Engineer Degree (USA), CPEng, CMEngNZ

ACTING TEAM LEADER ENGINEERING

Building System Performance
Ministry of Business, Innovation & Employment
jenni.tipler@mbie.govt.nz
s 9(2)(a)
Level 5, 15 Stout Street, Wellington, New Zealand

BUILDING PERFORMANCE

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

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Fire Performance of Cladding Systems

DRAFT FOR COMMENT – IN CONFIDENCE

1.0 Introduction

Technical advancements in the understanding of how fire spreads externally and the contribution products make to the fire spread as a consequence of the Grenfell Tower fire and similar high-rise fire events, has prompted the need for clearer information.

MBIE at the sector's request has developed guidance ~~about~~ on how external cladding systems are tested for fire spread performance. This information will help industry to demonstrate ~~achieve the~~ compliance with the requirements of the New Zealand Building Code (NZBC), taking into account the overall risks associated with the building use, risk profile of its occupants and the escape height.

s 9(2)(a) Is this the building sector or BCA sector?

Fire testing protocols: individual components versus cladding systems

Since 2001 fire testing protocols have been based on either bench scale testing using AS 3837 (or more recently ISO 5660) or the larger-scale NFPA 285 facade test. Large scale fire tests are a pragmatic way of assessing how a cladding system performs when exposed to an external flame projecting from an opening in the external wall. However, such tests are by necessity a systems test and are sensitive to any change in the system details. Cladding systems are complex and can include a multitude of combustible components. It is difficult to determine how each of those individual components contributes to the overall system performance to limit fire spread. It may not be possible to confidently evaluate the complexity of the system performance based on small scale fire testing of only individual components.

Questions from Industry

This guidance has been prepared to help address the questions from industry such as:

1. is there latitude to consider alternative fire testing protocols than those currently cited in the compliance documents
2. how the particular criteria for testing external fire spread are applied to cladding systems when historically the focus was about the fire performance of individual components.

Who is this for?

This document is of interest to Fire Engineers, Architects, facade engineers, Building Consent and Territorial Authorities, Testing Laboratories, Product manufacturers and Suppliers.

Disclaimer

s 9(2)(a) MBIE Legal to provide input; potentially include same text as Alternative Solution Guidance; Legal to include reference to Section 175

2.0 In Scope

This guidance:

- Makes it clear what constitutes a cladding *system* for testing external vertical fire spread and assessing performance against the New Zealand Building Code requirements
- Describes the suite of fire testing protocols that could be applied to demonstrate compliance with the New Zealand Building Code.
- Scopes the parameters that need to be considered when addressing external vertical fire spread

The guidance does not intend to provide a fire-engineered design solution for each construction detail but covers broad principles requiring consideration. Some of the principles are based on a simplified risk assessment approach.

Cladding systems defined

For the purpose of this guidance, cladding systems are classified into three broad categories:

1. **Conventional cladding system** – Cladding systems that present a low fire risk because they have limited cavities and are largely comprised of non-combustible materials. Typically such systems would not require an assessment and can be readily observed to comply based on their composition e.g. concrete, steel, or glazing.
2. **Multi-layered cladding system** – comprised of many individual components and/or incorporating ventilated cavities.
3. **Engineered Facades** – these types of design, such as curtain walls, external thermal insulation composite systems (ETICS), ETFE, Expanded Polystyrene Systems (EPS) fall outside the criteria.

s 9(2)(a) I think this leaves it open to too much interpretation. Could it be a % say 95% or 99%.

s 9(2)(a) I am not sure why these should be excluded. Surely they can be tested to NFPA 285 or AS 5113.

2.1 Exclusions

s 9(2)(a) MBIE Legal to consider exclusions, their alignment with AS/VM and ref S175.

This guidance does not apply to:

- Buildings with staged or phased evacuation
- Buildings with evacuation to a place of relative safety within the building e.g. hospitals, care-homes
- Importance Level 4 Buildings
- Specific design engineered facade and curtain wall systems

s 9(2)(a) So where does this leave the design community? These are the high risk buildings that probably need the most guidance. Could a note be added that since these buildings have longer or infinite escape times that agreement will need to be reached with stakeholders as to the level of protection, however it is expected that protection is going to tend towards a Type H cladding assessment given in Section 5.0. or non combustible.

Consult early with the local Building Consent Authority to agree the fire testing evidence required for buildings with these defined characteristics.

3.0 New Zealand Building Code Compliance Pathways

The New Zealand Building Code (NZBC) is performance based. Clause C of the Building Code describes the performance criteria for Protection from Fire. Clause C3 describes Functional and Performance Requirements for fire affecting areas beyond the fire source.

Functional Requirements - NZBC Clause C3	
C3.1	*Buildings* must be designed and constructed so that there is a low probability of injury or illness to persons not in close proximity to a *fire source*.
C3.2	*Buildings* with a *building height* greater than 10 m where upper floors contain sleeping uses or other property must be designed and constructed so that there is a low probability of external vertical fire spread to upper floors in the *building*.
C3.3	*Buildings* must be designed and constructed so that there is a low probability of *fire* spread to *other property* vertically or horizontally across a *relevant boundary*.

There are two Performance Clauses that describe the constraints for control of external vertical fire spread:

- Clause C3.5 – limiting the vertical spread of fire
- Clause C3.7 – covering the ignitability of wall materials

Three pathways are available to demonstrate compliance with the Building Code Performance Requirements: Acceptable Solutions, Verification Methods and Alternative Solutions.
Note: CodeMark and Multiproof are alternative means for demonstrating compliance with the NZBC.
The following table outlines the Performance Requirements of the New Zealand Building Code and summarises the associated compliance pathways:

New Zealand Building Code Clause – External Spread of Fire		
C3.5	**C3.7**	
Buildings must be designed and constructed so that *fire* does not spread more than 3.5 m vertically from the *fire* source over the external cladding of multi-level *buildings*.	External walls of *buildings* that are located closer than 1 m to the *relevant boundary* of the property on which the *building* stands must either: (a) be constructed from materials which are not *combustible building material, or*	(b) for *buildings* in importance levels 3 and 4, be constructed from materials that, when subjected to a radiant flux of 30 kW/m^2, do not ignite for 30 minutes, or (c) for *buildings* in importance levels 1 and 2, be constructed from materials that, when subjected to a radiant flux of 30 kW/m^2, do not ignite for 15 minutes.

<table>
<tr><td rowspan="3">Compliance Pathway</td><td>Acceptable Solutions</td><td colspan="3">The Acceptable Solutions (C/AS2 to C/AS7) contain three means of demonstrating compliance:

1. Fire properties of external wall cladding systems shall be determined in accordance with ISO 5660 Reaction-to-fire tests – Heat release, smoke production and mass loss rate – Part 1: Heat release rate (cone calorimeter method), or
2. External wall cladding systems which comprise only materials which individually are classified as non-combustible (exempting a 1mm combustible finish) may be deemed to satisfy all the requirements, or
3. The entire wall assembly has been tested at full scale in accordance with NFPA 285 and has passed the test criteria.</td></tr>
<tr><td>Verification Method</td><td colspan="3">The Verification Method (C/VM2) contains four means of demonstrating compliance:

1. Fire properties of external wall cladding systems shall be determined in accordance with ISO 5660.1 or AS/NZS 3837, to criteria as tabulated, or
2. Use non-combustible materials, or
3. Comply with the Acceptable Solutions (for buildings with an importance level not higher than 3).
4. Use large or medium scale facade type tests to determine the extent of vertical flame test is not more than 3.5 m above the fire source. (C3.5 only)</td></tr>
<tr><td>Alternative Solution</td><td>Provide an alternative solution proposal that justifies how the design of the building will not result in fire spread of more than 3.5 m vertically from the fire source over the external cladding of multi-level buildings.

Note: Fire source means the head of an opening in the external wall from which flames are presumed to be projecting from.</td><td>Combustible building materials is a defined term in the Building Regulations, and "means building materials that are deemed combustible according to AS 1530.1."</td><td>Provide an alternative solution proposal that justifies how either:
(b) for buildings in importance levels 3 and 4, be constructed from materials that, when subjected to a radiant flux of 30 kW/m^2, do not ignite for 30 minutes, or
(c) for buildings in importance levels 1 and 2, be constructed from materials that, when subjected to a radiant flux of 30 kW/m^2, do not ignite for 15 minutes.</td></tr>
</table>

s 9(2)(a) Note this definition does not comply with the proscribed definition for the fire source.

If the wall above the window head is not fire rated does it matter that the wall will burn out and the effective window head is higher?

4.0 Fire Test Methods for Wall Cladding Systems

4.1 Fire Testing requirements for a building cladding system

A cladding system for demonstrating compliance with the NZ Building Code for Protection from Fire Performance Clauses C3.5 and C3.7 for external vertical fire spread can be defined as: 'a cladding system can be considered to include all substantive components within the complete wall assembly (i.e. sheet cladding materials, framing, rigid air barrier and any insulation or sheet materials or blanket)'.

s 9(2)(a) Is the internal lining included as well.

Cladding System – Test Methods

Substantive components of the wall (i.e. sheet cladding materials, framing, rigid air barrier and any insulation or polymeric sheet / blanket) within the wall shall:

(i) Comprise of only glass, concrete, steel, brick / block, ceramic tile or aluminium, or

(ii) Are classified as "non-combustible" when tested to AS 1530.1 or ISO 1182, or

(iii) Achieve a Euroclass A1 or A2 in accordance with EN 13501: 2007+A1:2009, or

(iv) Meet the requirements of NFPA 285: Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components, or

(v) Be tested to BS 8414 and assessed to the requirements of BRE 135 Fire performance of external thermal insulation for walls of multi-storey buildings" – 3rd edition 2013

4.2 "BRE 135 Fire performance of external thermal insulation for walls of multi-storey buildings" – 3rd edition 2013

BRE 135: 2013 addresses the principles and design methodologies related to the fire-spread performance characteristics of non-loadbearing external cladding systems. Although various potential design solutions have been identified and discussed in BRE 135, robust design details are not presented. In this rapidly changing market generic solutions are not available where new products and novel design solutions are frequently presented. The illustrations and scenarios presented in BRE 135 are based on typical examples of current practice in the UK. To help designers and end users better understand the parameters impacting on the fire-safe design and construction of external cladding systems, BRE 135 focuses on the issues surrounding the topic of external vertical fire spread.

Note : BS 8414-2 and Annex B of the BRE 135 guide relate specifically to external cladding systems applied to steel-frame constructions.

Other construction systems such as concrete-frame or timber-frame constructions are not considered in this guidance. However, the general principles in the BRE 135 guide may still apply, although suitable additional risk assessments and detail design reviews would be required. The risk matrix approach provides an option for considering alternative forms of supporting wall frames.

BRE 135 Annex A provides a classification system for the test methodology outlined in BS 8414-1Fire performance of external cladding systems – Part 1: Test method for nonloadbearing external cladding systems applied to the face of the building.

BRE 135 Annex B provides a classification system for the test methodology outlined in BS 8414-2 Fire performance of external cladding systems – Part 2: Test method for non-loadbearing external cladding systems fixed to and supported by a structural steel frame.

4.3 Alternative Test Methods to those currently cited

The New Zealand Building Code Protection from Fire Acceptable Solutions and Verification Method currently cite two fire tests for assessing the fire performance of cladding systems. These are, a bench scale independent component test (ISO 5660), and the intermediate-scale system test NFPA 285. This guidance broadens the suite of test protocols to include the British Standard BS 8414.

The British Standard test, with compliance interpretation provided by BRE 135:

BS 8414-1:2015 Fire performance of external cladding systems. Test method for non-loadbearing external cladding systems applied to the masonry face of a building. Amended by BS 8414-1:2015+A1:2017 (June 2017).

BS 8414-2:2015 Fire performance of external cladding systems. Test method for non-loadbearing external cladding systems fixed to and supported by a structural steel frame. Amended by BS 8414-2:2015+A1:2017 (June 2017).

BRE 135 Fire performance of external thermal insulation for walls of multi-storey buildings: (BRE 135) Third edition, BRE (15 March 2013).

It may also be acceptable to test cladding systems using the methods outlined in the Australian Standard AS 5113 to meet the 'EW' classification. Refer to the risk matrix section of this guidance for specific details.

4.4 What is specifically excluded from cladding systems for the purpose of fire compliance with C3.5 and C3.7?

For the purposes of defining a cladding system for demonstrating compliance with the NZ Building Code for Protection from Fire, substantive components may exclude:

- Signage and Billboards – aggregated area 25m^2
- Video screens <6m^2
- Greenwalls – the acceptance of Green and living walls will be dependent on the type of system proposed, its support structure and the associated management and maintenance/irrigation procedures. Generally plants growing on metallic support systems (such as stainless steel wires) will not present an increased fire hazard provided they are adequately maintained. Other systems that include combustible support systems should be proven via fire test evidence to support compliance.

  For more information on greenwalls see

  ANS Living Walls receive a Fire Safety Standard

  Fire Performance of Green Roofs and Walls

- Sunscreens / Sunshades / louvres - <6m^2 or non-combustible
- Top floor when the building height is more than 10 m and the roof does not require a fire resistance rating
- Door sets and window frames are not included with the cladding requirements
- Sealants and tapes comprising < 5% of the wall area
- Canopy or balcony at ground floor of buildings that exceed 10m in height can be excluded from the requirements where it can be shown that a fire would not spread from the area to the main building cladding
- Minor trim and gutters, downpipes and facias. Limited amounts of materials are excluded from the requirements where it can be shown that a fire involving the

product would not spread fire to the remaining parts of the building cladding or where they are remote from the main building cladding.

- Individual components on or within the wall assembly that include a surface coating not more than 1mm thick applied directly to a non-combustible substrate.

Note: the above exclusions are only relevant to each component when taken in isolation. Consideration needs to be given when the above items are considered as part of a whole system and when one item may impact the performance of another. For example, a video screen meeting the size limitations must be attached to a non-combustible facade but would require further consideration if attached to a combustible wall system.

4.5 In-Wall Cavities

Continuous vertical channels and cavities within cladding systems are known to promote upward vertical fire spread. Fire researchers have noted that when flames are confined within a vertical cavity or channel they elongate, leading to flame extension of five to ten times the expected unconfined flame lengths. This is true even in cavities without additional combustible materials present, but is made worse by the presence of combustible materials. This flame extension effect can support rapid, potentially unseen, fire spread within an external cladding system and must be limited.

Cavity barriers are important within cladding systems and are particularly important when combustible cladding, Rigid Air Barriers (RAB) and insulation products are used.

Intumescing products and fire resistant barriers are required to maintain a minimum 30 minute fire resistance rating [-/30/30] as demonstrated in a fire resistance test.

Solid timber blocking could be an appropriate cavity barrier if there is evidence to support a maintained integrity and insulation rating for a minimum 30 minute duration.

5.0 External cladding system vertical fire spread - risk assessment approach

A simplified risk assessment approach has been developed to identify the level of complexity for assessment of the cladding system for external fire spread. The parameters considered are:

- Building Height
- Vulnerability of Risk Group
- Provision of an automatic fire sprinkler system to the requirements of NZS 4541 (NZ Building Code modified NZS4541 sprinkler system)

Building Height	Sleeping Use* Risk groups SM, SI		Non-Sleeping Use* Risk groups CA, WB, WS, VP	
	Sprinkler protected	Non-sprinkler protected	Sprinkler protected	Non-sprinkler protected
Single storey building	L	L	L	L
≤ 10 m (typically 2 to 3 floor levels)	L	L	L	L
> 10 m ≤ 25 m (typically 4 to 8 floor levels)	M	H	M	M
> 25 m and ≤ 60 m	H	H	M	H
> 60 m	H	H	H	H

*Excludes – staged evacuation, phased evacuation, evacuation to a place of relative safety within the building, Importance Level 4 Buildings

Where:

L	**Low**	No requirement for building height < 10 m (NZ Building Code Performance Clause C3.5).
M	**Medium**	P1. All cladding and Rigid Air Barriers (RABs) used in the external wall construction may be tested using ISO 5660-1 to meet requirements in C/AS Section 5.8. Insulation products†, and filler materials (not including gaskets, sealants etc) to be *limited combustibility* *.

		All external wall cavities need to be fire stopped using cavity barriers at each floor level. ACP materials must be tested without Aluminium (metal) facing as per C/AS 7.1.5. **Any of options P1-P4 are acceptable.**
H	**High**	P2. External wall system to meet the performance criteria given in BRE 135 for cladding systems using full scale test data from BS 8414-1:2002 or BS 8414-2: 2005; or P3. External wall system to pass the NPFA 285 full scale test; or P4. External wall system to meet 'EW' classification in AS 5113; or P5. All cladding, framing**, insulation products†, RAB and filler materials (not including gaskets, sealants etc) used in the external wall construction to be *limited combustible**. If vapour barriers, drainage mats, building wraps or similar are not limited combustibility * then all external wall cavities need to be fire stopped using cavity fire barriers at each floor level.

s 9(2)(a) Fibre cement RAB over steel framing with EPS insulation would appear to comply however the fibre cement is likely to fail early and expose the EPS or the EPS will melt and run out the cracks. Refer to s 9(2)(advice on what risks the insurers are willing to accept when EPS is present (none).

† This does not apply to combustible insulation products encapsulated within a conventional timber-frame assembly on the interior-facing side of a solid RAB.

* Limited combustibility means the product/material meets one or more of the following criteria:

1. A1 or A2 classification in accordance with EN 13501-1:2007+A1:2009.
2. Non-combustible or not combustible when tested to AS1530.1 or ISO 1182.
3. Concrete, brick/block masonry, stone, glass, ceramic tiles, aluminium and steel with or without paint or similar thin surface coatings.

** Timber framing may be used if a robust protective lining material (limited combustibility) is fixed to the exterior side of the framing and can be demonstrated to remain in place and protect the timber framing during the period of external fire exposure. The term 'protect timber framing' can be achieved if the protective lining material as part of a light timber frame wall exposed to the test conditions of AS1530.4 can be shown to prevent charring of the timber frame for a period of 30 minutes. One way to determine this is to limit the temperature on the cavity side of the fire-exposed protective lining material during the test period to be no greater than 300 Centigrade.

s 9(2)(a) EPS insulation in this type of wall assembly melts at 100 degree's and runs out the cracks to ignite.

5.1 Use of combustible RAB

A combustible Rigid Air Barrier (RAB) e.g. plywood, may be used for any building if it has been included as part of a representative external wall subjected to a full-scale fire test and meeting the criteria in P2-P4 in the risk matrix .

5.2 External Walls of any height located within 1 m of a relevant boundary.

To limit potential horizontal fire spread to and from a neighbouring property, the exterior cladding material (and or with a representative substrate if that cladding material is less than 50 mm thick) shall either be limited combustible or be tested using ISO 5660-1 to meet the requirements in the relevant C/ASx Section 5.8. NOTE: This is not a vertical fire spread provision.

5.3 Technical Assessment in Lieu of Test

Cladding products and systems range in nature and complexity. There are also a range of base wall assemblies that may impact how the outer weather facing part of a cladding system product will perform. Examples include:

- Exterior insulation finish systems (EIFS)
- High Pressure Laminates (HPL)
- External thermal insulation composite systems (ETICS)
- Rain screen Cladding
- Structural insulation panel systems (SIPS)
- Expanded Polystyrene Systems (EPS)
- Timber cladding

Key system performance considerations which must be considered in a technical assessment are:

- Combustibility of insulation
- Combustibility of framing (e.g. timber frame)
- Composition of rigid air barrier
- Building underlay
- Uninterrupted vertical cavity
- Continuity of products

In order for a cladding system to be certified for fire safety performance, it needs to be constructed to replicate the details of the test. This includes for example, framings, substrate, flashing details, gaskets, sealants and fixing mechanisms.

It is valid to present a technical assessment as part of evidence to demonstrate compliance with the performance based Building Code. Situations may arise where the proposed cladding system installation differs slightly from the absolute details of that endorsed by the

fire testing certificate. A technical assessment from a certified testing laboratory or from a subject matter expert in fire science and testing is required.

s 9(2)(a) This should have some definition as it will be open to interpretation. Will someone with CPEng in fire be a suitable benchmark.

6.0 Documentation and Evidence for Building Consent

When considering documentation the Building Consent Authority (BCA) needs to be satisfied on reasonable grounds that the building when constructed will meet the requirements of the New Zealand Building Code and therefore the intent of the Building Act.

The BCA needs evidence of which compliance pathway you are using to show how the building cladding system meets the performance requirements of the Building Code and evidence to show how it can be constructed to comply.

BCAs may wish to consider the following when assessing building cladding system case-by-case:

- the extent of combustible products used on the building (i.e. is it a feature or the entire cladding?)
- the building use (occupancy type)
- the active (e.g. alarms and sprinklers) and passive (e.g. firewalls and smoke compartments) fire protection systems throughout the building
- the system tested by the manufacturer or supplier and whether its use is consistent with this (and if not, are the changes likely to negatively affect the building's fire performance?)
- the quality and accuracy of the Building Consent documentation and detailing in relation to external wall assemblies (i.e. can the cladding system be constructed from the information that has been provided?)
- the height and proximity of the building to other buildings
- the use of plastics (e.g. polyethylene core aluminium composite panel); the content of the specific product and its use
- if the design has been reviewed / peer reviewed by a fire engineer?

7.0 Useful Resources & References

1. New Zealand Building Code
2. Wade, C.A., (1995), BRANZ, Report Number 133, *Fire Performance of External Wall Claddings under a Performance Based Building Code*.
3. National Fire Protection Association (NFPA) 285, Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components
4. AS 5113 Fire propagation testing and classification of external walls of buildings
5. ISO 5660 Reaction-to-fire tests Part 1 Heat release rate (cone calorimter method), and Part 2 Smoke production rate (dynamic method)

6. EN ISO 1182: 2010. Fire Test For Non-Combustibility Of Building Products
7. AS 1530.1 Methods for fire tests on building materials and structures Part 1: Combustibility test for materials.
8. Lamont, S. & Ingolfsson, S. (2018) *High rise Buildings with Combustible Exterior Wall Assemblies: Fire Risk Assessment Tool*, NFPA, USA
9. White N. and Delichatsios M., (2014) Fire Hazards of Exterior Wall Assemblies Containing Combustible Components, Fire Protection Research Foundation Report (EP142293)
10. BS 8414-1 & 2:2015+A1:2017 Fire performance of external cladding systems. Test method for non-loadbearing external cladding systems applied to the masonry face of a building
11. BRE 135: 2013 Fire performance of external thermal insulation for walls of multi-storey buildings: (BRE 135) Third edition
12. EN 13501-1:2007+A1:2009

8.0 Useful Definitions

Cladding The exterior weather-resistant surface of a *building*.
COMMENT: Includes any supporting substrate and, if applicable, surface treatment.

Cladding system
The outside or exterior weather-resistant surface of a *building*, including *roof cladding* and *roof underlays*, *wall* cladding and *wall underlays*, and cavity components, rooflights, windows, doors and all penetrations, *flashings*, seals, joints and junctions. Where required by the Acceptable Solution, the *cladding* system shall include a *drained cavity*.

Cavity wall
A term used to describe a wall that incorporates a *drained cavity*.

Drained cavity
A cavity space, immediately behind a wall *cladding*, that has vents at the base of the wall. Also known as a drained and vented cavity and referred to in the NZBC E2 Acceptable Solution as a cavity or *drained cavity*. A *drained cavity* assists drying by allowing water which occasionally penetrates the wall *cladding system* to drain to the exterior of the *building*, and any remaining moisture to dry by evaporation. Where the Acceptable Solution requires a nominal 20 mm *drained cavity*, the depth shall be between limits of 18 mm and 25 mm. For definition of masonry veneer cavity refer to SNZ HB 4236.

External wall
Any vertical exterior face of a *building* consisting of *primary* and/or *secondary elements* intended to provide protection against the outdoor environment.

Outside of Scope

From: Davis, Simon <Simon.Davis@fireandemergency.nz>
Sent: Friday, 30 November 2018 9:05 a.m.
To: Jenni Tipler
Subject: FW: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Hi Jenni

Sorry wasn't able to return your call yesterday.
We have read the proposed guidance and did have a few comments.
I am out of the office today but happy to answer any questions next week.

Point 2 part 3
Does this clause mean that these types of systems are not covered by this guidance?

Point 4.3
Is AS5113 acceptable and thus can be used as a test method?

Point 4.4
Top floors of buildings required to comply with horizontal fire spread to protect neighbours property.

Point 4.5
Any part of a fire rated system to stop vertical fire spread (wood blocking et al) should meet the maximum L or P rating and not just 30 minutes

Table 5
Not sure what this table conveys, as goes from low to high risk for non-sprinklered building under 25m.
Unlike Australia we do not have a combined sprinkler system such as installed at La Crosse in Melbourne. Thus in NZ only design for 6 heads thus very likely, in the event of an external façade fire, the residential sprinkler system will be overwhelmed resulting in fire spread internally and thus likely to lose whole building.

Point 5.3

A recent determination published by MBIE concerned the application of technical assessments. In summary an assessment by a fire engineer as part of a building consent was challenged by the BCA. The determination process referred to an expert independent fire test scientist that found the assessment by the fire engineer was flawed and upheld the BCA's refusal to issue a BC. Thus any guidance from MBIE should be inline with the conclusions of this determination and therefore only assessments from reputable testing agencies should be considered acceptable.

Regards

Simon Davis
B.E.(mech), M.Bld.Sc(dist), M.E. (fire engineering)
Fire Engineering Manager

s 9(2)(a)

s 9(2)(a)
Email: simon.davis@fireandemergency.nz
National Headquarters, 2 Poynton Terrace, Newton, Auckland
PO Box 68 444, Auckland 1145

From: Jenni Tipler <jenni.tipler@mbie.govt.nz>
Sent: Monday, November 26, 2018 4:44 PM
To: Davis, Simon; Hermouet, Etienne; Saunders, Rob
Cc: Antony Walker
Subject: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Good afternoon,

My name is Jenni Tipler and I'm currently the acting team leader for engineering filling in after Dave McGuigan's departure from MBIE. Further to Christine's email last month, please can you confirm whether FENZ has additional comments on the draft 'Fire performance of cladding systems' guidance document?

Please feel free to give me a call if you'd like to discuss.

Kind regards,

Jenni Tipler
BA/BE (Hons), MSc (EU), Engineer Degree (USA), CPEng, CMEngNZ

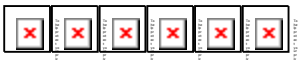
ACTING TEAM LEADER ENGINEERING

Building System Performance
Ministry of Business, Innovation & Employment
jenni.tipler@mbie.govt.nz
s 9(2)(a)
Level 5, 15 Stout Street, Wellington, New Zealand

BUILDING PERFORMANCE

MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT

New Zealand Government



Outside of Scope

From: Antony Walker <antony@cognition.nz>
Sent: Tuesday, 4 December 2018 2:06 p.m.
To: Ed Claridge; Colleen Wade; Jenni Tipler; Antony Walker
Cc: Peter Whiting
Subject: RE: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Hi All,

As discussed please find attached the "final" version of the track changes document, and a clean version.

If there are any more comments can you please make them on the clean version, I've just gone through it and done a wee tidy up on formatting and deleting content that still showed up as "strike-through".

Thank you all for your time so far, hopefully you'll have time for one quick final review!

Regards,

Antony Walker
PRINCIPAL
Cognition Limited

antony@cognition.nz
s 9(2)(a)

-----Original Appointment-----
From: Antony Walker
Sent: Friday, 30 November 2018 5:28 PM
To: Antony Walker; Ed Claridge; Colleen Wade; Jenni Tipler; Antony Walker
Cc: Peter Whiting
Subject: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]
When: Tuesday, 4 December 2018 11:30 AM-12:30 PM (UTC+12:00) Auckland, Wellington.
Where: Skype Meeting

Hi guys,

I've set this up as a Skype meeting (link below) so that we can look over the document if needed (Jenni there were no VC rooms available at MBIE, so I'll be doing this from home).

If you think we can just do this by phone let me know and I'll sort a dial in at MBIE.

Regards, Antony.

→ Join Skype Meeting

Trouble Joining? Try Skype Web App

Help

From: Ed Claridge [mailto:ed.claridge@aucklandcouncil.govt.nz]
Sent: Friday, 30 November 2018 4:00 PM
To: Antony Walker <antxxx@xxxxxxxxx.xx>; Colleen Wade <Colleen.Wade@branz.co.nz>; Jenni Tipler <Jenni.Tipler@mbie.govt.nz>; Antony Walker <Antony.Walker@mbie.govt.nz>
Subject: RE: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Yes lets make it 11:30.

Regards

Ed Claridge | Principal Fire Engineer
s 9(2)(a)
Auckland Council, 35 Graham Street, Auckland
Visit our website: www.aucklandcouncil.govt.nz

From: Antony Walker [mailto:antony@cognition.nz]
Sent: Friday, 30 November 2018 3:57 PM
To: Ed Claridge <ed.claridge@aucklandcouncil.govt.nz>; Colleen Wade <Colleen.Wade@branz.co.nz>; Jenni Tipler <Jenni.Tipler@mbie.govt.nz>; Antony Walker <Antony.Walker@mbie.govt.nz>
Subject: RE: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Thanks Ed,

Shall we lock in 11 (or 11:30 to be safe?) this Tuesday.

I doubt there will be anything contentious arising if we were to discuss the NFPA test that is coming up, but just so you know I was contracted to MBIE to review the 6 Certmark ACP certificates and Peer Review the Enright report…

Regards,

Antony Walker
PRINCIPAL
Cognition Limited

<< OLE Object: Picture (Device Independent Bitmap) >>

antony@cognition.nz
s 9(2)(a)

From: Ed Claridge [mailto:ed.claridge@aucklandcouncil.govt.nz]
Sent: Friday, 30 November 2018 2:27 PM
To: Antony Walker <anxxxx@xxxxxxxxx.xx>; Colleen Wade <Colleen.Wade@branz.co.nz>; Jenni Tipler <Jenni.Tipler@mbie.govt.nz>; Antony Walker <Antony.Walker@mbie.govt.nz>
Subject: RE: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Hi Anthony,

Tuesday works for me, just not between 10-11. Coincidently I'll be discussing a proposed NFPA 285 test taking place in January on one the ACP systems.

Regards

Ed Claridge | Principal Fire Engineer
s 9(2)(a)
Auckland Council, 35 Graham Street, Auckland
Visit our website: www.aucklandcouncil.govt.nz

From: Antony Walker [mailto:antony@cognition.nz]
Sent: Friday, 30 November 2018 1:48 PM
To: Colleen Wade <Colleen.Wade@branz.co.nz>; Ed Claridge <ed.claridge@aucklandcouncil.govt.nz>; Jenni Tipler <Jenni.Tipler@mbie.govt.nz>; Antony Walker <Antony.Walker@mbie.govt.nz>
Subject: RE: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Thanks Colleen,

That's awesome! I will have a look through yours (I'd already started to sort some minor edits as well), and we can sort out any remaining issues, hopefully Tuesday 10am if that suits Ed.

Cheers, Antony.

From: Colleen Wade [mailto:Colleen.Wxxx@xxxxx.xx.xx]
Sent: Friday, 30 November 2018 1:41 PM
To: Antony Walker <anxxxx@xxxxxxxxx.xx>; Ed Claridge <ed.claridge@aucklandcouncil.govt.nz>; Jenni Tipler <Jenni.Tipler@mbie.govt.nz>; Antony Walker <Antony.Walker@mbie.govt.nz>
Subject: RE: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Hi again,

Further to my email yesterday, I have attached two documents.

1. The draft guidance as sent for comment but with lots of track changes and margin comments included from SFPE, FENZ, BRANZ.

2. A cleaner version with only a few comments left in and most of the tracked changes taken out. I have probably taken too many liberties with this version but you can pull me back as appropriate. I'm conscious of the very limited time we have and the need to get something useful published.

Regards, Colleen

Colleen Wade

Senior Fire Research Scientist

[<< OLE Object: Picture (Device Independent Bitmap) >>]

1222 Moonshine Road, RD1, Porirua 5381, New Zealand
Private Bag 50 908, Porirua 5240, New Zealand
| s 9(2)(a)
Email: Colleen.Wadx@xxnz | Website: branz.nz

Inspiring the industry to provide better buildings for New Zealanders

From: Colleen Wade
Sent: Friday, 30 November 2018 11:26 AM
To: Antony Walker <anxxxx@xxxxxxxxx.xx>; Ed Claridge <ed.claridge@aucklandcouncil.govt.nz>; Jenni Tipler <Jenni.Tipler@mbie.govt.nz>; Antony Walker <Antony.Walker@mbie.govt.nz>
Subject: RE: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Hi , I can do 10-1 on Tuesday, and second choice would be Wednesday 10-11.30.
I also notice that Peter Whiting seems to have been dropped from this group, does he need to be added back in?

Regards, Colleen

From: Antony Walker <antony@cognition.nz>
Sent: Friday, 30 November 2018 11:18 AM
To: Ed Claridge <ed.claridge@aucklandcouncil.govt.nz>; Jenni Tipler <Jenni.xxxxxx@xxxx.xxxx.xx>; Antony Walker <Antony.Walker@mbie.govt.nz>; Colleen Wade <Colleen.Wade@branz.co.nz>
Subject: RE: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Hey everyone,

How about Tuesday sometime between 10 and 2pm, if that suits I can book a VC room (hopefully, on Monday) and we can go over the issues to hopefully resolve them all?

If not alternate day Wednesday same time slot.

Regards,

Antony Walker
PRINCIPAL
Cognition Limited

<< OLE Object: Picture (Device Independent Bitmap) >>

antony@cognition.nz
s 9(2)(a)

From: Ed Claridge [mailto:ed.claridge@aucklandcouncil.govt.nz]
Sent: Friday, 30 November 2018 9:18 AM
To: Jenni Tipler <Jenni.Tipler@mbie.govt.nz>; Antony Walker <Antony.Walker@mbie.govt.nz>; Antony Walker <antony@cognition.nz>; Colleen Wade <Colleen.Wadx@xxxxx.xx.nz >
Subject: RE: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Thanks Jenni,

I am happy to catch up as soon as possible to get this resolved so please just throw out some times that suit.

Regards

Ed Claridge | Principal Fire Engineer
s 9(2)(a)
Auckland Council, 35 Graham Street, Auckland
Visit our website: www.aucklandcouncil.govt.nz

From: Jenni Tipler [mailto:Jenni.Tipler@mbie.govt.nz]
Sent: Friday, 30 November 2018 9:14 AM
To: Antony Walker <Antony.Walker@mbie.govt.nz>; Antony Walker <antony@cognition.nz>; Colleen Wade <Colleen.Wadx@xxxxx.xx.nz >; Ed Claridge <ed.claridge@aucklandcouncil.govt.nz>
Subject: FW: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Good morning all,

I've now received comments back from Simon Davis – see below. It would be great if you could arrange a time early next week to go over the comments together agree on the final content – I'll leave it to Antony to arrange a time that suits.

In order to get this published before Christmas, the content needs to be ready by next Thursday (Dec 6) so it can go through the MBIE approvals process for release.

Kind regards,

Jenni

From: Davis, Simon [mailto:Simon.Davis@fireandemergency.nz]
Sent: Friday, 30 November 2018 9:05 a.m.
To: Jenni Tipler
Subject: FW: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Hi Jenni

Sorry wasn't able to return your call yesterday.
We have read the proposed guidance and did have a few comments.
I am out of the office today but happy to answer any questions next week.

Point 2 part 3
Does this clause mean that these types of systems are not covered by this guidance?

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Any part of a fire rated system to stop vertical fire spread (wood blocking et al) should meet the maximum L or P rating and not just 30 minutes

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Not sure what this table conveys, as goes from low to high risk for non-sprinklered building under 25m.

Unlike Australia we do not have a combined sprinkler system such as installed at La Crosse in Melbourne. Thus in NZ only design for 6 heads thus very likely, in the event of an external façade fire, the residential sprinkler system will be overwhelmed resulting in fire spread internally and thus likely to lose whole building.

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A recent determination published by MBIE concerned the application of technical assessments. In summary an assessment by a fire engineer as part of a building consent was challenged by the BCA. The determination process referred to an expert independent fire test scientist that found the assessment by the fire engineer was flawed and upheld the BCA's refusal to issue a BC. Thus any guidance from MBIE should be inline with the conclusions of this determination and therefore only assessments from reputable testing agencies should be considered acceptable.

Regards

Simon Davis
B.E.(mech), M.Bld.Sc(dist), M.E. (fire engineering)
Fire Engineering Manager
<< OLE Object: Picture (Device Independent Bitmap) >>
s 9(2)(a)

Email: simon.davis@fireandemergency.nz
National Headquarters, 2 Poynton Terrace, Newton, Auckland
PO Box 68 444, Auckland 1145

From: Jenni Tipler <jenni.tipler@mbie.govt.nz>
Sent: Monday, November 26, 2018 4:44 PM
To: Davis, Simon; Hermouet, Etienne; Saunders, Rob
Cc: Antony Walker
Subject: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Good afternoon,

My name is Jenni Tipler and I'm currently the acting team leader for engineering filling in after Dave McGuigan's departure from MBIE. Further to Christine's email last month, please can you confirm whether FENZ has additional comments on the draft 'Fire performance of cladding systems' guidance document?

Please feel free to give me a call if you'd like to discuss.

Kind regards,

Jenni Tipler
BA/BE (Hons), MSc (EU), Engineer Degree (USA), CPEng, CMEngNZ

ACTING TEAM LEADER ENGINEERING

Building System Performance
Ministry of Business, Innovation & Employment
jenni.tipler@mbie.govt.nz
s 9(2)(a)
Level 5, 15 Stout Street, Wellington, New Zealand

<< OLE Object: Picture (Device Independent Bitmap) >>

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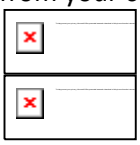

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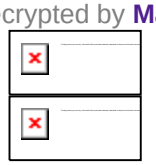

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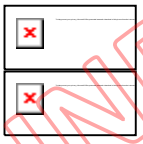

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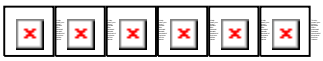

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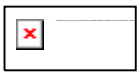

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<<

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DRAFT Guidance for Cladding Systems for comment 04.12.18 - Clean.docx (52.3KB)
DRAFT Guidance for Cladding Systems for comment 04.12.18.docx (81.5KB)

(138.6KB)
>>

Fire Performance of External Wall Cladding Systems

DRAFT FOR COMMENT – IN CONFIDENCE

1.0 Introduction

~~The Grenfell Tower and similar~~ Various high-rise fire events globally have provided evidence of potential outcomes of fire spreading externally and within modern façade construction. This evidence has prompted a review of the existing methods used to demonstrate compliance of external wall cladding systems with building regulation fire safety objectives. There have also been questions as to how New Zealand requirements should be interpreted and whether alternative fire test and evaluation methods available internationally are suitable for use in New Zealand. ~~Technical advancements in the understanding of how fire spreads externally and the contribution products make to the fire spread as a consequence of the Grenfell Tower fire and similar high-rise fire events, has prompted the need for clearer information.~~

MBIE ~~at the sector's request~~ has developed this guidance ~~about~~ on how external wall cladding systems ~~are to be~~ tested to determine ~~for~~ their fire ~~spread~~ performance. This information will help industry to demonstrate ~~achieve the~~ compliance with the requirements of the New Zealand Building Code (NZBC), ~~taking into account~~considering the overall risks associated with the building use, risk profile of its occupants, ~~and~~ the ~~escape~~ building height and other fire safety systems in the building.

Fire testing protocols: individual components versus cladding systems

Since 2001 fire testing protocols used for building code compliance in New Zealand have been based on either bench scale testing of individual materials or components using AS/NZS 3837 (or more recently ISO 5660) or the larger-scale NFPA 285 facade test.

Bench scale fire tests have typically been used in New Zealand for cladding in a way that treats fire spread over the external wall as a surface flame spread phenomena (similar to interior linings). However, it is apparent that in many cases, it is the entire system performance that must be considered and not only that of the outermost cladding material.

Large scale fire tests are a ~~pragmatic~~ way of assessing how an external wall cladding system performs when exposed to ~~an external~~ flames projecting from an opening in the external wall. ~~However,~~ Fire performance in these ~~such~~ tests ~~are by necessity a systems test and are~~ can be sensitive to ~~any~~ a small change in the system details. External wall c~~C~~ladding systems are complex and can include a multitude of combustible components. It is difficult to determine how each of those individual components contributes to the overall system performance to limit fire spread.

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s 9(2)(a) Is this the building sector or BCA sector?

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s 9(2)(a) AS/NZS 3837

s 9(2)(a) Does this mean bench scale tests are not pragmatic? What situations are the bench scale tests appropriate for?

It may therefore not always be possible to confidently evaluate the ~~complexity of the~~overall system performance for facades containing combustible components solely based on small scale fire testing of only the individual components.

s 9(2)(a) This sentence doesn't logically follow from the rest of the paragraph. We haven't described how the bench scale tests have been used.

s 9(2)(a) Added "bench scale testing of individual materials or components" in the 2nd line of this paragraph.

Questions from Industry

This guidance has been prepared to help address the questions from industry such as:

1. Are~~is there latitude to consider~~ alternative fire testing protocols acceptable ~~than~~ to those currently cited in ~~the compliance documents~~ an Acceptable Solution or Verification Method?
2. H~~h~~ow should the fire test ~~particular~~ criteria ~~for testing external fire spread are~~be applied to external wall cladding systems ~~when historically the focus was about the fire performance of individual components~~?~~.~~

Who is this guidance for?

This document is of interest to Fire Engineers, Architects, Ffacade Eengineers, Building Consent and Territorial Authorities, Testing Laboratories, Product M~~m~~anufacturers and Suppliers.

Disclaimer

[MBIE to add content.]

s 9(2)(a) MBIE Legal to provide input; potentially include same text as Alternative Solution Guidance; Legal to include reference to Section 175

2.0 What is ~~In~~ the ~~S~~scope of this guidance

This guidance is intended to:

- Make~~s~~ it clear ~~-~~what constitutes an external wall ~~-~~cladding system for testing external vertical fire spread and assessing performance against the New Zealand Building Code requirements.
- Describe~~s~~ the suite of fire testing protocols that could be applied to demonstrate compliance with the New Zealand Building Code.
- Scope~~s~~ the parameters that need to be considered when addressing external vertical fire spread.

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The guidance does not intend to provide a fire-engineered design solution for ~~each~~ individual construction details but covers broad principles requiring consideration in their development. Some of the principles are based on a simplistic~~fied~~ risk assessment approach.

~~**Cladding systems defined**~~

~~For the purpose of this guidance, cladding systems are classified into three broad categories:~~

~~1. **Conventional cladding system –** Cladding systems that present a low fire risk because they have limited cavities and are largely comprised of non-combustible~~

s 9(2)(a) My recommendation here is to delete this section since the 3. terms are not used later in the guidance anyway, and that I don't think it is necessary to exclude engineered facades systems from the scope, as that will provide a big out for someone. The solution for the high risk buildings given in this guidance either requires a large scale test or it requires limited combustible materials throughout. That would be as much as could be asked of an engineered façade system.

~~materials. Typically such systems would not require an assessment and can be readily observed to comply based on their composition e.g. concrete, steel, or glazing.~~

~~**2. Multi-layered cladding system –** comprised of many individual components and/or incorporating ventilated cavities.~~

~~3. **Engineered Facades –** these types of design, such as curtain walls, external thermal insulation composite systems (ETICS), ETFE, Expanded Polystyrene Systems (EPS) fall outside the criteria.~~

~~2.1 Exclusions~~

~~This guidance does not apply to:~~

- ~~Buildings with staged or phased evacuation~~
- ~~Buildings with evacuation to a place of relative safety within the building e.g. hospitals, care homes~~
- ~~Importance Level 4 Buildings~~
- ~~Specific design engineered facade and curtain wall systems~~

~~Consult early with the local Building Consent Authority to agree the fire testing evidence required for buildings with these defined characteristics.~~

s 9(2)(a) I am not sure why these should be excluded. Surely they can be tested to NFPA 285 or AS 5113.

s 9(2)(a) I don't see why these should fall outside – shouldn't the testing methods, particularly full-scale options be applicable for any system? In my thinking, the full-scale testing should equally be considered the reference test

s 9(2)(a) FENZ - Point 2 part 3
Does this clause mean that these types of systems are not covered by this guidance?

s 9(2)(a) This point also raised by SFPE+BRANZ.

s 9(2)(a) MBIE Legal to consider exclusions, their alignment with AS/VM and ref S175.

s 9(2)(a) I agree there is no need to exclude these buildings for the reasons in my comments above. Delete this section 2.1 and add the additional note under the matrix table in section 5 – however it can still be argued that this is going beyond what NZBC C3.5 requires.

s 9(2)(a) So where does this leave the design community? These are the high risk buildings that probably need the most guidance.

s 9(2)(a) As above – don't understand why there is the need for these exclusions Is there an element omitted here if a building with staged evacuation is acceptable – this addresses the life safety perhaps, but does not cater for the property protection requirement (3.5m spread)?.

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3.0 New Zealand Building Code Compliance Pathways

The New Zealand Building Code (NZBC) is performance based. Clause C of the Building Code describes the performance criteria for Protection from Fire. Clause C3 describes Functional and Performance Requirements for fire affecting areas beyond the fire source.

Functional Requirements - NZBC Clause C3	
C3.1	*Buildings* must be designed and constructed so that there is a low probability of injury or illness to persons not in close proximity to a *fire source*.
C3.2	*Buildings* with a *building height* greater than 10 m where upper floors contain sleeping uses or other property must be designed and constructed so that there is a low probability of external vertical fire spread to upper floors in the *building*.
C3.3	*Buildings* must be designed and constructed so that there is a low probability of *fire* spread to *other property* vertically or horizontally across a *relevant boundary*.

There are two Performance Clauses that describe the constraints for control of external vertical fire spread:

- Clause C3.5 – limiting the vertical spread of fire

- Clause C3.7 – covering the ignitability of wall cladding materials

Three pathways are available to demonstrate compliance with the Building Code Performance Requirements: Acceptable Solutions, Verification Methods and Alternative Solutions.

Note: CodeMark and Multiproof are alternative means for demonstrating compliance with the NZBC.

The following table outlines the Performance Requirements of the New Zealand Building Code and summarises the associated compliance pathways:

		New Zealand Building Code Clause – External Spread of Fire	
		C3.5	**C3.7**
		Buildings must be designed and constructed so that *fire* does not spread more than 3.5 m vertically from the *fire* source over the external cladding of multi-level *buildings*.	External walls of *buildings* that are located closer than 1 m to the *relevant boundary* of the property on which the *building* stands must either: (a) be constructed from materials which are not *combustible building material, or*	(b) for *buildings* in importance levels 3 and 4, be constructed from materials that, when subjected to a radiant flux of 30 kW/m^2, do not ignite for 30 minutes, or (c) for *buildings* in importance levels 1 and 2, be constructed from materials that, when subjected to a radiant flux of 30 kW/m^2, do not ignite for 15 minutes.
Compliance Pathway	**Acceptable Solutions**	The Acceptable Solutions (C/AS2 to C/AS7) contain three means of demonstrating compliance: 1. Fire properties of external wall cladding systems shall be determined in accordance with ISO 5660 Reaction-to-fire tests – Heat release, smoke production and mass loss rate – Part 1: Heat release rate (cone calorimeter method), or 2. External wall cladding systems which comprise only materials which individually are classified as non-combustible (exempting a 1mm combustible finish) may be deemed to satisfy all the requirements, or 3. The entire wall assembly has been tested at full scale in accordance with NFPA 285 and has passed the test criteria.	
	Verification Method	The Verification Method (C/VM2) contains four means of demonstrating compliance: 1. Fire properties of external wall cladding systems shall be determined in accordance with ISO 5660.1 or AS/NZS 3837, to criteria as tabulated, or 2. Use non-combustible materials, or 3. Comply with the Acceptable Solutions (for buildings with an importance level not higher than 3).	
		4a. Use large or medium scale facade type tests to determine the extent of vertical ~~flame~~ fire ~~test~~ spread is not more than 3.5 m above the fire source (C3.5). ~~(C3.5 only)~~	4b. Use bench scale fire tests (e.g. ISO 5660-1) to confirm that materials when exposed to 30 kW/m^2 do not ignite within the time period specified in C3.7.

s 9(2)(a) Is this defined anywhere –e.g. temperatures exceeding x deg, or pyrolised material. Also it would be good to have consistency of terms - there are some instances using fire others flame spread,

s 9(2)(a) In my world it would be useful to have this defined in terms of Cone testing at 30 kW/m2 is suitable….etc.

s 9(2)(a) This is addressed in section 5.2 below.

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s 9(2)(a) "spread" ??

	Alternative Solution	Provide an alternative solution proposal that justifies how the design of the building will not result in fire spread of more than 3.5 m vertically from the fire source over the external cladding of multi-level buildings. ~~Note: For the purpose of this guidance, fFire source means the head of an opening in the external wall from which flames are presumed to be projecting from. It differs from the definition given in Schedule 1 of the NZBC.~~	*Combustible building materials* is a defined term in the Building Regulations, and "means building materials that are deemed combustible according to AS 1530.1."	Provide an alternative solution proposal that justifies how either: (b) for buildings in importance levels 3 and 4, be constructed from materials that, when subjected to a radiant flux of 30 kW/m^2, do not ignite for 30 minutes, or (c) for buildings in importance levels 1 and 2, be constructed from materials that, when subjected to a radiant flux of 30 kW/m^2, do not ignite for 15 minutes.

4.0 Fire Test Methods for External Wall Cladding Systems

4.1 Fire Testing requirements for an external wall ~~building~~ cladding system

An external wall cladding system for demonstrating compliance with the NZ Building Code for Protection from Fire Performance Clauses C3.5 and C3.7 for external vertical fire spread ~~can be defined as: 'a cladding system can be considered to~~ includes all substantive components within the complete wall assembly (i.e. sheet cladding materials, framing, rigid air barrier, ~~and~~ any insulation or sheet materials or blanket and the internal lining)'. Where relevant, the direction of fire exposure to be considered is from the exterior side of the wall.

~~**Cladding System – Test Methods**~~

~~Substantive components of the wall (i.e. sheet cladding materials, framing, rigid air barrier and any insulation or polymeric sheet / blanket) within the wall shall:~~

~~(i) Comprise of only glass, concrete, steel, brick / block, ceramic tile or aluminium, or~~

~~(ii) Are classified as "non-combustible" when tested to AS 1530.1 or ISO 1182, or~~

~~(iii) Achieve a Euroclass A1 or A2 in accordance with EN 13501: 2007+A1:2009, or~~

~~(iv) Meet the requirements of NFPA 285: Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components, or~~

~~(v) Be tested to BS 8414 and assessed to the requirements of BRE 135 Fire performance of external thermal insulation for walls of multi-storey buildings" – 3rd edition 2013~~

Recommendations on the different fire testing options to evaluate the fire properties of an external wall cladding system are given in the risk matrix in Section 5.

s 9(2)(a): Not sure why this is here – could delete this cell?

s 9(2)(a): Since this is not really the point of this guidance, maybe delete this note rather open up the whole debate right here.

s 9(2)(a): Needs further discussion. What if there is no opening in the actual building?

s 9(2)(a): Consistent terminology would aid clarity. "External wall Cladding System"?

s 9(2)(a): I have tried to go through and edit to be consistent.

s 9(2)(a): Is the internal lining included as well.

s 9(2)(a): Good question, I think yes – what if the interior lining was ACP as well achieving Group 1, 2 meeting interior surface finish requirement, we couldn't ignore it as part of an external wall system.

s 9(2)(a): Relevance depends on the location of the material in the wall system, and the fire testing protocol proposed to be used.

s 9(2)(a): This is confusing and is it even required since we have the risk matrix table that comes later?

s 9(2)(a): I suggest we delete this – we have put our requirements in the risk matrix.

4.2 "BRE 135 Fire performance of external thermal insulation for walls of multi-storey buildings" – 3rd edition 2013

s 9(2)(a) This is a BRE document, its correct reference number is "BR 135", i.e. without the "E".

s 9(2)(a) Move this section 4.2 to follow section 4.3

s 9(2)(a) Agree

BRE 135: 2013 addresses the principles and design methodologies related to the fire -spread performance characteristics of non-loadbearing external cladding systems. Although various potential design solutions have been identified and discussed in BRE 135, robust design details are not presented. In this rapidly changing market generic solutions are not available where new products and novel design solutions are frequently presented. The illustrations and scenarios presented in BRE 135 are based on typical examples of current practice in the UK. To help designers and end users better understand the parameters impacting on the fire-safe design and construction of external cladding systems, BRE 135 focuses on the issues surrounding the topic of external vertical fire spread.

~~Note : BS 8414-2 and Annex B of the BRE 135 guide relate specifically to external cladding systems applied to steel-frame constructions.~~

~~Other construction systems such as concrete-frame or timber-frame constructions are not considered in this guidance. However, the general principles in the BRE 135 guide may still apply, although suitable additional risk assessments and detail design reviews would be required. The risk matrix approach provides an option for considering alternative forms of supporting wall frames.~~

BRE 135 Annex A provides a classification system for the test methodology outlined in BS 8414-1Fire performance of external cladding systems – Part 1: Test method for nonloadbearing external cladding systems applied to the face of the building.

BRE 135 Annex B provides a classification system for the test methodology outlined in BS 8414-2 Fire performance of external cladding systems – Part 2: Test method for non-loadbearing external cladding systems fixed to and supported by a structural steel frame.

Other construction systems such as concrete-framed or timber-framed constructions are not considered in this guidance. However, the general principles in the BRE 135 guide may still apply, although suitable additional risk assessments and detail design reviews would be required. The risk matrix ~~approach provides~~approach provides an option for considering alternative forms of supporting wall frames.

4.3 Alternative Test Methods to those currently cited

s 9(2)(a) FENZ - Is AS5113 acceptable and thus can be used as a test method?

s 9(2)(a) Yes, but it gives the acceptance criteria and classification and references the test method eg BS8414.

The New Zealand Building Code Protection from Fire Acceptable Solutions and Verification Method currently cite two fire tests for assessing the fire performance of cladding systems. These are, a bench scale independent component test (ISO 5660), and the intermediate-scale system test NFPA 285. This guidance broadens the suite of test protocols to include the British Standard BS 8414 with the acceptance criteria provided by BR135.

~~The British Standard test, with compliance interpretation provided by BRE 135:~~

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BS 8414-1:2015 Fire performance of external cladding systems. Test method for non-loadbearing external cladding systems applied to the masonry face of a building. Amended by BS 8414-1:2015+A1:2017 (June 2017).

BS 8414-2:2015 Fire performance of external cladding systems. Test method for non-loadbearing external cladding systems fixed to and supported by a structural steel frame. Amended by BS 8414-2:2015+A1:2017 (June 2017).

BR~~E~~ 135 Fire performance of external thermal insulation for walls of multi-storey buildings: (BR~~E~~ 135) Third edition, BR~~E~~ (15 March 2013).

It ~~may~~ is also ~~be~~ acceptable to test cladding systems using the methods outlined in the Australian Standard AS 5113 to meet the 'EW' classification. This classification standard in turn references~~-~~ BS 8414 as a test method.~~Refer to the risk matrix section of this guidance for specific details.~~

It is also acceptable to test components within cladding systems using the methods outlined in EN 13501: 2007+A1:2009 to meet a Euroclass A1 or A2 classification.

s 9(2)(a) Does this mean that the likes of Alucobond FRA2 and Alubond A2 could be used as part of a wall, on the basis of the remaining components also meeting the test criteria?

Refer to the risk matrix in Section 5 ~~section of this guidance~~ for guidance on ~~for specific details.~~where the different test methods ~~should~~may be used.

s 9(2)(a) Ok with this as it is based on ISO 1182 (non-combustibility) testing, therefore limited combustibility at most.

4.4 What is specifically excluded from external wall cladding systems for the purpose of fire compliance with C3.5 and C3.7?

For the purposes of ~~defining~~ an external wall cladding system as defined in section 4.1 of this guidance and for demonstrating compliance with the NZ Building Code for Protection from Fire, substantive components may exclude:

s 9(2)(a) Proposed to be deleted.

- Signage and Billboards – aggregated area up to 25m^2
- Video screens ~~<~~up to 6m^2
- ~~Greenwalls –~~Greenwalls – the acceptance of Green and living walls will be dependent on the type of system proposed, its support structure and the associated management and maintenance/irrigation procedures. Generally plants growing on metallic support systems (such as stainless steel wires) will not present an increased fire hazard provided they are adequately maintained. Other systems that include combustible support systems should be proven via fire test evidence to support compliance.
- For more information on Ggreenwalls ~~see~~refer:

ANS Living Walls receive a Fire Safety Standard

Fire Performance of Green Roofs and Walls

- Sunscreens / Sunshades / louvres up to ~~<~~6m^2 or any area if non-combustible
- Any materials used ~~to~~ as part of the external wall cladding system for the t~~T~~opmost floor ~~when the building height is more than 10 m and~~provided ~~when~~ the roof does not require a fire resistance rating. (Other requirements to prevent horizontal fire spread to other property may still apply eg. limits on unprotected area and/or the ignitability of the wall cladding when located within 1m of the relevant boundary – see section 5.2)~~ignitability of the cladding given an exposure from a fire in a neighbouring building.)~~
- Door sets and window frames are not included with the cladding requirements
- Sealants and tapes comprising < 5% of the wall area
- A c~~C~~anopy or balcony at ground floor level of buildings that exceed 10m in height can be excluded from the requirements where it can be shown or is agreed that a fire is unlikely to ~~would not~~ spread from the area to the main external wall ~~building~~ cladding
- Minor trim and gutters, downpipes and facias. Limited amounts of materials are excluded from the requirements where it can be shown or is agreed that a fire involving the ~~product~~ materials is unlikely to ~~would not~~ spread fire to the remaining parts of the ~~building~~ external wall cladding or where they are remote from the main building cladding.
- Individual components on or within the wall assembly that are non-combustible but include a surface coating not more than 1mm thick. ~~applied directly to a non-combustible substrate.~~

Note: the above exclusions are only relevant to each component when taken in isolation. Consideration needs to be given when the above items are ~~considered~~ combined as part of a whole system ~~and when one item may impact the performance of another~~ to determine the contribution of each component to the overall performance of the cladding system. For example, a video screen meeting the size limitations ~~must be~~ attached to a non-combustible facade ~~but~~ would require further consideration and might not be appropriate if attached to a combustible ~~external wall system~~ sunscreen system.

4.5 In-Wall Cavities

Continuous vertical channels and cavities within external wall cladding systems are known to promote upward vertical fire spread. Fire researchers have noted that when flames are confined within a vertical cavity or channel they elongate, leading to flame extension of up to five to ten times the expected unconfined flame lengths. This is true even in cavities without additional combustible materials present, but is made worse by the presence of combustible materials. This flame extension effect can support rapid, potentially unseen, fire spread within an external cladding system and must be limited.

s 9(2)(a) FENZ - FENZ -Top floors of buildings required to comply with horizontal fire spread to protect neighbours property.

s 9(2)(a) Is this bit needed?

•Small quantities of sealants and tapes

s 9(2)(a) or as otherwise agreed?

s 9(2)(a) or as otherwise agreed?

s 9(2)(a) - Do these systems need full scale fire tests or not?

s 9(2)(a) FENZ Any part of a fire rated system to stop vertical fire spread (wood blocking et al) should meet the maximum L or P rating and not just 30 minutes

The provision of ~~C~~cavity barriers ~~are important~~ within external wall cladding systems are important and ~~are~~ particularly ~~important~~ when combustible cladding, Rigid Air Barriers (RAB) and insulation products are used.

s 9(2)(a) Unfortunately they are probably least effective when the other materials are combustible.

Cavity barriers based on fire resisting construction tested to AS1530.4 or similar and satisfying integrity and insulation ratings for at least 30 minutes are likely to provide an~~be~~ acceptable means of controlling flame spread within cavities. However, additional consideration is needed to ensure that cavity barriers within a façade system have adequate support and can in remain in place for the period required, and provide the required level of fire resistance rating where located at the junction of fire separations and the external wall assembly.

s 9(2)(a) I'm not sure we have all the answers right now, so perhaps adding this paragraph and deleting the following two paragraphs might be a better approach for now.

Examples of other test standards that may be used for curtain wall systems, such as ANSI/ASTM E2307, "Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus", or BS EN 1364-4:2014 "Fire resistance tests for non-loadbearing elements", may be acceptable.

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~~Intumescing products and fire resistantfire resistant barriers are required to maintain a minimum 30 minute fire resistance rating [-/30/30] as demonstrated in a fire resistance test.~~

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~~Solid timber blocking could be an appropriate cavity barrier if there is evidence to support a maintained integrity and insulation rating for a minimum 30 minute30 minute duration.~~

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s 9(2)(a) I agree with the principle, but not sure if testing in AS 1530.4 proves the desired performance. In an example scenario where the outer cladding is say aluminium or perhaps a fibre cement type product, under direct flame impingement these products may melt back or break away leaving the intumescent barrier with nothing to expand against to seal off the cavity. Applies to both horizontal and vertical barriers.

s 9(2)(a) I'd expect this to pass the BR 135 criteria (fire spread within 15 mins), however this is unlikely to permit drainage.

s 9(2)(a) Should we delete this sentence.?

5.0 External cladding system vertical fire spread - risk assessment approach

A simplified risk assessment approach has been developed to ~~identify the~~identify the level of complexity and fire risk for the building ~~for assessment~~for the purpose of identifying suitable fire test protocols for~~of~~ the contribution of the cladding system ~~to for~~ external vertical spread of fire ~~spread~~. The parameters considered are:

- Building Height
- Vulnerability of Risk Group
- Provision of an automatic fire sprinkler system to the requirements of NZS 4541 (~~NZ Building Code modified NZS4541 sprinkler systems~~as modified by the NZBC)

How to use this table – find the risk level L, M or H applying to the building based on the building height and risk group. Refer to the table key to determine the fire testing protocol options considered acceptable for the applicable risk level.

Table 1. External Wall Cladding System – Risk Matrix for Fire Testing Protocols

Building Height	Sleeping Use* Risk groups SM, SI		Non-Sleeping Use* Risk groups CA, WB, WS, VP	
	Sprinkler protected	Non-sprinkler protected	Sprinkler protected	Non-sprinkler protected
Single ~~storey building~~level	L	L	L	L
0 ~~≤~~ 10 m ~~(typically 2 to 3~~ and up to 2 ~~floor~~ levels~~)~~	L	L	L	L
> 10 m ≤ 25 m ~~(typically 4 to 8 floor levels)~~	M †	H	M	M
> 25 m and ≤ 60 m	H	~~H~~ n/a	M	~~H~~n/a
> 60 m	H	~~H~~ n/a	H	~~H~~n/a

~~*Excludes – staged evacuation, phased evacuation, evacuation to a place of relative safety within the building, Importance Level 4 Buildings~~

* For a building height ≤ 10 m, cladding systems used for Importance Level 4 buildings or multi-floor buildings incorporating staged evacuation, phased evacuation, or evacuation to a place of relative safety within the building should meet the requirements for M or H given below.

† Where a NZS 4515 residential sprinkler system is installed then the non-sprinkler risk level in column 3 should be used instead.

Where risk levels L, M and H are matched to fire testing protocols P1 to P5 as follows:

s 9(2)(a) FENZ - Table 5 Not sure what this table conveys, as goes from low to high risk for non-sprinklered building under 25m. Unlike Australia we do not have a combined sprinkler system such as installed at La Crosse in Melbourne. Thus in NZ only design for 6 heads thus very likely, in the event of an external façade fire, the residential sprinkler system will be overwhelmed resulting in fire spread internally and thus likely to lose whole building.

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s 9(2)(a) So, likely to be a residential sprinkler system not ie. 4516 4541 – scope of C3.5 still governs.

s 9(2)(a) This could be a residential sprinkler system NZS 4515 – so the non-sprinklered protocol should apply.

s 9(2)(a) 4515 is up to 3 levels only.

s 9(2)(a) If these buildings characteristics are moved outside the scope of this guidance, then for building height <10m, the engineer only needs to point to NZBC C3.5 and say nothing required.

Our guidance for building height above 10m requires M or H.

s 9(2)(a) agree

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L	**Low**	No requirement for building height < 10 m (NZ Building Code Performance Clause C3.5).
M	**Medium**	~~P1.~~ All cladding and Rigid Air Barriers (RABs) used in the external wall construction may be individually tested using ISO 5660-1 to meet requirements in C/AS Section 5.8. Insulation products†, and filler materials (not including gaskets, sealants etc) to be limited combustibility *. All external wall cavities need to be fire stopped using cavity barriers at each floor level and at the junctions to other vertical fire separations. P1. ACP materials must be tested without Aluminium (metal) facing as per C/AS 7.1.5. Any of options P2~~1~~ P5~~4~~ below are also acceptable.
H	**High**	P2. External wall cladding system ~~to~~ may meet the performance criteria given in BR~~E~~ 135 for cladding systems using full scale test data from BS 8414-1:2002 or BS 8414-2: 2005; or P3. External wall cladding system ~~to~~ may pass the NPFA 285 full scale test; or P4. External wall cladding system may~~to~~ meet 'EW' classification in AS ~~5113; or~~5113; or ~~P5.~~ All cladding, framing**, insulation products**~~†~~, RAB and filler materials (not including gaskets, sealants etc) used in the external wall construction ~~to~~ may be of *limited combustibility~~combustible~~*. ~~P6.~~P5. If vapour barriers, drainage mats, building wraps or similar are not of *limited combustibility~~limited combustibility~~* * then all external wall cavities need to be fire stopped using cavity fire barriers at each floor level.

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s 9(2)(a) Shouldn't this apply equally to prevent horizontal spread across intertenancy walls ?

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s 9(2)(a) Fibre cement RAB over steel framing with EPS insulation would appear to comply however the fibre cement is likely to fail early and expose the EPS or the EPS will melt and run out the cracks. Refer to s 9(2)(advice on what risks the insurers are willing to accept when EPS is present (none).

s 9(2)(a) Edited to require such insulation to be protected with a fire-resistant board.

~~‡ This does not apply to combustible insulation products encapsulated within a conventional timber-frame assembly on the interior-facing side of a solid RAB.~~

* *Limited combustibility* means the product/material meets one or more of the following criteria:

1. A1 or A2 classification in accordance with EN 13501-1:2007+A1:2009.
2. Non-combustible or not combustible when tested to AS1530.1 or ISO 1182.
3. Concrete, brick/block masonry, stone, glass, ceramic tiles, aluminium and steel with or without paint or similar thin surface coatings not exceeding 1 mm thickness.

s 9(2)(a) Copper, brass? Just say metal?

s 9(2)(a) Reference to not exceeding 1 mm thick??

s 9(2)(a) C/ASx 5.8.2

** Timber framing (or combustible insulation products within a framed wall assembly) may be used if a robust protective lining material (being of *limited* *combustibility*~~*combustibility*~~) is fixed to the exterior side of the framing ~~and that~~and can be demonstrated to remain in place and protect the ~~timber~~ framing during the period of external fire exposure. ~~The term~~ 'P~~p~~rotect ~~timber~~ framing' can be assumed to be achieved if the protective lining material as part of a light timber frame wall exposed to the test conditions of AS1530.4 can be shown to prevent charring of the timber frame for a period of 30 minutes. One way to determine this is to limit the temperature on the cavity side of the fire-exposed protective lining material during the test period to be no greater than 300°C ~~Centigrade~~.

s 9(2)(a) EPS insulation in this type of wall assembly melts at 100 degree's and runs out the cracks to ignite.

s 9(2)(a) Shouldn't be significant cracks … for a fire resistant board … for an external fire scenario. ???

s 9(2)(a) – if the board is adequate at protecting the studs from charring for 30 minutes, then should contain EPS OK.

s 9(2)(a) Is this easy enough to obtain data for?

5.1 Use of combustible RAB

A combustible Rigid Air Barrier (RAB) e.g. plywood, may be used for any building if it has been included as part of a representative external wall subjected to a full-scale fire test and meeting the criteria in given P2-P4 in the risk matrix.

5.2 External Walls of any height located within 1 m of a relevant boundary.

To limit potential horizontal fire spread to and from a neighbouring property, the exterior cladding material (~~and or with~~including a representative substrate if that cladding material is less than 50 mm thick) shall either be of limited combustibility~~ble~~ or be tested using ISO 5660-1 to meet the requirements in ~~the relevant~~ C/ASx Section 5.8. NOTE: This is not a vertical fire spread provision and needs to be considered in addition to the requirements of Table 1.

s 9(2)(a) The "Type A" cladding in C/ASx does not comply with the building code already, it is a relaxation from non-combustible, ref NZBC 3.7 a) "be constructed from materials which are not *combustible building material*" *Combustible building materials* is a defined term in the Building Regulations, and "means building materials that are deemed combustible according to AS 1530.1."

It is also acceptable for the exterior cladding material to be tested using ISO 5660-1 using an external irradiance of 30 kW/m^2 and not ignite within the period of time given in NZBC C3.7.

5.3 Technical Assessment in Lieu of Test

Cladding products and systems range in nature and complexity. There are also a range of base wall assemblies that may impact upon how the outer weather facing part of a cladding system product will perform. Examples include:

- Exterior insulation finish systems (EIFS)
- High Pressure Laminates (HPL)

- External thermal insulation composite systems (ETICS)
- Rain screen Cladding
- Structural insulation panel systems (SIPS)
- Expanded Polystyrene Systems (EPS)
- Timber cladding

Key system performance considerations which must be considered in a technical assessment are:

- Combustibility of insulation
- Combustibility of framing (e.g. timber frame)
- Composition of rigid air barrier
- Building underlay
- Uninterrupted vertical cavity
- Continuity of products

In order for an external wall cladding system to be certified for fire safety performance, it needs to be constructed to replicate the details of the test. This includes for example, framings, substrate, flashing details, gaskets, sealants and fixing mechanisms.

~~It is valid to present a~~A technical assessment may be presented as part of the ~~evidence~~ plans and specifications to demonstrate compliance with the performance ~~based~~ requirements of the Building Code. Situations may arise where the proposed cladding system installation differs slightly from the absolute details of that ~~endorsed by the fire testing certificate~~described in a fire test report. A technical assessment from an ~~certified~~ accredited testing laboratory or from a subject matter expert with knowledge and experience in fire science and fire testing is required.

s 9(2)(a) This should have some definition as it will be open to interpretation. Will someone with CPEng in fire be a suitable benchmark.

s 9(2)(a) Should be defined

s 9(2)(a) Don't think CPEng in fire would be sufficient

s 9(2)(a) FENZ -A recent determination published by MBIE concerned the application of technical assessments. In summary an assessment by a fire engineer as part of a building consent was challenged by the BCA. The determination process referred to an expert independent fire test scientist that found the assessment by the fire engineer was flawed and upheld the BCA's refusal to issue a BC. Thus any guidance from MBIE should be inline with the conclusions of this determination and therefore only assessments from reputable testing agencies should be considered acceptable.

6.0 Documentation and Evidence for Building Consent

When considering ~~documentation~~ an application for a building consent the Building Consent Authority (BCA) needs to be satisfied on reasonable grounds that the provisions of the building code would be met if the building work were properly completed in accordance with the plans and specifications that accompanied the application. ~~that the building when constructed will meet the requirements of the New Zealand Building Code and therefore the intent of the Building Act.~~

The BCA needs evidence of which compliance pathway you are using to show how the building cladding system meets the performance requirements of the Building Code and evidence to show how it can be constructed to comply.

BCAs may wish to consider the following when assessing ~~building~~ external wall cladding systems case-by-case:

- the extent of combustible products used on the building (i.e. is it a feature or the entire cladding?)

- the building use (occupancy type)
- the active (e.g. alarms and sprinklers) and passive (e.g. firewalls and smoke compartments) fire protection systems throughout the building
- the system tested by the manufacturer or supplier and whether its use is consistent with this (and if not, are the changes likely to negatively affect the building's fire performance?)
- the quality and accuracy of the Building Consent documentation and detailing in relation to external wall assemblies (i.e. can the cladding system be constructed from the information that has been provided?)
- the height and proximity of the building to other buildings
- the use of plastics (e.g. polyethylene core aluminium composite panel); the content of the specific product and its use
- if the design has been reviewed / peer reviewed by a fire engineer~~?~~

7.0 Useful Resources & References

1. New Zealand Building Code
2. Wade, C.A., (1995), BRANZ, Report Number 133, *Fire Performance of External Wall Claddings under a Performance Based Building Code*.
3. National Fire Protection Association (NFPA) 285, Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components
4. AS 5113 Fire propagation testing and classification of external walls of buildings.
5. ISO 5660 Reaction-to-fire tests Part 1 Heat release rate (cone calorimeter method)~~, and Part 2 Smoke production rate (dynamic method)~~
6. EN ISO 1182: 2010. Fire Test f~~F~~or Non-Combustibility o~~O~~f Building Products
7. AS 1530.1 Methods for fire tests on building materials and structures Part 1: Combustibility test for materials.
8. Lamont, S. & Ingolfsson, S. (2018) *High rise Buildings with Combustible Exterior Wall Assemblies: Fire Risk Assessment Tool*, NFPA, USA.
9. White N. and Delichatsios M., (2014) Fire Hazards of Exterior Wall Assemblies Containing Combustible Components, Fire Protection Research Foundation Report (EP142293).
10. BS 8414-1 & 2:2015+A1:2017 Fire performance of external cladding systems. Test method for non-loadbearing external cladding systems applied to the masonry face of a building.
11. BRE 135: 2013 Fire performance of external thermal insulation for walls of multi-storey buildings: (BRE 135) Third edition.
12. EN 13501-1:2007+A1:2009.

s 9(2)(a) The correct reference should be to BR 135.

8.0 Useful Definitions

Cladding The exterior weather-resistant surface of a *building*.
COMMENT: Includes any supporting substrate and, if applicable, surface treatment.

Cladding system
The outside or exterior weather-resistant surface of a *building*; including *roof cladding* and *roof underlays*, *wall* cladding and *wall underlays*, and cavity components, rooflights, windows, doors and all penetrations, *flashings*, seals, joints and junctions. Where required by the Acceptable Solution, the *cladding* system shall include a *drained cavity*.

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Cavity wall
A term used to describe a wall that incorporates a *drained cavity*.

Drained cavity
A cavity space, immediately behind a wall *cladding*, that has vents at the base of the wall. Also known as a drained and vented cavity and referred to in the NZBC E2 Acceptable Solution as a cavity or *drained cavity*. A *drained cavity* assists drying by allowing water which occasionally penetrates the wall *cladding system* to drain to the exterior of the *building*, and any remaining moisture to dry by evaporation. Where the Acceptable Solution requires a nominal 20 mm *drained cavity*, the depth shall be between limits of 18 mm and 25 mm. For definition of masonry veneer cavity refer to SNZ HB 4236.

External wall
Any vertical exterior face of a *building* consisting of *primary* and/or *secondary elements* intended to provide protection against the outdoor environment.

Fire Performance of External Wall Cladding Systems

DRAFT FOR COMMENT – IN CONFIDENCE

1.0 Introduction

Various high-rise fire events globally have provided evidence of potential outcomes of fire spreading externally and within modern façade construction. This evidence has prompted a review of the existing methods used to demonstrate compliance of external wall cladding systems with building regulation fire safety objectives. There have also been questions as to how New Zealand requirements should be interpreted and whether alternative fire test and evaluation methods available internationally are suitable for use in New Zealand.

MBIE has developed this guidance on how external wall cladding systems be tested to determine their fire performance. This information will help industry to demonstrate compliance with the requirements of the New Zealand Building Code (NZBC), considering the overall risks associated with the building use, risk profile of its occupants, the building height and other fire safety systems in the building.

Fire testing protocols: individual components versus cladding systems

Since 2001 fire testing protocols used for building code compliance in New Zealand have been based on either bench scale testing of individual materials or components using AS/NZS 3837 (or more recently ISO 5660) or the larger-scale NFPA 285 facade test.

Bench scale fire tests have typically been used in New Zealand for cladding in a way that treats fire spread over the external wall as a surface flame spread phenomena (similar to interior linings). However, it is apparent that in many cases, it is the entire system performance that must be considered and not only that of the outermost cladding material.

Large scale fire tests are a way of assessing how an external wall cladding system performs when exposed to flames projecting from an opening in the external wall. Fire performance in these tests can be sensitive to a small change in the system details. External wall cladding systems are complex and can include a multitude of combustible components. It is difficult to determine how each of those individual components contributes to the overall system performance to limit fire spread.

It may therefore not always be possible to confidently evaluate the overall system performance for facades containing combustible components solely based on small scale fire testing of only the individual components.

Questions from Industry

This guidance has been prepared to help address the questions from industry such as:

1. Are alternative fire testing protocols acceptable to those currently cited in an Acceptable Solution or Verification Method?
2. How should the fire test criteria be applied to external wall cladding systems?

Who is this guidance for?

This document is of interest to Fire Engineers, Architects, Facade Engineers, Building Consent and Territorial Authorities, Testing Laboratories, Product Manufacturers and Suppliers.

Disclaimer

[MBIE to add content.]

2.0 What is the scope of this guidance

This guidance is intended to:

- Make it clear what constitutes an external wall cladding system for testing external vertical fire spread and assessing performance against the New Zealand Building Code requirements.
- Describe the suite of fire testing protocols that could be applied to demonstrate compliance with the New Zealand Building Code.
- Scope the parameters that need to be considered when addressing external vertical fire spread.

The guidance does not intend to provide a fire-engineered design solution for individual construction details but covers broad principles requiring consideration in their development. Some of the principles are based on a simplistic risk assessment approach.

3.0 New Zealand Building Code Compliance Pathways

The New Zealand Building Code (NZBC) is performance based. Clause C of the Building Code describes the performance criteria for Protection from Fire. Clause C3 describes Functional and Performance Requirements for fire affecting areas beyond the fire source.

Functional Requirements - NZBC Clause C3	
C3.1	*Buildings* must be designed and constructed so that there is a low probability of injury or illness to persons not in close proximity to a *fire source*.
C3.2	*Buildings* with a *building height* greater than 10 m where upper floors contain sleeping uses or other property must be designed and constructed so that there is a low probability of external vertical fire spread to upper floors in the *building*.
C3.3	*Buildings* must be designed and constructed so that there is a low probability of *fire* spread to *other property* vertically or horizontally across a *relevant boundary*.

There are two Performance Clauses that describe the constraints for control of external vertical fire spread:

- Clause C3.5 – limiting the vertical spread of fire
- Clause C3.7 – covering the ignitability of wall cladding materials

Three pathways are available to demonstrate compliance with the Building Code Performance Requirements: Acceptable Solutions, Verification Methods and Alternative Solutions.

Note: CodeMark and Multiproof are alternative means for demonstrating compliance with the NZBC.

The following table outlines the Performance Requirements of the New Zealand Building Code and summarises the associated compliance pathways:

<table>
<tr><td colspan="2"></td><td colspan="3">New Zealand Building Code Clause – External Spread of Fire</td></tr>
<tr><td colspan="2"></td><td>C3.5</td><td colspan="2">C3.7</td></tr>
<tr><td colspan="2"></td><td>Buildings must be designed and constructed so that fire does not spread more than 3.5 m vertically from the fire source over the external cladding of multi-level buildings.</td><td>External walls of buildings that are located closer than 1 m to the relevant boundary of the property on which the building stands must either:

(a) be constructed from materials which are not combustible building material, or</td><td>(b) for buildings in importance levels 3 and 4, be constructed from materials that, when subjected to a radiant flux of 30 kW/m^2, do not ignite for 30 minutes, or
(c) for buildings in importance levels 1 and 2, be constructed from materials that, when subjected to a radiant flux of 30 kW/m^2, do not ignite for 15 minutes.</td></tr>
<tr><td rowspan="3">Compliance Pathway</td><td>Acceptable Solutions</td><td colspan="3">The Acceptable Solutions (C/AS2 to C/AS7) contain three means of demonstrating compliance:

1. Fire properties of external wall cladding systems shall be determined in accordance with ISO 5660 Reaction-to-fire tests – Heat release, smoke production and mass loss rate – Part 1: Heat release rate (cone calorimeter method), or
2. External wall cladding systems which comprise only materials which individually are classified as non-combustible (exempting a 1mm combustible finish) may be deemed to satisfy all the requirements, or
3. The entire wall assembly has been tested at full scale in accordance with NFPA 285 and has passed the test criteria.</td></tr>
<tr><td rowspan="2">Verification Method</td><td colspan="3">The Verification Method (C/VM2) contains four means of demonstrating compliance:

1. Fire properties of external wall cladding systems shall be determined in accordance with ISO 5660.1 or AS/NZS 3837, to criteria as tabulated, or
2. Use non-combustible materials, or
3. Comply with the Acceptable Solutions (for buildings with an importance level not higher than 3).</td></tr>
<tr><td>4a. Use large or medium scale facade type tests to determine the extent of vertical fire spread is not more than 3.5 m above the fire source (C3.5).</td><td colspan="2"></td></tr>
</table>

	Alternative Solution	Provide an alternative solution proposal that justifies how the design of the building will not result in fire spread of more than 3.5 m vertically from the fire source over the external cladding of multi-level buildings.	Use non-combustible materials. *Combustible building materials* is a defined term in the Building Regulations, and "means building materials that are deemed combustible according to AS 1530.1."	Provide an alternative solution proposal that justifies how either: (b) for buildings in importance levels 3 and 4, be constructed from materials that, when subjected to a radiant flux of 30 kW/m^2, do not ignite for 30 minutes, or (c) for buildings in importance levels 1 and 2, be constructed from materials that, when subjected to a radiant flux of 30 kW/m^2, do not ignite for 15 minutes. The above can be achieved by the use of bench scale fire tests (e.g. ISO 5660-1) to confirm that materials when exposed to 30 kW/m^2 do not ignite within the specified time period.

4.0 Fire Test Methods for External Wall Cladding Systems

4.1 Fire Testing requirements for an external wall cladding system

An external wall cladding system for demonstrating compliance with the NZ Building Code for Protection from Fire Performance Clauses C3.5 and C3.7 for external vertical fire spread includes all substantive components within the complete wall assembly (i.e. sheet cladding materials, framing, rigid air barrier, any insulation or sheet materials or blanket and the internal lining)'. Where relevant, the direction of fire exposure to be considered is from the exterior side of the wall.

Recommendations on the different fire testing options to evaluate the fire properties of an external wall cladding system are given in the risk matrix in Section 5.

4.2 "BR 135 Fire performance of external thermal insulation for walls of multi-storey buildings" – 3rd edition 2013

BR 135: 2013 addresses the principles and design methodologies related to the fire spread performance characteristics of non-loadbearing external cladding systems. Although various potential design solutions have been identified and discussed in BR 135, robust design details are not presented. In this rapidly changing market generic solutions are not available where new products and novel design solutions are frequently presented. The illustrations and scenarios presented in BR 135 are based on typical examples of current practice in the UK. To help designers and end users better understand the parameters impacting on the fire-safe design and construction of external cladding systems, BR 135 focuses on the issues surrounding the topic of external vertical fire spread.

BR 135 Annex A provides a classification system for the test methodology outlined in BS 8414-1Fire performance of external cladding systems – Part 1: Test method for nonloadbearing external cladding systems applied to the face of the building.

BR 135 Annex B provides a classification system for the test methodology outlined in BS 8414-2 Fire performance of external cladding systems – Part 2: Test method for non-loadbearing external cladding systems fixed to and supported by a structural steel frame.

Other construction systems such as concrete-framed or timber-framed construction are not considered in this guidance. However, the general principles in the BR 135 guide may still apply, although suitable additional risk assessments and detail design reviews would be required. The risk matrix approach provides an option for considering alternative forms of supporting wall frames.

4.3 Alternative Test Methods to those currently cited

The New Zealand Building Code Protection from Fire Acceptable Solutions and Verification Method currently cite two fire tests for assessing the fire performance of cladding systems. These are, a bench scale independent component test (ISO 5660), and the intermediate-scale system test NFPA 285. This guidance broadens the suite of test protocols to include the British Standard BS 8414 with the acceptance criteria provided by BR 135.

> BS 8414-1:2015 Fire performance of external cladding systems. Test method for non-loadbearing external cladding systems applied to the masonry face of a building. Amended by BS 8414-1:2015+A1:2017 (June 2017).
>
> BS 8414-2:2015 Fire performance of external cladding systems. Test method for non-loadbearing external cladding systems fixed to and supported by a structural steel frame. Amended by BS 8414-2:2015+A1:2017 (June 2017).
>
> BR 135 Fire performance of external thermal insulation for walls of multi-storey buildings: (BR 135) Third edition, BRE (15 March 2013).

It is also acceptable to test cladding systems using the methods outlined in the Australian Standard AS 5113 to meet the 'EW' classification. This classification standard in turn references BS 8414 as a test method.

It is also acceptable to test components within cladding systems using the methods outlined in EN 13501: 2007+A1:2009 to meet a Euroclass A1 or A2 classification.

Refer to the risk matrix in Section 5 for guidance on where the different test methods may be used.

4.4 What is specifically excluded from external wall cladding systems for the purpose of fire compliance with C3.5 and C3.7?

For the purposes of an external wall cladding system as defined in section 4.1 of this guidance and for demonstrating compliance with the NZ Building Code for Protection from Fire, substantive components may exclude:

- Signage and Billboards – aggregated area up to $25m^2$
- Video screens up to $6m^2$
- Greenwalls – the acceptance of Green and living walls will be dependent on the type of system proposed, its support structure and the associated management and maintenance/irrigation procedures. Generally plants growing on metallic support systems (such as stainless steel wires) will not present an increased fire hazard provided they are adequately maintained. Other systems that include combustible support systems should be proven via fire test evidence to support compliance. For more information on Greenwalls refer:

  ANS Living Walls receive a Fire Safety Standard

  Fire Performance of Green Roofs and Walls

- Sunscreens / Sunshades / louvres up to $6m^2$ or any area if non-combustible
- Any materials used as part of the external wall cladding system for the topmost floor provided the roof does not require a fire resistance rating. (Other requirements to prevent horizontal fire spread to other property may still apply eg. limits on unprotected area and/or the ignitability of the wall cladding when located within 1m of the relevant boundary – see section 5.2)
- Door sets and window frames are not included with the cladding requirements
- Sealants and tapes comprising < 5% of the wall area
- A canopy or balcony at ground floor level of buildings that exceed 10m in height can be excluded from the requirements where it can be shown or is agreed that a fire is unlikely to spread from the area to the main external wall cladding
- Minor trim and gutters, downpipes and facias. Limited amounts of materials are excluded from the requirements where it can be shown or is agreed that a fire involving the materials is unlikely to spread fire to the remaining parts of the external wall cladding or where they are remote from the main building cladding.
- Individual components on or within the wall assembly that are non-combustible but include a surface coating not more than 1mm thick.

Note: the above exclusions are only relevant to each component when taken in isolation. Consideration needs to be given when the above items are combined as part of a whole system to determine the contribution of each component to the overall performance of the cladding system. For example, a video screen meeting the size limitations attached to a non-combustible facade would require further consideration and might not be appropriate if attached to a combustible sunscreen system.

4.5 In-Wall Cavities

Continuous vertical channels and cavities within external wall cladding systems are known to promote upward vertical fire spread. Fire researchers have noted that when flames are confined within a vertical cavity or channel they elongate, leading to flame extension of up to five to ten times the expected unconfined flame lengths. This is true even in cavities without additional combustible materials present, but is made worse by the presence of combustible materials. This flame extension effect can support rapid, potentially unseen, fire spread within an external cladding system and must be limited.

The provision of cavity barriers within external wall cladding systems are important and particularly when combustible cladding, Rigid Air Barriers (RAB) and insulation products are used.

Cavity barriers based on fire resisting construction tested to AS 1530.4 or similar and satisfying integrity and insulation ratings for at least 30 minutes are likely to provide an acceptable means of controlling flame spread within cavities. However, additional consideration is needed to ensure that cavity barriers within a façade system have adequate support and can in remain in place for the period required, and provide the required level of fire resistance rating where located at the junction of fire separations and the external wall assembly.

Examples of other test standards that may be used for curtain wall systems, such as ANSI/ASTM E2307, "Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus", or BS EN 1364-4:2014 “Fire resistance tests for non-loadbearing elements”, may be acceptable.

5.0 External cladding system vertical fire spread - risk assessment approach

A simplified risk assessment approach has been developed to identify the level of complexity and fire risk for the building for the purpose of identifying suitable fire test protocols for the contribution of the cladding system to external vertical spread of fire. The parameters considered are:

- Building Height
- Vulnerability of Risk Group
- Provision of an automatic fire sprinkler system to the requirements of NZS 4541 (as modified by the NZBC)

How to use this table – find the risk level L, M or H applying to the building based on the building height and risk group. Refer to the table key to determine the fire testing protocol options considered acceptable for the applicable risk level.

Table 1. External Wall Cladding System – Risk Matrix for Fire Testing Protocols

Building Height	Sleeping Use* Risk groups SM, SI		Non-Sleeping Use* Risk groups CA, WB, WS, VP	
	Sprinkler protected	Non-sprinkler protected	Sprinkler protected	Non-sprinkler protected
Single level	L	L	L	L
0-10 m and up to 2 levels	L	L	L	L
> 10 m ≤ 25 m	M †	H	M	M
> 25 m and ≤ 60 m	H	n/a	M	n/a
> 60 m	H	n/a	H	n/a

* For a building height ≤ 10 m, cladding systems used for Importance Level 4 buildings or multi-floor buildings incorporating staged evacuation, phased evacuation, or evacuation to a place of relative safety within the building should meet the requirements for M or H given below.

† Where a NZS 4515 residential sprinkler system is installed then the non-sprinkler risk level in column 3 should be used instead.

Where risk levels L, M and H are matched to fire testing protocols P1 to P5 as follows:

L	**Low**	No requirement for building height < 10 m (NZ Building Code Performance Clause C3.5).

M	**Medium**	P1. All cladding and Rigid Air Barriers (RABs) used in the external wall construction may be individually tested using ISO 5660-1 to meet requirements in C/AS2 to C/AS7 Section 5.8. Insulation products, and filler materials (not including gaskets, sealants etc) to be limited combustibility*. All external wall cavities need to be fire stopped using cavity barriers at each floor level and at the junctions to other vertical fire separations. ACP materials must be tested without Aluminium (metal) facing as per C/AS2 to C/AS7 Appendix C7.1.5. Any of options P2-P5 below are also acceptable.
H	**High**	P2. External wall cladding system may meet the performance criteria given in BR 135 for cladding systems using full scale test data from BS 8414-1:2002 or BS 8414-2: 2005; or P3. External wall cladding system may pass the NPFA 285 full scale test; or P4. External wall cladding system may meet 'EW' classification in AS 5113; or P5. All cladding, framing**, insulation products**, RAB and filler materials (not including gaskets, sealants etc) used in the external wall construction may be of *limited combustibility**. If vapour barriers, drainage mats, building wraps or similar are not of *limited combustibility** then all external wall cavities need to be fire stopped using cavity fire barriers at each floor level.

* *Limited combustibility* means the product/material meets one or more of the following criteria:

1. A1 or A2 classification in accordance with EN 13501-1:2007+A1:2009.
2. Non-combustible or not combustible when tested to AS 1530.1 or ISO 1182.
3. Concrete, brick/block masonry, stone, glass, ceramic tiles, aluminium and steel with or without paint or similar thin surface coatings not exceeding 1 mm thickness.

** Timber framing (or combustible insulation products within a framed wall assembly) may be used if a robust protective lining material (being of *limited combustibility*) is fixed to the exterior side of the framing and can be demonstrated to remain in place and protect the framing during the period of external fire exposure. 'Protect framing' can be assumed to be achieved if the protective lining material as part of a light timber frame wall exposed to the test conditions of AS 1530.4 can be shown to prevent charring of the timber frame for a period of 30 minutes. One way to determine this is to limit the temperature on the cavity

side of the fire-exposed protective lining material during the test period to be no greater than 300°C.

5.1 Use of combustible RAB

A combustible Rigid Air Barrier (RAB) e.g. plywood, may be used for any building if it has been included as part of a representative external wall subjected to a full-scale fire test and meeting the criteria in given P2-P4 in the risk matrix.

5.2 External Walls of any height located within 1 m of a relevant boundary.

To limit potential horizontal fire spread to and from a neighbouring property, the exterior cladding material (including a representative substrate if that cladding material is less than 50 mm thick) shall either be of limited combustibility or be tested using ISO 5660-1 to meet the requirements in C/AS2 to C/AS7 Section 5.8. NOTE: This is not a vertical fire spread provision and needs to be considered in addition to the requirements of Table 1.

It is also acceptable for the exterior cladding material to be tested using ISO 5660-1 using an external irradiance of 30 kW/m^2 and not ignite within the period of time given in NZBC C3.7.

5.3 Technical Assessment in Lieu of Test

Cladding products and systems range in nature and complexity. There are also a range of base wall assemblies that may impact upon how the outer weather facing part of a cladding system product will perform. Examples include:

- Exterior insulation finish systems (EIFS)
- High Pressure Laminates (HPL)
- External thermal insulation composite systems (ETICS)
- Rain screen Cladding
- Structural insulation panel systems (SIPS)
- Expanded Polystyrene Systems (EPS)
- Timber cladding

Key system performance considerations which must be considered in a technical assessment are:

- Combustibility of insulation
- Combustibility of framing (e.g. timber frame)
- Composition of rigid air barrier
- Building underlay
- Uninterrupted vertical cavity
- Continuity of products

In order for an external wall cladding system to be certified for fire safety performance, it needs to be constructed to replicate the details of the test. This includes for example, framings, substrate, flashing details, gaskets, sealants and fixing mechanisms.

A technical assessment may be presented as part of the plans and specifications to demonstrate compliance with the performance requirements of the Building Code. Situations may arise where the proposed cladding system installation differs slightly from the absolute details of that described in a fire test report. A technical assessment from an accredited testing laboratory or from a subject matter expert with knowledge and experience in fire science and fire testing is required.

6.0 Documentation and Evidence for Building Consent

When considering an application for a building consent the Building Consent Authority (BCA) needs to be satisfied on reasonable grounds that the provisions of the building code would be met if the building work were properly completed in accordance with the plans and specifications that accompanied the application.

The BCA needs evidence of which compliance pathway you are using to show how the building cladding system meets the performance requirements of the Building Code and evidence to show how it can be constructed to comply.

BCAs may wish to consider the following when assessing external wall cladding systems case-by-case:

- the extent of combustible products used on the building (i.e. is it a feature or the entire cladding?)
- the building use (occupancy type)
- the active (e.g. alarms and sprinklers) and passive (e.g. firewalls and smoke compartments) fire protection systems throughout the building
- the system tested by the manufacturer or supplier and whether its use is consistent with this (and if not, are the changes likely to negatively affect the building's fire performance?)
- the quality and accuracy of the Building Consent documentation and detailing in relation to external wall assemblies (i.e. can the cladding system be constructed from the information that has been provided?)
- the height and proximity of the building to other buildings
- the use of plastics (e.g. polyethylene core aluminium composite panel); the content of the specific product and its use
- if the design has been reviewed / peer reviewed by a fire engineer

7.0 Useful Resources & References

1. New Zealand Building Code
2. Wade, C.A., (1995), BRANZ, Report Number 133, *Fire Performance of External Wall Claddings under a Performance Based Building Code*.

3. National Fire Protection Association (NFPA) 285, Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components
4. AS 5113 Fire propagation testing and classification of external walls of buildings.
5. ISO 5660 Reaction-to-fire tests Part 1 Heat release rate (cone calorimeter method).
6. EN ISO 1182: 2010. Fire Test for Non-Combustibility of Building Products
7. AS 1530.1 Methods for fire tests on building materials and structures Part 1: Combustibility test for materials.
8. Lamont, S. & Ingolfsson, S. (2018) *High rise Buildings with Combustible Exterior Wall Assemblies: Fire Risk Assessment Tool*, NFPA, USA.
9. White N. and Delichatsios M., (2014) Fire Hazards of Exterior Wall Assemblies Containing Combustible Components, Fire Protection Research Foundation Report (EP142293).
10. BS 8414-1 & 2:2015+A1:2017 Fire performance of external cladding systems. Test method for non-loadbearing external cladding systems applied to the masonry face of a building.
11. BR 135: 2013 Fire performance of external thermal insulation for walls of multi-storey buildings: (BR 135) Third edition.
12. EN 13501-1:2007+A1:2009.

Outside of Scope

From: Antony Walker <antony@cognition.nz>
Sent: Thursday, 6 December 2018 9:16 a.m.
To: Peter Whiting; Ed Claridge; Colleen Wade; Antony Walker
Cc: Jenni Tipler
Subject: RE: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Thanks,

Completed as attached.

Regards, Antony.

From: Peter Whiting <Peter.Whiting@branz.co.nz>
Sent: Thursday, 6 December 2018 8:29 AM
To: Ed Claridge <ed.claridge@aucklandcouncil.govt.nz>; Colleen Wade <Colleen.Wade@branz.co.nz>; Antony Walker <antxxx@xxxxxxxxx.xx>; Antony Walker <Antony.Walker@mbie.govt.nz>
Cc: Jenni Tipler <Jenni.Tipler@mbie.govt.nz>
Subject: RE: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Thanks, happy with that.

Cheers
Peter

Peter Whiting
Senior Fire Engineer/Fire Testing Team Leader

1222 Moonshine Road, RD1, Porirua 5381, New Zealand
Private Bag 50 908, Porirua 5240, New Zealand
s 9(2)(a)
Email: Peter.Whiting@branz.co.nz | Website: branz.nz

Inspiring the industry to provide better buildings

From: Ed Claridge <ed.claridge@aucklandcouncil.govt.nz>
Sent: Wednesday, 5 December 2018 10:55 PM
To: Colleen Wade <Colleen.Wade@branz.co.nz>; Antony Walker <antony@cognition.nz>; Antony Walker <Antony.Walker@mbie.govt.nz>; Peter Whiting <Peter.Whiting@branz.co.nz>
Cc: Jenni Tipler <Jenni.Tipler@mbie.govt.nz>
Subject: Re: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Thanks Colleen, That clarifies it for me.

Regards
Ed Claridge | Principal Fire Engineer
s 9(2)(a)
Auckland Council, 35 Graham Street, Auckland

-------- Original message --------
From: Colleen Wade <Colleen.Wade@branz.co.nz>
Date: 5/12/18 9:47 PM (GMT+12:00)
To: Antony Walker <antony@cognition.nz>, Ed Claridge <ed.claridge@aucklandcouncil.govt.nz>, Antony Walker <Antony.Walker@mbie.govt.nz>, Peter Whiting <Peter.Whiting@branz.co.nz>
Cc: Jenni Tipler <Jenni.Tipler@mbie.govt.nz>
Subject: RE: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Hi, sorry coming late to the party.

Re: 5.2 – there may be some misunderstanding about what was meant here. When referring to a representative substrate it meant that the ISO 5660-1 test would be done by having the cladding mounted over a representative substrate in the test (up 50 mm thick – because that is the max depth of sample accommodated in the test). It wasn't supposed to mean that the cladding and the substrate be separately tested to meet the requirement. The characteristics of the substrate can affect a test result particularly for a thin substrate. Alternatively there could be an air gap directly behind the outermost cladding and it might be then tested like that.

> "To limit potential horizontal fire spread to and from a neighbouring property, the exterior cladding material (including a representative substrate if that cladding material is less than 50 mm thick) shall either be of limited combustibility or be tested using ISO 5660-1 to meet the requirements in C/AS2 to C/AS7 Section 5.8. NOTE: This is not a vertical fire spread provision and needs to be considered in addition to the requirements of Table 1."

In any case, timber cladding would not be permitted within 1 m of the boundary (my understanding is this has always been the case), but fibre cement cladding for example fixed to a timber frame wall would be acceptable. The following alternative wording would express this more clearly. The need for a two-way fire rating is a separate matter not related to this guidance.

> "To limit potential horizontal fire spread to and from a neighbouring property, the exterior cladding material shall either be of limited combustibility or be tested using ISO 5660-1 to meet the requirements in C/AS2 to C/AS7 Section 5.8. The test specimen shall comprise the cladding material mounted over a representative substrate if the cladding material is less than 50 mm thick. NOTE: This is not a vertical fire spread provision and needs to be considered in addition to the requirements of Table 1."

For external walls of non-sleeping buildings 10-25 m high but within 1 m of the boundary, assuming the 'M' level, this could have timber framing (and timber cavity battens) but the cladding material and RAB would need to meet C/AS Para 5.8 and the insulation would need to be limited combustible.

Colleen

Colleen Wade
Senior Fire Research Scientist

1222 Moonshine Road, RD1, Porirua 5381, New Zealand
Private Bag 50 908, Porirua 5240, New Zealand
s 9(2)(a)
Email: Colleen.Wade@branz.nz | Website: branz.nz

From: Antony Walker <antony@cognition.nz>
Sent: Wednesday, 5 December 2018 2:28 PM
To: Ed Claridge <ed.claridge@aucklandcouncil.govt.nz>; Colleen Wade <Colleen.Wade@branz.co.nz>; Antony Walker <Antony.Walker@mbie.govt.nz>; Peter Whiting <Peter.Whiting@branz.co.nz>
Cc: Jenni Tipler <Jenni.Tipler@mbie.govt.nz>
Subject: RE: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Thanks Ed,

5.2, that's interesting… WCC certainly won't permit timber cladding within a meter of the boundary from my experience…

4.4, yes, attachments to control sun or rain, they could be stand-along architectural features, but I get your point about the use of façade here, so propose to change the last sentence of 4.4 to:

For example, a video screen meeting the size limitations attached to a non-combustible cladding would require further consideration and might not be appropriate if attached to a combustible sunscreen or rainscreen system.

Thanks for the references, they have been included.

Any last comments? If not, then I've attached what will be the final draft.

Regards,

Antony Walker
PRINCIPAL
Cognition Limited

antony@cognition.nz
s 9(2)(a)

From: Ed Claridge <ed.claridge@aucklandcouncil.govt.nz>
Sent: Wednesday, 5 December 2018 1:25 PM
To: Antony Walker <anxxxx@xxxxxxxxx.xx>; Colleen Wade <Colleen.Wade@branz.co.nz>; Antony Walker <Antony.Walker@mbie.govt.nz>; Peter Whiting <Peter.Whiting@branz.co.nz>
Cc: Jenni Tipler <Jenni.Tipler@mbie.govt.nz>
Subject: RE: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Hi Anthony,

Just to follow up with yours and Colleens comments and close them out from my perspective.

- Agree and accept the wording regarding the video screen query I raised below.
- Section 5.2 – the point I raised below and Anthony's response. I agree but this may (will) be controversial so prepare for the implications when these are realised by the BCA's (none of them, even though we are talking about it) that are currently enforcing this clause like this.

- Section 4.4 and “sunscreen”. I assume that we are talking about attachments for sun shading of buildings. So typically we see timber fins, and other ‘attachments’ provided for solar shading. The sentence appears to be talking about the cladding proper and so might just be better worded to say ‘cladding’ to avoid confusion.
- Need to include in the references - ANSI/ASTM E2307, "Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus", and BS EN 1364-4:2014 “Fire resistance tests for non-loadbearing elements” if we are inlcuding them in the main text.

Otherwise I am happy with this so far.

Ngā mihi

Ed Claridge | Principal Fire Engineer
s 9(2)(a)
Auckland Council, 35 Graham Street, Auckland
Visit our website: www.aucklandcouncil.govt.nz

From: Antony Walker [mailto:antony@cognition.nz]
Sent: Wednesday, 5 December 2018 1:14 PM
To: Colleen Wade <Colleen.Wade@branz.co.nz>; Ed Claridge <ed.claridge@aucklandcouncil.govt.nz>; Antony Walker <Antony.Walker@mbie.govt.nz>; Peter Whiting <Peter.Whiting@branz.co.nz>
Cc: Jenni Tipler <Jenni.Tipler@mbie.govt.nz>
Subject: RE: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Thanks for your comments Colleen and Ed.

I’ve updated nearly all of them, and can send the final for your records once we resolve these ones:

I think the only item outstanding is the discussion around part 5.2. Both the current C/AS1 and the new C/AS2 (and C/AS2 to C/AS6 for the matter) require a Type A cladding when within 1m of the boundary (and also for the external wall to achieve a two-way FRR. So yes, timber is excluded when within 1m of the boundary. If we remove the representative sample when the cladding is less than 50 mm thick, then we are only requiring the cladding material to be tested, and not the cladding system (including the battens, water resistive barrier, RAB, tapes sealant etc etc…) So do we not need to leave the content in paragraph in?

Also the use of façade is fairly limited, and generally relates to areas where the discussion revolves around the outer-most skin (or uses the terminology relevant to “façade tests”), so is OK?

Regards,

Antony Walker
PRINCIPAL
Cognition Limited

antony@cognition.nz
s 9(2)(a)

From: Colleen Wade <Colleen.Wade@branz.co.nz>
Sent: Tuesday, 4 December 2018 5:01 PM

To: Ed Claridge <ed.claridge@aucklandcouncil.govt.nz>; Antony Walker <anxxxx@xxxxxxxxx.xx>; Antony Walker <Antony.Walker@mbie.govt.nz>; Peter Whiting <Peter.Whiting@branz.co.nz>
Cc: Jenni Tipler <Jenni.Tipler@mbie.govt.nz>
Subject: RE: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Hi all, see attached with some very minor edits. Also the comments in red below.

Regards, Colleen

Colleen Wade
Senior Fire Research Scientist

1222 Moonshine Road, RD1, Porirua 5381, New Zealand
Private Bag 50 908, Porirua 5240, New Zealand
| s 9(2)(a)
Email: Colleen.Wade@xx.nz | Website: branz.nz

Inspiring the industry to provide better buildings for New Zealanders

From: Ed Claridge <ed.claridge@aucklandcouncil.govt.nz>
Sent: Tuesday, 4 December 2018 4:33 PM
To: Antony Walker <anxxxx@xxxxxxxxx.xx>; Colleen Wade <Colleen.Wade@branz.co.nz>; Antony Walker <Antony.Walker@mbie.govt.nz>; Peter Whiting <Peter.Whiting@branz.co.nz>
Cc: Jenni Tipler <Jenni.Tipler@mbie.govt.nz>
Subject: RE: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Hi All,

Its looking really good. I have a couple of minor comments:

- We use the terms facade and cladding interchangeably. Is that an issue, do we or should we just stick with one term i.e. cladding and cladding system? I don't mind.
- Page 4 . space missing between "…BS 8414-1 Fire…" last sentence
- Comma after the word "Generally, plants…" page 6, 3rd bullet
- Use of eg. Rather than e.g. page 6, 5th bullet
- Last sentence page 6. Should this read that video screen NOT meeting the size limitations requires further consideration…?

I think it is saying that a video screen that is under the size limit is fine on a non-combustible wall, but might not be if the wall was also combustible – so existing wording is okay?

- Section 5.2. I am happy with this but I am conscious that this does not sit well (perhaps contradicts it) with the 2nd table options for compliance on page 3. Also does this infer that timber construction cannot be used on low rise buildings, i.e. houses within 1m of the boundary? This has been a problem for a while, but is this for example confirming that you cannot use timber frame construction for houses on the boundary? Or is it simply only requiring this for the cladding material and the substrate (what is that), ignoring other major components such as framing and cavity batters etc. I think here we just need to be careful about what we mean by 'substrate' in this context given that we are excluding everything else. Substrate means different things to different people. Would for example a James hardie system comply when built close to the boundary - i.e. - JHETGJ30 I think the intent here is to consider only the potential for the cladding material to ignite. Substrate is only mentioned in the context of testing as it can affect time to ignition if the cladding material is quite thin. So, brick veneer on timber frame is fine, or fibre-cement should be okay too. Perhaps would be better to delete the bit in brackets ie. (including a representative substrate if that cladding material is less than 50 mm thick), and let the test lab specify the conditions under which it is tested. ?

- Section 6. I don't think we want to define what a fire engineer is here. However, a review by a fire engineer is very loose. Perhaps we say reviewed by a suitably qualified and experienced person to try and make the point here.

Regards

Ed Claridge | Principal Fire Engineer
s 9(2)(a)
Auckland Council, 35 Graham Street, Auckland
Visit our website: www.aucklandcouncil.govt.nz

From: Antony Walker [mailto:antony@cognition.nz]
Sent: Tuesday, 4 December 2018 2:06 PM
To: Ed Claridge <ed.claridge@aucklandcouncil.govt.nz>; Colleen Wade <Colleen.Wade@branz.co.nz>; Jenni Tipler <Jenni.Tipler@mbie.govt.nz>; Antony Walker <Antony.Walker@mbie.govt.nz>
Cc: Peter Whiting <Peter.Whiting@branz.co.nz>
Subject: RE: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Hi All,

As discussed please find attached the "final" version of the track changes document, and a clean version.

If there are any more comments can you please make them on the clean version, I've just gone through it and done a wee tidy up on formatting and deleting content that still showed up as "strike-through".

Thank you all for your time so far, hopefully you'll have time for one quick final review!

Regards,

Antony Walker
PRINCIPAL
Cognition Limited

antony@cognition.nz
s 9(2)(a)

-----Original Appointment-----
From: Antony Walker
Sent: Friday, 30 November 2018 5:28 PM
To: Antony Walker; Ed Claridge; Colleen Wade; Jenni Tipler; Antony Walker
Cc: Peter Whiting
Subject: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]
When: Tuesday, 4 December 2018 11:30 AM-12:30 PM (UTC+12:00) Auckland, Wellington.
Where: Skype Meeting

Hi guys,

I've set this up as a Skype meeting (link below) so that we can look over the document if needed (Jenni there were no VC rooms available at MBIE, so I'll be doing this from home).

If you think we can just do this by phone let me know and I'll sort a dial in at MBIE.

Regards, Antony.

.....

→ Join Skype Meeting

Trouble Joining? Try Skype Web App

Help

.....

_____

From: Ed Claridge [mailto:ed.claridge@aucklandcouncil.govt.nz]
Sent: Friday, 30 November 2018 4:00 PM
To: Antony Walker <anxxxx@xxxxxxxxx.xx>; Colleen Wade <Colleen.Wade@branz.co.nz>; Jenni Tipler <Jenni.Tipler@mbie.govt.nz>; Antony Walker <Antony.Walker@mbie.govt.nz>
Subject: RE: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Yes lets make it 11:30.

Regards

Ed Claridge | Principal Fire Engineer
s 9(2)(a)
Auckland Council, 35 Graham Street, Auckland
Visit our website: www.aucklandcouncil.govt.nz

From: Antony Walker [mailto:antony@cognition.nz]
Sent: Friday, 30 November 2018 3:57 PM
To: Ed Claridge <ed.claridge@aucklandcouncil.govt.nz>; Colleen Wade <Colleen.Wade@branz.co.nz>; Jenni Tipler <Jenni.Tipler@mbie.govt.nz>; Antony Walker <Antony.Walker@mbie.govt.nz>
Subject: RE: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Thanks Ed,

Shall we lock in 11 (or 11:30 to be safe?) this Tuesday.

I doubt there will be anything contentious arising if we were to discuss the NFPA test that is coming up, but just so you know I was contracted to MBIE to review the 6 Certmark ACP certificates and Peer Review the Enright report…

Regards,

Antony Walker
PRINCIPAL
Cognition Limited

<< OLE Object: Picture (Device Independent Bitmap) >>

antony@cognition.nz
s 9(2)(a)

From: Ed Claridge [mailto:ed.claridge@aucklandcouncil.govt.nz]
Sent: Friday, 30 November 2018 2:27 PM
To: Antony Walker <anxxxx@xxxxxxxxx.xx>; Colleen Wade <Colleen.Wade@branz.co.nz>; Jenni Tipler <Jenni.Tipler@mbie.govt.nz>; Antony Walker <Antony.Walker@mbie.govt.nz>
Subject: RE: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Hi Anthony,

Tuesday works for me, just not between 10-11. Coincidently I'll be discussing a proposed NFPA 285 test taking place in January on one the ACP systems.

Regards

Ed Claridge | Principal Fire Engineer
s 9(2)(a)
Auckland Council, 35 Graham Street, Auckland
Visit our website: www.aucklandcouncil.govt.nz

From: Antony Walker [mailto:antony@cognition.nz]
Sent: Friday, 30 November 2018 1:48 PM
To: Colleen Wade <Colleen.Wade@branz.co.nz>; Ed Claridge <ed.claridge@aucklandcouncil.govt.nz>; Jenni Tipler <Jenni.Tipler@mbie.govt.nz>; Antony Walker <Antony.Walker@mbie.govt.nz>
Subject: RE: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Thanks Colleen,

That's awesome! I will have a look through yours (I'd already started to sort some minor edits as well), and we can sort out any remaining issues, hopefully Tuesday 10am if that suits Ed.

Cheers, Antony.

From: Colleen Wade [mailto:Colleen.Wxxx@xxxxx.xx.xx]
Sent: Friday, 30 November 2018 1:41 PM
To: Antony Walker <anxxxx@xxxxxxxxx.xx>; Ed Claridge <ed.claridge@aucklandcouncil.govt.nz>; Jenni Tipler <Jenni.Tipler@mbie.govt.nz>; Antony Walker <Antony.Walker@mbie.govt.nz>
Subject: RE: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Hi again,

Further to my email yesterday, I have attached two documents.

1. The draft guidance as sent for comment but with lots of track changes and margin comments included from SFPE, FENZ, BRANZ.

2. A cleaner version with only a few comments left in and most of the tracked changes taken out. I have probably taken too many liberties with this version but you can pull me back as appropriate. I'm conscious of the very limited time we have and the need to get something useful published.

Regards, Colleen

Colleen Wade
Senior Fire Research Scientist

<< OLE Object: Picture (Device Independent Bitmap) >>

1222 Moonshine Road, RD1, Porirua 5381, New Zealand
Private Bag 50 908, Porirua 5240, New Zealand
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Email: Colleen.Wade@branz.co.nz | Website: branz.nz

From: Colleen Wade
Sent: Friday, 30 November 2018 11:26 AM
To: Antony Walker <anxxxx@xxxxxxxxx.xx>; Ed Claridge <ed.claridge@aucklandcouncil.govt.nz>; Jenni Tipler <Jenni.Tipler@mbie.govt.nz>; Antony Walker <Antony.Walker@mbie.govt.nz>
Subject: RE: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Hi , I can do 10-1 on Tuesday, and second choice would be Wednesday 10-11.30.
I also notice that Peter Whiting seems to have been dropped from this group, does he need to be added back in?

Regards, Colleen

From: Antony Walker <antony@cognition.nz>
Sent: Friday, 30 November 2018 11:18 AM
To: Ed Claridge <ed.claridge@aucklandcouncil.govt.nz>; Jenni Tipler <Jenni.xxxxxx@xxxx.xxxx.xx >; Antony Walker <Antony.Walker@mbie.govt.nz>; Colleen Wade <Colleen.Wade@branz.co.nz>
Subject: RE: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Hey everyone,

How about Tuesday sometime between 10 and 2pm, if that suits I can book a VC room (hopefully, on Monday) and we can go over the issues to hopefully resolve them all?

If not alternate day Wednesday same time slot.

Regards,

Antony Walker
PRINCIPAL
Cognition Limited

<< OLE Object: Picture (Device Independent Bitmap) >>

antony@cognition.nz
s 9(2)(a)

From: Ed Claridge [mailto:ed.claridge@aucklandcouncil.govt.nz]
Sent: Friday, 30 November 2018 9:18 AM
To: Jenni Tipler <Jenni.Tipler@mbie.govt.nz>; Antony Walker <Antony.Walker@mbie.govt.nz>; Antony Walker <antony@cognition.nz>; Colleen Wade <Colleen.Wadx@xxxxx.xx.nz >
Subject: RE: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Thanks Jenni,

I am happy to catch up as soon as possible to get this resolved so please just throw out some times that suit.

Regards

Ed Claridge | Principal Fire Engineer
s 9(2)(a)
Auckland Council, 35 Graham Street, Auckland
Visit our website: www.aucklandcouncil.govt.nz

From: Jenni Tipler [mailto:Jenni.Tipler@mbie.govt.nz]
Sent: Friday, 30 November 2018 9:14 AM
To: Antony Walker <Antony.Walker@mbie.govt.nz>; Antony Walker <antony@cognition.nz>; Colleen Wade <Colleen.Wadx@xxxxx.xx.nz >; Ed Claridge <ed.claridge@aucklandcouncil.govt.nz>
Subject: FW: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Good morning all,

I've now received comments back from Simon Davis – see below. It would be great if you could arrange a time early next week to go over the comments together agree on the final content – I'll leave it to Antony to arrange a time that suits.

In order to get this published before Christmas, the content needs to be ready by next Thursday (Dec 6) so it can go through the MBIE approvals process for release.

Kind regards,

Jenni

From: Davis, Simon [mailto:Simon.Davis@fireandemergency.nz]
Sent: Friday, 30 November 2018 9:05 a.m.
To: Jenni Tipler
Subject: FW: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Hi Jenni

Sorry wasn't able to return your call yesterday.
We have read the proposed guidance and did have a few comments.
I am out of the office today but happy to answer any questions next week.

Point 2 part 3
Does this clause mean that these types of systems are not covered by this guidance?

Point 4.3
Is AS5113 acceptable and thus can be used as a test method?

Point 4.4

Top floors of buildings required to comply with horizontal fire spread to protect neighbours property.

Point 4.5
Any part of a fire rated system to stop vertical fire spread (wood blocking et al) should meet the maximum L or P rating and not just 30 minutes

Table 5
Not sure what this table conveys, as goes from low to high risk for non-sprinklered building under 25m.
Unlike Australia we do not have a combined sprinkler system such as installed at La Crosse in Melbourne. Thus in NZ only design for 6 heads thus very likely, in the event of an external façade fire, the residential sprinkler system will be overwhelmed resulting in fire spread internally and thus likely to lose whole building.

Point 5.3

A recent determination published by MBIE concerned the application of technical assessments. In summary an assessment by a fire engineer as part of a building consent was challenged by the BCA. The determination process referred to an expert independent fire test scientist that found the assessment by the fire engineer was flawed and upheld the BCA's refusal to issue a BC. Thus any guidance from MBIE should be inline with the conclusions of this determination and therefore only assessments from reputable testing agencies should be considered acceptable.

Regards

Simon Davis
B.E.(mech), M.Bld.Sc(dist), M.E. (fire engineering)
Fire Engineering Manager
<< OLE Object: Picture (Device Independent Bitmap) >>
s 9(2)(a)

Email: simon.davis@fireandemergency.nz
National Headquarters, 2 Poynton Terrace, Newton, Auckland
PO Box 68 444, Auckland 1145

From: Jenni Tipler <jenni.tipler@mbie.govt.nz>
Sent: Monday, November 26, 2018 4:44 PM
To: Davis, Simon; Hermouet, Etienne; Saunders, Rob
Cc: Antony Walker
Subject: Fire performance of cladding systems - draft for review [IN-CONFIDENCE:RELEASE EXTERNAL]

Good afternoon,

My name is Jenni Tipler and I'm currently the acting team leader for engineering filling in after Dave McGuigan's departure from MBIE. Further to Christine's email last month, please can you confirm whether FENZ has additional comments on the draft 'Fire performance of cladding systems' guidance document?

Please feel free to give me a call if you'd like to discuss.

Kind regards,

Jenni Tipler
BA/BE (Hons), MSc (EU), Engineer Degree (USA), CPEng, CMEngNZ

ACTING TEAM LEADER ENGINEERING

Building System Performance
Ministry of Business, Innovation & Employment
jenni.tipler@mbie.govt.nz
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Level 5, 15 Stout Street, Wellington, New Zealand

<< OLE Object: Picture (Device Independent Bitmap) >>

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image002.png (11.1KB)
image003.jpg (4.8KB)
DRAFT Guidance for Cladding Systems for comment 06.12.18 - Clean.docx (52.5KB)

(71.0KB)
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Fire Performance of External Wall Cladding Systems

DRAFT FOR COMMENT – IN CONFIDENCE

1.0 Introduction

Various high-rise fire events globally have provided evidence of potential outcomes of fire spreading externally and within modern façade construction. This evidence has prompted a review of the existing methods used to demonstrate compliance of external wall cladding systems with building regulation fire safety objectives. There have also been questions as to how New Zealand requirements should be interpreted and whether alternative fire test and evaluation methods available internationally are suitable for use in New Zealand.

MBIE has developed this guidance on how external wall cladding systems be tested to determine their fire performance. This information will help industry to demonstrate compliance with the requirements of the New Zealand Building Code (NZBC), considering the overall risks associated with the building use, risk profile of its occupants, the building height and other fire safety systems in the building.

Fire testing protocols: individual components versus cladding systems

Since 2001 fire testing protocols used for building code compliance in New Zealand have been based on either bench scale testing of individual materials or components using AS/NZS 3837 (or more recently ISO 5660) or the larger-scale NFPA 285 facade test.

Bench scale fire tests have typically been used in New Zealand for cladding in a way that treats fire spread over the external wall as a surface flame spread phenomena (similar to interior linings). However, it is apparent that in many cases, it is the entire system performance that must be considered and not only that of the outermost cladding material.

Large scale fire tests are a way of assessing how an external wall cladding system performs when exposed to flames projecting from an opening in the external wall. Fire performance in these tests can be sensitive to a small change in the system details. External wall cladding systems are complex and can include a multitude of combustible components. It is difficult to determine how each of those individual components contributes to the overall system performance to limit fire spread.

It may therefore not always be possible to confidently evaluate the overall system performance for facades containing combustible components solely based on small scale fire testing of only the individual components.

Questions from Industry

This guidance has been prepared to help address the questions from industry such as:

1. Are alternative fire testing protocols acceptable to those currently cited in an Acceptable Solution or Verification Method?
2. How should the fire test criteria be applied to external wall cladding systems?

Who is this guidance for?

This document is of interest to Fire Engineers, Architects, Facade Engineers, Building Consent and Territorial Authorities, Testing Laboratories, Product Manufacturers and Suppliers.

Disclaimer

[MBIE to add legal content.]

2.0 What is the scope of this guidance

This guidance is intended to:

- Make it clear what constitutes an external wall cladding system for testing external vertical fire spread and assessing performance against the New Zealand Building Code requirements.
- Describe the suite of fire testing protocols that could be applied to demonstrate compliance with the New Zealand Building Code.
- Scope the parameters that need to be considered when addressing external vertical fire spread.

The guidance does not intend to provide a fire-engineered design solution for individual construction details but covers broad principles requiring consideration in their development. Some of the principles are based on a simplistic risk assessment approach.

3.0 New Zealand Building Code Compliance Pathways

The New Zealand Building Code (NZBC) is performance based. Clause C of the Building Code describes the performance criteria for Protection from Fire. Clause C3 describes Functional and Performance Requirements for fire affecting areas beyond the fire source.

Functional Requirements - NZBC Clause C3	
C3.1	*Buildings* must be designed and constructed so that there is a low probability of injury or illness to persons not in close proximity to a *fire source*.
C3.2	*Buildings* with a *building height* greater than 10 m where upper floors contain sleeping uses or other property must be designed and constructed so that there is a low probability of external vertical fire spread to upper floors in the *building*.
C3.3	*Buildings* must be designed and constructed so that there is a low probability of *fire* spread to *other property* vertically or horizontally across a *relevant boundary*.

There are two Performance Clauses that describe the constraints for control of external vertical fire spread:

- Clause C3.5 – limiting the vertical spread of fire
- Clause C3.7 – covering the ignitability of wall cladding materials

Three pathways are available to demonstrate compliance with the Building Code Performance Requirements: Acceptable Solutions, Verification Methods and Alternative Solutions.

> Note: CodeMark and Multiproof are alternative means for demonstrating compliance with the NZBC.

The following table outlines the Performance Requirements of the New Zealand Building Code and summarises the associated compliance pathways:

<table>
<tr><td colspan="2"></td><td colspan="3">New Zealand Building Code Clause – External Spread of Fire</td></tr>
<tr><td colspan="2"></td><td>C3.5</td><td colspan="2">C3.7</td></tr>
<tr><td colspan="2"></td><td>Buildings must be designed and constructed so that fire does not spread more than 3.5 m vertically from the fire source over the external cladding of multi-level buildings.</td><td>External walls of buildings that are located closer than 1 m to the relevant boundary of the property on which the building stands must either:

(a) be constructed from materials which are not combustible building material, or</td><td>(b) for buildings in importance levels 3 and 4, be constructed from materials that, when subjected to a radiant flux of 30 kW/m^2, do not ignite for 30 minutes, or
(c) for buildings in importance levels 1 and 2, be constructed from materials that, when subjected to a radiant flux of 30 kW/m^2, do not ignite for 15 minutes.</td></tr>
<tr><td rowspan="3">Compliance Pathway</td><td>Acceptable Solutions</td><td colspan="3">The Acceptable Solutions (C/AS2 to C/AS7) contain three means of demonstrating compliance:

1. Fire properties of external wall cladding systems shall be determined in accordance with ISO 5660 Reaction-to-fire tests – Heat release, smoke production and mass loss rate – Part 1: Heat release rate (cone calorimeter method), or
2. External wall cladding systems which comprise only materials which individually are classified as non-combustible (exempting a 1mm combustible finish) may be deemed to satisfy all the requirements, or
3. The entire wall assembly has been tested at full scale in accordance with NFPA 285 and has passed the test criteria.</td></tr>
<tr><td rowspan="2">Verification Method</td><td colspan="3">The Verification Method (C/VM2) contains four means of demonstrating compliance:

1. Fire properties of external wall cladding systems shall be determined in accordance with ISO 5660.1 or AS/NZS 3837, to criteria as tabulated, or
2. Use non-combustible materials, or
3. Comply with the Acceptable Solutions (for buildings with an importance level not higher than 3).</td></tr>
<tr><td>4a. Use large or medium scale facade type tests to determine the extent of vertical fire spread is not more than 3.5 m above the fire source (C3.5).</td><td colspan="2"></td></tr>
</table>

	Alternative Solution	Provide an alternative solution proposal that justifies how the design of the building will not result in fire spread of more than 3.5 m vertically from the fire source over the external cladding of multi-level buildings.	Use non-combustible materials. *Combustible building materials* is a defined term in the Building Regulations, and "means building materials that are deemed combustible according to AS 1530.1."	Provide an alternative solution proposal that justifies how either: (b) for buildings in importance levels 3 and 4, be constructed from materials that, when subjected to a radiant flux of 30 kW/m^2, do not ignite for 30 minutes, or (c) for buildings in importance levels 1 and 2, be constructed from materials that, when subjected to a radiant flux of 30 kW/m^2, do not ignite for 15 minutes. The above can be achieved by the use of bench scale fire tests (e.g. ISO 5660-1) to confirm that materials when exposed to 30 kW/m^2 do not ignite within the specified time period.

4.0 Fire Test Methods for External Wall Cladding Systems

4.1 Fire Testing requirements for an external wall cladding system

An external wall cladding system for demonstrating compliance with the NZ Building Code for Protection from Fire Performance Clauses C3.5 and C3.7 for external vertical fire spread includes all substantive components within the complete wall assembly (i.e. sheet cladding materials, framing, rigid air barrier, any insulation or sheet materials or blanket and the internal lining). Where relevant, the direction of fire exposure to be considered is from the exterior side of the wall.

Recommendations on the different fire testing options to evaluate the fire properties of an external wall cladding system are given in the risk matrix in Section 5.

4.2 Alternative Test Methods to those currently cited

The New Zealand Building Code Protection from Fire Acceptable Solutions and Verification Method currently cite two fire tests for assessing the fire performance of cladding systems. These are, a bench scale independent component test (ISO 5660), and the intermediate-scale system test NFPA 285. This guidance broadens the suite of test protocols to include the British Standard BS 8414 with the acceptance criteria provided by BR 135.

BS 8414-1:2015 Fire performance of external cladding systems. Test method for non-loadbearing external cladding systems applied to the masonry face of a building. Amended by BS 8414-1:2015+A1:2017 (June 2017).

BS 8414-2:2015 Fire performance of external cladding systems. Test method for non-loadbearing external cladding systems fixed to and supported by a structural steel frame. Amended by BS 8414-2:2015+A1:2017 (June 2017).

BR 135 Fire performance of external thermal insulation for walls of multi-storey buildings: (BR 135) Third edition, BRE (15 March 2013).

It is also acceptable to test cladding systems using the methods outlined in the Australian Standard AS 5113 to meet the 'EW' classification. This classification standard in turn references BS 8414 as a test method.

It is also acceptable to test components within cladding systems using the methods outlined in EN 13501: 2007+A1:2009 to meet a Euroclass A1 or A2 classification.

Refer to the risk matrix in Section 5 for guidance on where the different test methods may be used.

4.3 "BR 135 Fire performance of external thermal insulation for walls of multi-storey buildings" – 3rd edition 2013

BR 135: 2013 addresses the principles and design methodologies related to the fire spread performance characteristics of non-loadbearing external cladding systems. Although various potential design solutions have been identified and discussed in BR 135, robust design details are not presented. In this rapidly changing market generic solutions are not available where new products and novel design solutions are frequently presented. The illustrations and scenarios presented in BR 135 are based on typical examples of current practice in the UK. To help designers and end users better understand the parameters impacting on the fire-safe design and construction of external cladding systems, BR 135 focuses on the issues surrounding the topic of external vertical fire spread.

BR 135 Annex A provides a classification system for the test methodology outlined in BS 8414-1 Fire performance of external cladding systems – Part 1: Test method for nonloadbearing external cladding systems applied to the face of the building.

BR 135 Annex B provides a classification system for the test methodology outlined in BS 8414-2 Fire performance of external cladding systems – Part 2: Test method for non-loadbearing external cladding systems fixed to and supported by a structural steel frame.

Other construction systems such as concrete-framed or timber-framed construction are not considered in BR 135. However, the general principles in the BR 135 guide may still apply, although suitable additional risk assessments and detail design reviews would be required. The risk matrix approach provides an option for considering alternative forms of supporting wall frames.

4.4 What is specifically excluded from external wall cladding systems for the purpose of fire compliance with C3.5 and C3.7?

For the purposes of an external wall cladding system as defined in section 4.1 of this guidance and for demonstrating compliance with the NZ Building Code for Protection from Fire, substantive components may exclude:

- Signage and Billboards – aggregated area up to $25m^2$
- Video screens up to $6m^2$
- Greenwalls – the acceptance of Green and living walls will be dependent on the type of system proposed, its support structure and the associated management and maintenance/irrigation procedures. Generally, plants growing on metallic support systems (such as stainless steel wires) will not present an increased fire hazard provided they are adequately maintained. Other systems that include combustible support systems should be proven via fire test evidence to support compliance. For more information on Greenwalls refer:

  ANS Living Walls receive a Fire Safety Standard

  Fire Performance of Green Roofs and Walls

- Sunscreens / Sunshades / louvres up to $6m^2$ or any area if non-combustible
- Any materials used as part of the external wall cladding system for the topmost floor provided the roof does not require a fire resistance rating. (Other requirements to prevent horizontal fire spread to other property may still apply e.g. limits on unprotected area and/or the ignitability of the wall cladding when located within 1m of the relevant boundary – see section 5.2)
- Door sets and window frames are not included with the cladding requirements
- Sealants and tapes comprising < 5% of the wall area
- A canopy or balcony at ground floor level of buildings that exceed 10m in height can be excluded from the requirements where it can be shown or is agreed that a fire is unlikely to spread from the area to the main external wall cladding
- Minor trim and gutters, downpipes and facias. Limited amounts of materials are excluded from the requirements where it can be shown or is agreed that a fire involving the materials is unlikely to spread fire to the remaining parts of the external wall cladding or where they are remote from the main building cladding.
- Individual components on or within the wall assembly that are non-combustible but include a surface coating not more than 1mm thick.

Note: the above exclusions are only relevant to each component when taken in isolation. Consideration needs to be given when the above items are combined as part of a whole system to determine the contribution of each component to the overall performance of the cladding system. For example, a video screen meeting the size limitations attached to a non-combustible cladding would require further consideration and might not be appropriate if attached to a combustible sunscreen or rainscreen system.

4.5 In-Wall Cavities

Continuous vertical channels and cavities within external wall cladding systems are known to promote upward vertical fire spread. Fire researchers have noted that when flames are confined within a vertical cavity or channel they elongate, leading to flame extension of up to five to ten times the expected unconfined flame lengths. This is true even in cavities without additional combustible materials present, but is made worse by the presence of combustible materials. This flame extension effect can support rapid, potentially unseen, fire spread within an external cladding system and must be limited.

The provision of cavity barriers within external wall cladding systems are important and particularly when combustible cladding, Rigid Air Barriers (RAB) and insulation products are used.

Cavity barriers based on fire resisting construction tested to AS 1530.4 or similar and satisfying integrity and insulation ratings for at least 30 minutes are likely to provide an acceptable means of controlling flame spread within cavities. However, additional consideration is needed to ensure that cavity barriers within a façade system have adequate support and can in remain in place for the period required, and provide the required level of fire resistance rating where located at the junction of fire separations and the external wall assembly.

Examples of other test standards that may be used for curtain wall systems, such as ANSI/ASTM E2307, "Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus", or BS EN 1364-4:2014 “Fire resistance tests for non-loadbearing elements”, may be acceptable.

5.0 External cladding system vertical fire spread - risk assessment approach

A simplified risk assessment approach has been developed to identify the level of complexity and fire risk for the building for the purpose of identifying suitable fire test protocols for the contribution of the cladding system to external vertical spread of fire. The parameters considered are:

- Building Height
- Vulnerability of Risk Group
- Provision of an automatic fire sprinkler system to the requirements of NZS 4541 (as modified by the NZBC)

How to use this table – find the risk level L, M or H applying to the building based on the building height and risk group. Refer to the table key to determine the fire testing protocol options considered acceptable for the applicable risk level.

Table 1. External Wall Cladding System – Risk Matrix for Fire Testing Protocols

Building Height	Sleeping Use* Risk groups SM, SI		Non-Sleeping Use* Risk groups CA, WB, WS, VP	
	Sprinkler protected	Non-sprinkler protected	Sprinkler protected	Non-sprinkler protected
Single level	L	L	L	L
0-10 m and up to 2 levels	L	L	L	L
> 10 m ≤ 25 m	M †	H	M	M
> 25 m and ≤ 60 m	H	n/a	M	n/a
> 60 m	H	n/a	H	n/a

* For a building height ≤ 10 m, cladding systems used for Importance Level 4 buildings or multi-floor buildings incorporating staged evacuation, phased evacuation, or evacuation to a place of relative safety within the building should meet the requirements for risk levels M or H given below.

† Where a NZS 4515 residential sprinkler system is installed then the non-sprinkler risk level in column 3 should be used instead (i.e. risk level H given below).

Where risk levels L, M and H are matched to fire testing protocols P1 to P5 as follows:

L	**Low**	No requirement for building height < 10 m (NZ Building Code Performance Clause C3.5).

M	**Medium**	P1. All cladding and Rigid Air Barriers (RABs) used in the external wall construction may be individually tested using ISO 5660-1 to meet requirements in C/AS2 to C/AS7 Section 5.8. Insulation products, and filler materials (not including gaskets, sealants etc) to be limited combustibility*. All external wall cavities need to be fire stopped using cavity barriers at each floor level and at the junctions to other vertical fire separations. ACP materials must be tested without Aluminium (metal) facing as per C/AS2 to C/AS7 Appendix C7.1.5. Any of options P2-P5 below are also acceptable.
H	**High**	P2. External wall cladding system may meet the performance criteria given in BR 135 for cladding systems using full scale test data from BS 8414-1:2002 or BS 8414-2: 2005; or P3. External wall cladding system may pass the NPFA 285 full scale test; or P4. External wall cladding system may meet 'EW' classification in AS 5113; or P5. All cladding, framing**, insulation products**, RAB and filler materials (not including gaskets, sealants etc) used in the external wall construction may be of *limited combustibility**. If vapour barriers, drainage mats, building wraps or similar are not of *limited combustibility** then all external wall cavities need to be fire stopped using cavity fire barriers at each floor level.

* *Limited combustibility* means the product/material meets one or more of the following criteria:

1. A1 or A2 classification in accordance with EN 13501-1:2007+A1:2009.
2. Non-combustible or not combustible when tested to AS 1530.1 or ISO 1182.
3. Concrete, brick/block masonry, stone, glass, ceramic tiles, aluminium and steel with or without paint or similar thin surface coatings not exceeding 1 mm thickness.

** Timber framing (or combustible insulation products within a framed wall assembly) may be used if a robust protective lining material (being of *limited combustibility*) is fixed to the exterior side of the framing and can be demonstrated to remain in place and protect the framing during the period of external fire exposure. 'Protect framing' can be assumed to be achieved if the protective lining material as part of a light timber frame wall exposed to the test conditions of AS 1530.4 can be shown to prevent charring of the timber frame for a period of 30 minutes. One way to determine this is to limit the temperature on the cavity

side of the fire-exposed protective lining material during the test period to be no greater than 300°C.

5.1 Use of combustible RAB

A combustible Rigid Air Barrier (RAB) e.g. plywood, may be used for any building if it has been included as part of a representative external wall subjected to a full-scale fire test and meeting the criteria in given P2-P4 in the risk matrix.

5.2 External Walls of any height located within 1 m of a relevant boundary.

To limit potential horizontal fire spread to and from a neighbouring property, the exterior cladding material shall either be of limited combustibility or be tested using ISO 5660-1 to meet the requirements in C/AS2 to C/AS7 Section 5.8. The test specimen shall comprise the cladding material mounted over a representative substrate if the cladding material is less than 50 mm thick.

> NOTE: This is not a vertical fire spread provision and needs to be considered in addition to the requirements of Table 1.

It is also acceptable for the exterior cladding material to be tested using ISO 5660-1 using an external irradiance of 30 kW/m^2 and not ignite within the period of time given in NZBC C3.7.

5.3 Technical Assessment in Lieu of Test

Cladding products and systems range in nature and complexity. There are also a range of base wall assemblies that may impact upon how the outer weather facing part of a cladding system product will perform. Examples include:

- Exterior insulation finish systems (EIFS)
- High Pressure Laminates (HPL)
- External thermal insulation composite systems (ETICS)
- Rain screen Cladding
- Structural insulation panel systems (SIPS)
- Expanded Polystyrene Systems (EPS)
- Timber cladding

Key system performance considerations which must be considered in a technical assessment are:

- Combustibility of insulation
- Combustibility of framing (e.g. timber frame)
- Composition of rigid air barrier
- Building underlay
- Uninterrupted vertical cavity
- Continuity of products

In order for an external wall cladding system to be certified for fire safety performance, it needs to be constructed to replicate the details of the test. This includes for example, framings, substrate, flashing details, gaskets, sealants and fixing mechanisms.

A technical assessment may be presented as part of the plans and specifications to demonstrate compliance with the performance requirements of the Building Code. Situations may arise where the proposed cladding system installation differs slightly from the absolute details of that described in a fire test report. A technical assessment from an accredited testing laboratory or from a subject matter expert with knowledge and experience in fire science and fire testing is required.

6.0 Documentation and Evidence for Building Consent

When considering an application for a building consent the Building Consent Authority (BCA) needs to be satisfied on reasonable grounds that the provisions of the building code would be met if the building work were properly completed in accordance with the plans and specifications that accompanied the application.

The BCA needs evidence of which compliance pathway you are using to show how the building cladding system meets the performance requirements of the Building Code and evidence to show how it can be constructed to comply.

BCAs may wish to consider the following when assessing external wall cladding systems case-by-case:

- the extent of combustible products used on the building (i.e. is it a feature or the entire cladding?)
- the building use (occupancy type)
- the active (e.g. alarms and sprinklers) and passive (e.g. firewalls and smoke compartments) fire protection systems throughout the building
- the system tested by the manufacturer or supplier and whether its use is consistent with this (and if not, are the changes likely to negatively affect the building's fire performance?)
- the quality and accuracy of the Building Consent documentation and detailing in relation to external wall assemblies (i.e. can the cladding system be constructed from the information that has been provided?)
- the height and proximity of the building to other buildings
- the use of plastics (e.g. polyethylene core aluminium composite panel); the content of the specific product and its use
- if the design has been reviewed / peer reviewed by a suitably qualified and experienced person

7.0 Useful Resources & References

1. New Zealand Building Code.

2. Wade, C.A., (1995), BRANZ, Report Number 133, *Fire Performance of External Wall Claddings under a Performance Based Building Code*.
3. National Fire Protection Association (NFPA) 285, Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.
4. AS 5113 Fire propagation testing and classification of external walls of buildings.
5. ISO 5660 Reaction-to-fire tests Part 1 Heat release rate (cone calorimeter method).
6. EN ISO 1182: 2010. Fire Test for Non-Combustibility of Building Products.
7. AS 1530.1 Methods for fire tests on building materials and structures Part 1: Combustibility test for materials.
8. Lamont, S. & Ingolfsson, S. (2018) *High rise Buildings with Combustible Exterior Wall Assemblies: Fire Risk Assessment Tool*, NFPA, USA.
9. White N. and Delichatsios M., (2014) Fire Hazards of Exterior Wall Assemblies Containing Combustible Components, Fire Protection Research Foundation Report (EP142293).
10. BS 8414-1 & 2:2015+A1:2017 Fire performance of external cladding systems. Test method for non-loadbearing external cladding systems applied to the masonry face of a building.
11. BR 135: 2013 Fire performance of external thermal insulation for walls of multi-storey buildings: (BR 135) Third edition. BRE Trust.
12. EN 13501-1:2007+A1:2009. Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests.
13. ANSI/ASTM E2307, "Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus".
14. BS EN 1364-4:2014 “Fire resistance tests for non-loadbearing elements”

Outside of Scope

From: Claire Wilde
Sent: Thursday, 1 November 2018 12:10 p.m.
To: Christine Duncan
Subject: RE: Guidance for cladding systems - Fire [UNCLASSIFIED]
Attachments: 20181031 DRAFT Guidance for Cladding Systems for comment 19.10.18(legal1).docx

Hi Christine

I have marked up some suggestions and comments in the attachment.

I suggest the following disclaimer:

> *This information is published by the Ministry of Business, Innovation and Employment's Chief Executive. It is a general guide only and, if used, does not relieve any person of the obligation to consider any matter to which the information relates according to the circumstances of the particular case. Expert advice may be required in specific circumstances. MBIE is not responsible for any reliance on this guidance. To the extent that this information relates to assisting territorial authorities, building consent authorities, owners or persons who carry out building work with compliance with the Building Act 2004, it is published under section 175 of that Act.*

There is some inconsistent use of full stops at the end of bullet points, some inconsistent use of capital letters, etc... Maybe get someone to do a proof-read for this sort of thing. Maybe the Information and Education team?

Happy to discuss when you're ready.

Thanks

Claire Wilde
SOLICITOR

Legal Services (Corporate & Registries), Corporate, Governance and Information
Ministry of Business, Innovation & Employment | Hikina – Whakatutuki
claire.wilde@mbie.govt.nz | s 9(2)(a)
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I appreciate any feedback to better understand my personal strengths and areas for improvement. This feedback can be provided directly to myself or my manager Tania Turfrey.

From: Christine Duncan
Sent: Monday, 29 October 2018 2:55 p.m.
To: Claire Wilde <Claire.Wilde@mbie.govt.nz>
Subject: Guidance for cladding systems - Fire [UNCLASSIFIED]

Hi Claire

Thanks for taking a look at this guidance. Once you have had a chance to figure out the context I am happy to chat with you about what I think is needed. There are a couple of comment flags as prompts. Thanks C

http://mako.wd.govt.nz/otcs/llisapi.dll/overview/84849394

Fire Performance of Cladding Systems

DRAFT FOR COMMENT – IN CONFIDENCE

1.0 Introduction

Technical advancements in the understanding of how fire spreads externally and the contribution products make to the fire spread as a consequence of the Grenfell Tower fire and similar high-rise fire events, has prompted the need for clearer information.

MBIE at the sector's request has developed guidance about how external cladding systems are tested for fire spread performance. This information will help industry to achieve the compliance requirements of the Building Code, taking into account the overall risks associated with the building use, risk profile of its occupants and the escape height.

Fire testing protocols: individual components versus cladding systems

Since 2001 fire testing protocols have largely been based on either bench scale testing using AS 3837 (or more recently ISO 5660) or the larger-scale NFPA 285 facade test. Large scale fire tests are a pragmatic way of assessing how a cladding system performs when exposed to an external flame projecting from an opening in the external wall. However, such tests are by necessity a systems test and are sensitive to any change in the system details. Cladding systems are complex and can include a multitude of combustible components. It is difficult to determine how each of those individual components contributes to the overall system performance to limit fire spread. It may not be possible to confidently evaluate the complexity of the system performance based on small scale fire testing of only individual components.

Questions from Industry

This guidance has been prepared to help address the questions from industry such as:

1. is there latitude to consider alternative fire testing protocols than those currently cited in the compliance documents
2. how the particular criteria for testing external fire spread are applied to cladding systems when historically the focus was about the fire performance of individual components.

Who is this for?

This document is of interest to Fire Engineers, Architects, facade engineers, Building Consent and Territorial Authorities, Testing Laboratories, Product manufacturers and Suppliers.

Disclaimer

s 9(2)(a) MBIE Legal to provide input; potentially include same text as Alternative Solution Guidance; Legal to include reference to Section 175

s 9(2)(a) *I suggest: "This information is published by the Ministry of Business, Innovation and Employment's Chief Executive. It is a general guide only and, if used, does not relieve any person of the obligation to consider any matter to which the information relates according to the circumstances of the particular case. Expert advice may be required in specific circumstances. MBIE is not responsible for any reliance on this guidance. To the extent that this information relates to assisting territorial authorities, building consent authorities, owners or persons who carry out building work with compliance with the Building Act 2004, it is published under section 175 of that Act."*

2.0 In Scope

This guidance:

- Makes it clear what constitutes a cladding *system* for testing external vertical fire spread and assessing performance against the New Zealand Building Code requirements
- Describes the suite of fire testing protocols that could be applied to demonstrate compliance with the New Zealand Building Code.
- Scopes the parameters that need to be considered when addressing external vertical fire spread

The guidance does not intend to provide a fire-engineered design solution for each construction detail but covers broad principles requiring consideration. Some of the principles are based on a simplified risk assessment approach.

Cladding systems defined

For the purpose of this guidance, cladding systems are classified into three broad categories:

1. **Conventional cladding system** – Cladding systems that present a low fire risk because they have limited cavities and are largely comprised of non-combustible materials. Typically such systems would not require an assessment and can be readily observed to comply based on their composition e.g. concrete, steel, or glazing.
2. **Multi-layered cladding system** – comprised of many individual components and/or incorporating ventilated cavities.
3. **Engineered Facades** – these types of design, such as curtain walls, external thermal insulation composite systems (ETICS), ETFE, Expanded Polystyrene Systems (EPS) fall outside the criteria.

s 9(2)(a) Define

2.1 Exclusions

s 9(2)(a) MBIE Legal to consider exclusions, their alignment with AS/VM and ref S175.

s 9(2)(a) I don't think we're the best people to consider the alignment of exclusions with AS/VMs. Nick Locke? Or maybe, I've misunderstood the comment…let's discuss

This guidance does not apply to:

- Buildings with staged or phased evacuation
- Buildings with evacuation to a place of relative safety within the building e.g. hospitals, care-homes
- Importance Level 4 Buildings
- Specific design engineered facade and curtain wall systems

Consult early with the local Building Consent Authority to agree the fire testing evidence required for buildings with these defined characteristics.

3.0 New Zealand Building Code Compliance Pathways

The New Zealand Building Code (NZBC) is performance based. Clause C of the Building Code describes the performance criteria for Protection from Fire. Clause C3 describes Functional and Performance Requirements for fire affecting areas beyond the fire source.

Functional Requirements - NZBC Clause C3	
C3.1	*Buildings* must be designed and constructed so that there is a low probability of injury or illness to persons not in close proximity to a *fire source*.
C3.2	*Buildings* with a *building height* greater than 10 m where upper floors contain sleeping uses or other property must be designed and constructed so that there is a low probability of external vertical fire spread to upper floors in the *building*.
C3.3	*Buildings* must be designed and constructed so that there is a low probability of *fire* spread to *other property* vertically or horizontally across a *relevant boundary*.

There are two Performance Clauses that describe the constraints for control of external vertical fire spread:

- Clause C3.5 – limiting the vertical spread of fire
- Clause C3.7 – covering the ignitability of external wall materials

Three pathways are available to demonstrate compliance with the Building Code Performance Requirements: Acceptable Solutions, Verification Methods and Alternative Solutions.

Note: CodeMark and Multiproof are alternative means for demonstrating compliance with the NZBC.

The following table outlines the Performance Requirements of the New Zealand Building Code and summarises the associated compliance pathways:

		New Zealand Building Code Clause – External Spread of Fire		
		C3.5	**C3.7**	
		Buildings must be designed and constructed so that *fire* does not spread more than 3.5 m vertically from the *fire* source over the external cladding of multi-level *buildings*.	External walls of *buildings* that are located closer than 1 m to the *relevant boundary* of the property on which the *building* stands must either: (a) be constructed from materials which are not *combustible building material, or*	(b) for *buildings* in importance levels 3 and 4, be constructed from materials that, when subjected to a radiant flux of 30 kW/m^2, do not ignite for 30 minutes, or (c) for *buildings* in importance levels 1 and 2, be constructed from materials that, when subjected to a radiant flux of 30 kW/m^2, do not ignite for 15 minutes.
Compliance Pathway	**Acceptable Solutions**	The Acceptable Solutions (C/AS2 to C/AS7) contain three means of demonstrating compliance: 1. Fire properties of external wall cladding systems shall be determined in accordance with ISO 5660 Reaction-to-fire tests – Heat release, smoke production and mass loss rate – Part 1: Heat release rate (cone calorimeter method), or 2. External wall cladding systems which comprise only materials which individually are classified as non-combustible (exempting a 1mm combustible finish) may be deemed to satisfy all the requirements, or 3. The entire wall assembly has been tested at full scale in accordance with NFPA 285 and has passed the test criteria.		

s 9(2)(a) General comment on titles of standards, tests, etc: We need the full references including dates. When applicable these should match the wording in the relevant AS/VM. For example, "...Part 1:**2002**..." It might be easier to put the full titles in the definitions section then refer to the shortened titles in the body of the document.

s 9(2)(a) Date?

	Verification Method	The Verification Method (C/VM2) contains four means of demonstrating compliance: 1. Fire properties of external wall cladding systems shall be determined in accordance with ISO 5660.1 or AS/NZS 3837, to criteria as tabulated, or 2. Use non-combustible materials, or 3. Comply with the Acceptable Solutions (for buildings with an importance level not higher than 3). 4. Use large or medium scale facade type tests to determine the extent of vertical flame test is not more than 3.5 m above the fire source. (C3.5 only)		
	Alternative Solution	Provide an alternative solution proposal that justifies how the design of the building will not result in fire spread of more than 3.5 m vertically from the fire source over the external cladding of multi-level buildings. Note: Fire source means the head of an opening in the external wall from which flames are presumed to be projecting from.	*Combustible building materials* is a defined term in the Building ~~Regulations~~Code, and "means building materials that are deemed combustible according to AS 1530.1."	Provide an alternative solution proposal that justifies how either: (b) for buildings in importance levels 3 and 4, be constructed from materials that, when subjected to a radiant flux of 30 kW/m^2, do not ignite for 30 minutes, or (c) for buildings in importance levels 1 and 2, be constructed from materials that, when subjected to a radiant flux of 30 kW/m^2, do not ignite for 15 minutes.

s 9(2)(a) Date?

4.0 Fire Test Methods for Wall Cladding Systems

4.1 Fire Testing requirements for a building cladding system

A cladding system for demonstrating compliance with the NZ Building Code for Protection from Fire Performance Clauses C3.5 and C3.7 for external vertical fire spread can be defined as: 'a cladding system can be considered to include all substantive components within the complete wall assembly (i.e. sheet cladding materials, framing, rigid air barrier and any insulation or sheet materials or blanket)'.

s 9(2)(a) Is this quoted from somewhere?

Cladding System – Test Methods

Substantive components of the wall (i.e. sheet cladding materials, framing, rigid air barrier and any insulation or polymeric sheet / blanket) within the wall shall:

(i) Comprise of only glass, concrete, steel, brick / block, ceramic tile or aluminium, or
(ii) Are classified as "non-combustible" when tested to AS 1530.1 or ISO 1182, or
(iii) Achieve a Euroclass A1 or A2 in accordance with EN 13501: 2007+A1:2009, or
(iv) Meet the requirements of NFPA 285: Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components, or
(v) Be tested to BS 8414 and assessed to the requirements of BRE 135 Fire performance of external thermal insulation for walls of multi-storey buildings" – 3rd edition 2013

4.2 "BRE 135 Fire performance of external thermal insulation for walls of multi-storey buildings" – 3rd edition 2013

BRE 135: 2013 addresses the principles and design methodologies related to the fire-spread performance characteristics of non-loadbearing external cladding systems. Although various potential design solutions have been identified and discussed in BRE 135, robust design details are not presented. In this rapidly changing market generic solutions are not available where new products and novel design solutions are frequently presented. The illustrations and scenarios presented in BRE 135 are based on typical examples of current practice in the UK. To help designers and end users better understand the parameters impacting on the fire-safe design and construction of external cladding systems, BRE 135 focuses on the issues surrounding the topic of external vertical fire spread.

Note : BS 8414-2 and Annex B of the BRE 135 guide relate specifically to external cladding systems applied to steel-frame constructions.

Other construction systems such as concrete-frame or timber-frame constructions are not considered in this guidance. However, the general principles in the BRE 135 guide may still apply, although suitable additional risk assessments and detail design reviews would be required. The risk matrix approach provides an option for considering alternative forms of supporting wall frames.

BRE 135 Annex A provides a classification system for the test methodology outlined in BS 8414-1Fire performance of external cladding systems – Part 1: Test method for nonloadbearing external cladding systems applied to the face of the building.

BRE 135 Annex B provides a classification system for the test methodology outlined in BS 8414-2 Fire performance of external cladding systems – Part 2: Test method for non-loadbearing external cladding systems fixed to and supported by a structural steel frame.

4.3 Alternative Test Methods to those currently cited

The New Zealand Building Code Protection from Fire Acceptable Solutions and Verification Method currently cite two fire tests for assessing the fire performance of cladding systems. These are, a bench scale independent component test (ISO 5660), and the intermediate-scale system test NFPA 285. This guidance broadens the suite of test protocols to include the British Standard BS 8414.

s 9(2)(a) I think this could be read as a back door attempt to expand the AS/VM. Does that make sense? Could we say, "Another relevant test protocol may be..."? Happy to talk this through

The British Standard test, with compliance interpretation provided by BRE 135:

> BS 8414-1:2015 Fire performance of external cladding systems. Test method for non-loadbearing external cladding systems applied to the masonry face of a building. Amended by BS 8414-1:2015+A1:2017 (June 2017).

BS 8414-2:2015 Fire performance of external cladding systems. Test method for non-loadbearing external cladding systems fixed to and supported by a structural steel frame. Amended by BS 8414-2:2015+A1:2017 (June 2017).

BRE 135 Fire performance of external thermal insulation for walls of multi-storey buildings: (BRE 135) Third edition, BRE (15 March 2013).

It may also be acceptable to test cladding systems using the methods outlined in the Australian Standard AS 5113 to meet the 'EW' classification. Refer to the risk matrix section of this guidance for specific details.

s 9(2)(a) define

4.4 What is specifically excluded from cladding systems for the purpose of fire compliance with C3.5 and C3.7?

For the purposes of defining a cladding system for demonstrating compliance with the NZ Building Code for Protection from Fire, substantive components may exclude:

- Signage and Billboards – aggregated area 25m^2
- Video screens <6m^2
- Greenwalls – the acceptance of Green and living walls will be dependent on the type of system proposed, its support structure and the associated management and maintenance/irrigation procedures. Generally plants growing on metallic support systems (such as stainless steel wires) will not present an increased fire hazard provided they are adequately maintained. Other systems that include combustible support systems should be proven via fire test evidence to support compliance.

For more information on greenwalls see

ANS Living Walls receive a Fire Safety Standard

Fire Performance of Green Roofs and Walls

- Sunscreens / Sunshades / louvres - <6m^2 or non-combustible
- Top floor when the building height is more than 10 m and the roof does not require a fire resistance rating
- Door sets and window frames are not included with the cladding requirements
- Sealants and tapes comprising < 5% of the wall area
- Canopy or balcony at ground floor of buildings that exceed 10m in height can be excluded from the requirements where it can be shown that a fire would not spread from the area to the main building cladding
- Minor trim and gutters, downpipes and facias. Limited amounts of materials are excluded from the requirements where it can be shown that a fire involving the product would not spread fire to the remaining parts of the building cladding or where they are remote from the main building cladding.
- Individual components on or within the wall assembly that include a surface coating not more than 1mm thick applied directly to a non-combustible substrate.

Note: the above exclusions are only relevant to each component when taken in isolation. Consideration needs to be given when the above items are considered as part of a whole system and when one item may impact the performance of another. For example, a video screen meeting the size limitations must be attached to a non-combustible facade but would require further consideration if attached to a combustible wall system.

4.5 In-Wall Cavities

Continuous vertical channels and cavities within cladding systems are known to promote upward vertical fire spread. Fire researchers have noted that when flames are confined within a vertical cavity or channel they elongate, leading to flame extension of five to ten times the expected unconfined flame lengths. This is true even in cavities without additional combustible materials present, but is made worse by the presence of combustible materials. This flame extension effect can support rapid, potentially unseen, fire spread within an external cladding system and must be limited.

Cavity barriers are important within cladding systems and are particularly important when combustible cladding, Rigid Air Barriers (RAB) and insulation products are used.

Intumescing products and fire resistant barriers are required to maintain a minimum 30 minute fire resistance rating [-/30/30] as demonstrated in a fire resistance test.

Solid timber blocking could be an appropriate cavity barrier if there is evidence to support a maintained integrity and insulation rating for a minimum 30 minute duration.

5.0 External cladding system vertical fire spread - risk assessment approach

A simplified risk assessment approach has been developed to identify the level of complexity for assessment of the cladding system for external fire spread. The parameters considered are:

- Building Height
- Vulnerability of Risk Group
- Provision of an automatic fire sprinkler system to the requirements of NZS 4541 (NZ Building Code modified NZS4541 sprinkler system)

Building Height	Sleeping Use* Risk groups SM, SI		Non-Sleeping Use* Risk groups CA, WB, WS, VP	
	Sprinkler protected	Non-sprinkler protected	Sprinkler protected	Non-sprinkler protected
Single storey building	L	L	L	L
≤ 10 m (typically 2 to 3 floor levels)	L	L	L	L
> 10 m ≤ 25 m (typically 4 to 8 floor levels)	M	H	M	M
> 25 m and ≤ 60 m	H	H	M	H
> 60 m	H	H	H	H

*Excludes – staged evacuation, phased evacuation, evacuation to a place of relative safety within the building, Importance Level 4 Buildings

Where:

L	**Low**	No requirement for building height < 10 m (NZ Building Code Performance Clause C3.5).
M	**Medium**	P1. All cladding and Rigid Air Barriers (RABs) used in the external wall construction may be tested using ISO 5660-1 to meet requirements in C/AS Section 5.8. Insulation products†, and filler materials (not including gaskets, sealants etc) to be *limited combustibility* *.

		All external wall cavities need to be fire stopped using cavity barriers at each floor level. ACP materials must be tested without Aluminium (metal) facing as per C/AS 7.1.5. **Any of options P1-P4 are acceptable.**
H	**High**	P2. External wall system to meet the performance criteria given in BRE 135 for cladding systems using full scale test data from BS 8414-1:2002 or BS 8414-2: 2005; or P3. External wall system to pass the NPFA 285 full scale test; or P4. External wall system to meet 'EW' classification in AS 5113; or P5. All cladding, framing**, insulation products†, RAB and filler materials (not including gaskets, sealants etc) used in the external wall construction to be *limited combustible**. If vapour barriers, drainage mats, building wraps or similar are not limited combustibility * then all external wall cavities need to be fire stopped using cavity fire barriers at each floor level.

s 9(2)(a) I see that you have defined this under 5.1 – we will need to bring that definition forward or put it in the definitions section.

† This does not apply to combustible insulation products encapsulated within a conventional timber-frame assembly on the interior-facing side of a solid RAB.

* Limited combustibility means the product/material meets one or more of the following criteria:

1. A1 or A2 classification in accordance with EN 13501-1:2007+A1:2009.
2. Non-combustible or not combustible when tested to AS1530.1 or ISO 1182.
3. Concrete, brick/block masonry, stone, glass, ceramic tiles, aluminium and steel with or without paint or similar thin surface coatings.

** Timber framing may be used if a robust protective lining material (limited combustibility) is fixed to the exterior side of the framing and can be demonstrated to remain in place and protect the timber framing during the period of external fire exposure. The term 'protect timber framing' can be achieved if the protective lining material as part of a light timber frame wall exposed to the test conditions of AS1530.4 can be shown to prevent charring of the timber frame for a period of 30 minutes. One way to determine this is to limit the temperature on the cavity side of the fire-exposed protective lining material during the test period to be no greater than 300 Centigrade.

5.1 Use of combustible RAB

A combustible Rigid Air Barrier (RAB) e.g. plywood, may be used for any building if it has been included as part of a representative external wall subjected to a full-scale fire test and meeting the criteria in P2-P4 in the risk matrix .

5.2 External Walls of any height located within 1 m of a relevant boundary.

To limit potential horizontal fire spread to and from a neighbouring property, the exterior cladding material (and or with a representative substrate if that cladding material is less than 50 mm thick) shall either be limited combustible or be tested using ISO 5660-1 to meet the requirements in the relevant C/ASx Section 5.8. NOTE: This is not a vertical fire spread provision.

5.3 Technical Assessment in Lieu of Test

Cladding products and systems range in nature and complexity. There are also a range of base wall assemblies that may impact how the outer weather facing part of a cladding system product will perform. Examples include:

- Exterior insulation finish systems (EIFS)
- High Pressure Laminates (HPL)
- External thermal insulation composite systems (ETICS)
- Rain screen Cladding
- Structural insulation panel systems (SIPS)
- Expanded Polystyrene Systems (EPS)
- Timber cladding

Key system performance considerations which must be considered in a technical assessment are:

- Combustibility of insulation
- Combustibility of framing (e.g. timber frame)
- Composition of rigid air barrier
- Building underlay
- Uninterrupted vertical cavity
- Continuity of products

In order for a cladding system to be certified for fire safety performance, it needs to be constructed to replicate the details of the test. This includes for example, framings, substrate, flashing details, gaskets, sealants and fixing mechanisms.

It is valid to present a technical assessment as part of evidence to demonstrate compliance with the performance based Building Code. Situations may arise where the proposed cladding system installation differs slightly from the absolute details of that endorsed by the

fire testing certificate. A technical assessment from a certified testing laboratory or from a subject matter expert in fire science and testing is required.

6.0 Documentation and Evidence for Building Consent

When considering documentation the Building Consent Authority (BCA) needs to be satisfied on reasonable grounds that the provisions of the building code would be met if the building work were properly completed in accordance with the plans and specifications ~~-~~that accompanied the application. ~~when constructed will meet the requirements of the New Zealand Building Code and therefore the intent of the Building Act.~~

s 9(2)(a) I think we mirror the wording in the leg.

The BCA needs evidence of which compliance pathway you are using to show how the building cladding system meets the performance requirements of the Building Code and evidence to show how it can be constructed to comply.

BCAs may wish to consider the following when assessing building cladding system case-by-case:

- the extent of combustible products used on the building (i.e. is it a feature or the entire cladding?)
- the building use (occupancy type)
- the active (e.g. alarms and sprinklers) and passive (e.g. firewalls and smoke compartments) fire protection systems throughout the building
- the system tested by the manufacturer or supplier and whether its use is consistent with this (and if not, are the changes likely to negatively affect the building's fire performance?)
- the quality and accuracy of the Building Consent documentation and detailing in relation to external wall assemblies (i.e. can the cladding system be constructed from the information that has been provided?)
- the height and proximity of the building to other buildings
- the use of plastics (e.g. polyethylene core aluminium composite panel); the content of the specific product and its use
- if the design has been reviewed / peer reviewed by a fire engineer~~?~~

7.0 Useful Resources & References

1. New Zealand Building Code
2. Wade, C.A., (1995), BRANZ, Report Number 133, *Fire Performance of External Wall Claddings under a Performance Based Building Code*.
3. National Fire Protection Association (NFPA) 285, Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components
4. AS 5113 Fire propagation testing and classification of external walls of buildings

5. ISO 5660 Reaction-to-fire tests Part 1 Heat release rate (cone calorimter method), and Part 2 Smoke production rate (dynamic method)
6. EN ISO 1182: 2010. Fire Test For Non-Combustibility Of Building Products
7. AS 1530.1 Methods for fire tests on building materials and structures Part 1: Combustibility test for materials.
8. Lamont, S. & Ingolfsson, S. (2018) *High rise Buildings with Combustible Exterior Wall Assemblies: Fire Risk Assessment Tool*, NFPA, USA
9. White N. and Delichatsios M., (2014) Fire Hazards of Exterior Wall Assemblies Containing Combustible Components, Fire Protection Research Foundation Report (EP142293)
10. BS 8414-1 & 2:2015+A1:2017 Fire performance of external cladding systems. Test method for non-loadbearing external cladding systems applied to the masonry face of a building
11. BRE 135: 2013 Fire performance of external thermal insulation for walls of multi-storey buildings: (BRE 135) Third edition
12. EN 13501-1:2007+A1:2009

8.0 Useful Definitions

s 9(2)(a) I would bring this to the beginning of the document and expand it to cover acronyms, full titles of standards, etc...

Cladding The exterior weather-resistant surface of a *building*.
COMMENT: Includes any supporting substrate and, if applicable, surface treatment.

Cladding system
The outside or exterior weather-resistant surface of a *building*; including *roof cladding* and *roof underlays*, *wall* cladding and *wall underlays*, and cavity components, rooflights, windows, doors and all penetrations, *flashings*, seals, joints and junctions. Where required by the Acceptable Solution, the *cladding* system shall include a *drained cavity*.

Cavity wall
A term used to describe a wall that incorporates a *drained cavity*.

Drained cavity
A cavity space, immediately behind a wall *cladding*, that has vents at the base of the wall. Also known as a drained and vented cavity and referred to in the NZBC E2 Acceptable Solution as a cavity or *drained cavity*. A *drained cavity* assists drying by allowing water which occasionally penetrates the wall *cladding system* to drain to the exterior of the *building*, and any remaining moisture to dry by evaporation. Where the Acceptable Solution requires a nominal 20 mm *drained cavity*, the depth shall be between limits of 18 mm and 25 mm. For definition of masonry veneer cavity refer to SNZ HB 4236.

External wall
Any vertical exterior face of a *building* consisting of *primary* and/or *secondary elements* intended to provide protection against the outdoor environment.

Outside of Scope

From: Claire Wilde
Sent: Friday, 14 December 2018 11:45 a.m.
To: Jenni Tipler
Cc: Rosalind Barry
Subject: RE: Guidance for Cladding Systems for Approval Draft 1012.18 (3) [UNCLASSIFIED]
Attachments: 20181214 Guidance for Cladding Systems for Approval Draft 06.12.18 (2) (002) (legal).docx

Hi Jenni

I have marked up a few things in the attachment.

Happy to discuss

Thanks

Claire Wilde
SOLICITOR

Legal Services (Corporate & Registries), Corporate, Governance and Information
Ministry of Business, Innovation & Employment | Hikina – Whakatutuki
claire.wilde@mbie.govt.nz | s 9(2)(a)
Level 7, 15 Stout Street, PO Box 1473, Wellington CBD 6140, New Zealand

www.mbie.govt.nz
Grow New Zealand for all

I appreciate any feedback to better understand my personal strengths and areas for improvement. This feedback can be provided directly to myself or my manager Tania Turfrey.

From: Jenni Tipler
Sent: Thursday, 13 December 2018 12:32 p.m.
To: Claire Wilde <Claire.Wilde@mbie.govt.nz>
Subject: RE: Guidance for Cladding Systems for Approval Draft 1012.18 (3) [UNCLASSIFIED]

Hi Claire,

There's not really a complete track-changed version sorry. I think Word lets you compare docs though?

Regards,

Jenni

From: Claire Wilde
Sent: Thursday, 13 December 2018 11:10 a.m.

To: Jenni Tipler
Subject: RE: Guidance for Cladding Systems for Approval Draft 1012.18 (3) [UNCLASSIFIED]

Thanks Jenni,

Is there a version that shows all of the changes that have been made since I reviewed it last? It would speed up my review.

CW

From: Jenni Tipler
Sent: Thursday, 13 December 2018 10:34 a.m.
To: Claire Wilde <Claire.Wilde@mbie.govt.nz>
Subject: Re: Guidance for Cladding Systems for Approval Draft 1012.18 (3) [UNCLASSIFIED]

Thanks Claire,

We will need time to make changes to the formatting/PDF before we send it out so if it could be earlier than Monday that would be great. I don't think much has changed really since the last time you reviewed the document.

Regards,

Jenni

Sent from my iPhone

On 12/12/2018, at 2:07 PM, Claire Wilde <Claire.Wilde@mbie.govt.nz> wrote:

> Thanks for your understanding Jenni. In that case, would it be okay if I got back to you by COB on Monday the 17th (or sooner if I can get to it)?
>
> Claire
>
> ---
>
> **From:** Jenni Tipler
> **Sent:** Wednesday, 12 December 2018 1:43 p.m.
> **To:** Claire Wilde <Claire.Wilde@mbie.govt.nz>
> **Subject:** RE: Guidance for Cladding Systems for Approval Draft 1012.18 (3) [UNCLASSIFIED]
>
> Hi Claire,
>
> Thanks for that and sorry to hear about your bereavement. The deadline isn't set in stone – if we need to wait to send out the guidance early next week that's not the end of the world.
>
> Regards,
>
> Jenni
>
> ---
>
> **From:** Claire Wilde
> **Sent:** Wednesday, 12 December 2018 1:04 p.m.
> **To:** Jenni Tipler
> **Subject:** RE: Guidance for Cladding Systems for Approval Draft 1012.18 (3) [UNCLASSIFIED]
>
> Hi Jenni
>
> I will do my best but there's quite a high risk that I won't be able to get back to you by 12pm tomorrow. How set in stone is the deadline?

Sorry – I am trying to catch up from a week of bereavement leave + have very little desk time at the moment (so many meetings).

Claire

From: Jenni Tipler
Sent: Wednesday, 12 December 2018 8:07 a.m.
To: Claire Wilde <Claire.Wilde@mbie.govt.nz>
Subject: FW: Guidance for Cladding Systems for Approval Draft 1012.18 (3) [UNCLASSIFIED]

Hi Claire,

Can you please do a final legal check of the attached cladding guidance? You've seen this once before from Christine and not much has changed since then. We're hoping to send this out to stakeholders on Friday so if you could please get any comments back to us by 12pm tomorrow that would be greatly appreciated. Let me know if this isn't going to be possible.

Kind regards,

Jenni

From: Rosalind Barry
Sent: Tuesday, 11 December 2018 4:37 p.m.
To: Jenni Tipler
Cc: Antony Walker
Subject: Guidance for Cladding Systems for Approval Draft 1012.18 (3) [UNCLASSIFIED]

Hi

You might want to send this latest version to Claire Wilde to review – the content is pretty much final now . Hopefully quick turn around from them.

Thanks

Kind regards
Rosalind Barry
SENIOR ADVISOR
Building System Performance
Ministry of Business, Innovation & Employment

Rosalind.Barry@mbie.govt.nz | s 9(2)(a)
<image001.jpg>

Fire Performance of External Wall Cladding Systems

This guide discusses how external wall cladding systems can be tested to determine their fire performance. It will help industry to demonstrate compliance with the requirements of the New Zealand Building Code

s 9(2)(a) On cover page

~~FOR APPROVAL~~

1.0 Introduction

~~Various~~ Significant high-rise fire events globally have increased our understanding of how fire spreads externally ~~provided evidence of potential outcomes of fire spreading externally~~ and within modern façade construction. This ~~evidence~~ has prompted ~~a~~ MBIE to review ~~review of~~ the ~~existing~~ current methods used to demonstrate compliance of external wall cladding systems with building regulations' fire safety objectives. ~~T~~In particular, ~~here have also been questions as to~~ how New Zealand requirements should be interpreted and whether international alternative fire test and evaluation methods ~~available internationally~~ are suitable for use ~~in New Zealand~~here.

~~MBIE has developed this~~This guide ~~guidance~~ discusses ~~on how~~how external wall cladding systems can be tested to determine their fire performance. This information will help industry to demonstrate compliance with the requirements of the New Zealand Building Code (NZBC), consider~~ing~~ the overall risks associated with the building use, the risk profile of its occupants, the building height and other fire safety systems in the building.

Fire testing protocols: individual components versus cladding systems

Since 2001 fire testing protocols used for building code compliance in New Zealand have largely been based on either bench scale testing of individual materials or components using AS/NZS 3837 (or more recently ISO 5660) or the larger-scale NFPA 285 facade test.

Bench scale fire tests have typically been used in New Zealand for cladding in a way that treats fire spread over the external wall as a surface flame spread phenomena (similar to interior linings). However, it is apparent that in many cases, it is the entire system performance that must be considered and not only that of the outermost cladding material.

Large scale fire tests are a way of assessing how an external wall cladding system performs when exposed to flames projecting from an opening in the external wall. Fire performance in these tests can be sensitive to a small change in the system details. External wall cladding systems are complex and can include a multitude of combustible components. It is difficult to determine how each of those individual components contributes to the overall system performance to limit fire spread.

It may therefore not always be possible to confidently evaluate the overall system performance for facades containing combustible components solely based on small scale fire testing of only the individual components.

Questions from Industry

This guidance has been prepared to help address the questions from industry such as:

1. Are alternative fire testing protocols ~~acceptable~~ to those currently cited in an Acceptable Solution or Verification Method acceptable?
2. How should the fire test criteria be applied to external wall cladding systems?

s 9(2)(a): Is this what you meant? The sentence didn't make sense to me.

Who is this guidance for?

This document is of interest to Fire Engineers, Architects, Facade Engineers, Building Consent and Territorial Authorities, Testing Laboratories, Product Manufacturers and Suppliers.

s 9(2)(a) Put this info on front cover or inside front cover ?

Disclaimer

This information is published by the Ministry of Business, Innovation and Employment's Chief Executive. It is a general guide only and, if used, does not relieve any person of the obligation to consider any matter to which the information relates according to the circumstances of the particular case. Expert advice may be required in specific circumstances. MBIE is not responsible for any reliance on this guidance. To the extent that this information relates to assisting territorial authorities, building consent authorities, owners or persons who carry out building work with compliance with the Building Act 2004, it is published under section 175 of that Act.

s 9(2)(a) This should under Tthis documents status on inside front cover

2.0 What is the scope of this guidance

This guidance is intended to:

- Make it clear what constitutes an external wall cladding system for testing external vertical fire spread and assessing performance against the New Zealand Building Code requirements.
- Describe the suite of fire testing protocols that could be applied to demonstrate compliance with the New Zealand Building Code.
- Scope the parameters that need to be considered when addressing external vertical fire spread.

The guidance does not intend to provide a fire-engineered design solution for individual construction details but covers broad principles requiring consideration in their development. Some of the principles are based on a simplistic risk assessment approach.

3.0 New Zealand Building Code Compliance Pathways

The New Zealand Building Code (NZBC) is performance based. Clause C of the Building Code describes the performance criteria for Protection from Fire. Clause C3 describes Functional and Performance Requirements for fire affecting areas beyond the fire source.

Functional Requirements - NZBC Clause C3	
C3.1	*Buildings* must be designed and constructed so that there is a low probability of injury or illness to persons not in close proximity to a *fire source*.
C3.2	*Buildings* with a *building height* greater than 10 m where upper floors contain sleeping uses or other property must be designed and constructed so that there is a low probability of external vertical fire spread to upper floors in the *building*.
C3.3	*Buildings* must be designed and constructed so that there is a low probability of *fire* spread to *other property* vertically or horizontally across a *relevant boundary*.

There are two Performance Clauses that describe the constraints for control of external vertical fire spread:

- Clause C3.5 – limiting the vertical spread of fire
- Clause C3.7 – covering the ignitability of external wall cladding materials.

Three pathways are available to demonstrate compliance with the Building Code Performance Requirements: Acceptable Solutions, Verification Methods and Alternative Solutions.

> Note: CodeMark and Multiproof are alternative means for demonstrating compliance with the NZBC.

The following table outlines the Performance Requirements of the New Zealand Building Code and summarises the associated compliance pathways:

		New Zealand Building Code Clause – External Spread of Fire	
		C3.5	**C3.7**
		Buildings must be designed and constructed so that *fire* does not spread more than 3.5 m vertically from the *fire* source over the external cladding of multi-level *buildings*.	External walls of *buildings* that are located closer than 1 m to the *relevant boundary* of the property on which the *building* stands must either: (a) be constructed from materials which are not *combustible building material, or*	(b) for *buildings* in importance levels 3 and 4, be constructed from materials that, when subjected to a radiant flux of 30 kW/m^2, do not ignite for 30 minutes, or (c) for *buildings* in importance levels 1 and 2, be constructed from materials that, when subjected to a radiant flux of 30 kW/m^2, do not ignite for 15 minutes.
Compliance Pathway	**Acceptable Solutions**	The Acceptable Solutions (C/AS2 to C/AS7) contain three means of demonstrating compliance: 1. Fire properties of external wall cladding systems shall be determined in accordance with ISO 5660 Reaction-to-fire tests – Heat release, smoke production and mass loss rate – Part 1: Heat release rate (cone calorimeter method), or 2. External wall cladding systems which comprise only materials which individually are classified as non-combustible (exempting a 1mm combustible finish) may be deemed to satisfy all the requirements, or 3. The entire wall assembly has been tested at full scale in accordance with NFPA 285 and has passed the test criteria.	

s 9(2)(a) : Need to check the dividing lines in table are visible

	Verification Method	The Verification Method (C/VM2) contains four means of demonstrating compliance: 1. Fire properties of external wall cladding systems shall be determined in accordance with ISO 5660.1 or AS/NZS 3837, to criteria as tabulated, or 2. Use non-combustible materials, or 3. Comply with the Acceptable Solutions (for buildings with an importance level not higher than 3).		
		4a. Use large or medium scale facade type tests to determine the extent of vertical fire spread is not more than 3.5 m above the fire source (C3.5).		
	Alternative Solution	Provide an alternative solution proposal that justifies how the design of the building will not result in fire spread of more than 3.5 m vertically from the fire source over the external cladding of multi-level buildings.	Use non-combustible materials. *Combustible building materials* is a defined term in the Building ~~Regulations~~Code, and "means building materials that are deemed combustible according to AS 1530.1."	Provide an alternative solution proposal that justifies how either: (b) for buildings in importance levels 3 and 4, be constructed from materials that, when subjected to a radiant flux of 30 kW/m^2, do not ignite for 30 minutes, or (c) for buildings in importance levels 1 and 2, be constructed from materials that, when subjected to a radiant flux of 30 kW/m^2, do not ignite for 15 minutes. The above can be achieved by the use of bench scale fire tests (e.g. ISO 5660-1) to confirm that materials when exposed to 30 kW/m^2 do not ignite within the specified time period.

s 9(2)(a) I noticed that this isn't in section 7.0. Suggest we add it.

4.0 Fire Test Methods for External Wall Cladding Systems

4.1 Fire Testing requirements for an external wall cladding system

An external wall cladding system for demonstrating compliance with the NZ Building Code for Protection from Fire Performance Clauses C3.5 and C3.7 for external vertical fire spread includes all substantive components within the complete wall assembly (i.e. sheet cladding materials, framing, rigid air barrier, any insulation or sheet materials or blanket and the internal lining). Where relevant, the direction of fire exposure to be considered is from the exterior side of the wall.

Recommendations on the different fire testing options to evaluate the fire properties of an external wall cladding system are given in the risk matrix in Section 5.

4.2 Alternative Test Methods to those currently cited

The New Zealand Building Code Protection from Fire Acceptable Solutions and Verification Method currently cite two fire tests for assessing the fire performance of cladding systems. These are~~,~~ a bench scale independent component test (ISO 5660), and the intermediate-scale system test NFPA 285. ~~This guidance broadens the suite of test protocols to~~

~~include~~Another relevant test protocol may be the British Standard BS 8414 with the acceptance criteria provided by BR 135.

BS 8414-1:2015 Fire performance of external cladding systems. Test method for non-loadbearing external cladding systems applied to the masonry face of a building. Amended by BS 8414-1:2015+A1:2017 (June 2017).

BS 8414-2:2015 Fire performance of external cladding systems. Test method for non-loadbearing external cladding systems fixed to and supported by a structural steel frame. Amended by BS 8414-2:2015+A1:2017 (June 2017).

BR 135 Fire performance of external thermal insulation for walls of multi-storey buildings: (BR 135) Third edition, BRE (15 March 2013).

It is also acceptable to test cladding systems using the methods outlined in the Australian Standard AS 5113 to meet the 'EW' classification. This classification standard in turn references BS 8414 as a test method.

s 9(2)(a)

Suggest we define this

It is also acceptable to test components within cladding systems using the methods outlined in EN 13501: 2007+A1:2009 to meet a Euroclass A1 or A2 classification.

Refer to the risk matrix in Section 5 for guidance on where the different test methods may be used.

4.3 "BR 135 Fire performance of external thermal insulation for walls of multi-storey buildings" – 3rd edition 2013

BR 135: 2013 addresses the principles and design methodologies related to the fire spread performance characteristics of non-loadbearing external cladding systems. Although various potential design solutions have been identified and discussed in BR 135, robust design details are not presented. In this rapidly changing market generic solutions are not available where new products and novel design solutions are frequently presented. The illustrations and scenarios presented in BR 135 are based on typical examples of current practice in the UK. To help designers and end users better understand the parameters impacting on the fire-safe design and construction of external cladding systems, BR 135 focuses on the issues surrounding the topic of external vertical fire spread.

BR 135 Annex A provides a classification system for the test methodology outlined in BS 8414-1 Fire performance of external cladding systems – Part 1: Test method for nonloadbearing external cladding systems applied to the face of the building.

BR 135 Annex B provides a classification system for the test methodology outlined in BS 8414-2 Fire performance of external cladding systems – Part 2: Test method for non-loadbearing external cladding systems fixed to and supported by a structural steel frame.

Other construction systems such as concrete-framed or timber-framed construction are not considered in BR 135. However, the general principles in the BR 135 guide may still apply, although suitable additional risk assessments and detail design reviews would be required. The risk matrix approach provides an option for considering alternative forms of supporting wall frames.

4.4 What is specifically excluded from external wall cladding systems for the purpose of fire compliance with C3.5 and C3.7?

For the purposes of an external wall cladding system as defined in section 4.1 of this guidance and for demonstrating compliance with the NZ Building Code for Protection from Fire, substantive components may exclude:

- Signage and Billboards – aggregated area up to 25m^2
- Video screens up to 6m^2
- Greenwalls – the acceptance of Green and living walls will be dependent on the type of system proposed, its support structure and the associated management and maintenance/irrigation procedures. Generally, plants growing on metallic support systems (such as stainless steel wires) will not present an increased fire hazard provided they are adequately maintained. Other systems that include combustible support systems should be proven via fire test evidence to support compliance. For more information on Greenwalls refer:

  ANS Living Walls receive a Fire Safety Standard on the ans global website

  Fire Performance of Green Roofs and Walls on the GOV.UK website

- Sunscreens / Sunshades / louvres up to 6m^2 or any area if non-combustible
- Any materials used as part of the external wall cladding system for the topmost floor provided the roof does not require a fire resistance rating. (Other requirements to prevent horizontal fire spread to other property may still apply e.g. limits on unprotected area and/or the ignitability of the wall cladding when located within 1m of the relevant boundary – see section 5.2)
- Door sets and window frames are not included with the cladding requirements
- Sealants and tapes comprising < 5% of the wall area
- A canopy or balcony at ground floor level of buildings that exceed 10m in height can be excluded from the requirements where it can be shown or is agreed that a fire is unlikely to spread from the area to the main external wall cladding
- Minor trim and gutters, downpipes and facias. Limited amounts of materials are excluded from the requirements where it can be shown or is agreed that a fire involving the materials is unlikely to spread fire to the remaining parts of the external wall cladding or where they are remote from the main building cladding.
- Individual components on or within the wall assembly that are non-combustible but include a surface coating not more than 1mm thick.

Note: the above exclusions are only relevant to each component when taken in isolation. Consideration needs to be given when the above items are combined as part of a whole system to determine the contribution of each component to the overall performance of the cladding system. For example, a video screen meeting the size limitations attached to a non-combustible cladding would require further consideration and might not be appropriate if attached to a combustible sunscreen or rainscreen system.

4.5 In-Wall Cavities

Continuous vertical channels and cavities within external wall cladding systems are known to promote upward vertical fire spread. Fire researchers have noted that when flames are confined within a vertical cavity or channel they elongate, leading to flame extension of up to five to ten times the expected unconfined flame lengths. This is true even in cavities without additional combustible materials present, but is made worse by the presence of combustible materials. This flame extension effect can support rapid, potentially unseen, fire spread within an external cladding system and must be limited.

The provision of cavity barriers within external wall cladding systems are important and particularly when combustible cladding, Rigid Air Barriers (RAB) and insulation products are used.

Cavity barriers based on fire resisting construction tested to AS 1530.4 or similar and satisfying integrity and insulation ratings for at least 30 minutes are likely to provide an acceptable means of controlling flame spread within cavities. However, additional consideration is needed to ensure that cavity barriers within a façade system located at the junction of fire separations and the external wall assembly, have adequate support and can ~~in~~ remain in place for the period required, and provide the required level of fire resistance rating ~~where, located at the junction of fire separations and the external wall assembly.~~

s 9(2)(a) : i9s this correct ?

Examples of other potentially acceptable ~~-~~test standards that may be used for curtain wall systems ~~, include:~~

- ~~such as~~ ANSI/ASTM E2307, "Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus" or
- BS EN 1364-4:2014 “Fire resistance tests for non-loadbearing elements”, may be acceptable.

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~~, or BS EN 1364-4:2014 “Fire resistance tests for non-loadbearing elements”, may be acceptable.~~

5.0 External cladding system vertical fire spread - risk assessment approach

A simplified risk assessment approach has been developed to ~~identify~~ classify a building's~~the~~ level of complexity and fire ~~risk for the building for the purpose of identifying suitable fire test~~ risk to help identify suitable fire test protocols to assess~~protocols for the contribution of~~ the cladding system ~~to~~for ~~-~~external vertical spread of fire. The parameters considered are:

- Building Height
- Vulnerability of Risk Group
- Provision of an automatic fire sprinkler system to the requirements of NZS 4541 (as modified by the NZBC)

How to use this table – find the risk level L, M or H applying to the building based on the building height and risk group. Refer to the table key to determine the fire testing protocol options considered acceptable for the applicable risk level.

Table 1. External Wall Cladding System – Risk Matrix for Fire Testing Protocols

Building Height	Sleeping Use* Risk groups SM, SI		Non-Sleeping Use* Risk groups CA, WB, WS, VP	
	Sprinkler protected	Non-sprinkler protected	Sprinkler protected	Non-sprinkler protected
Single level	L	L	L	L
0-10 m and up to 2 levels	L	L	L	L
> 10 m ≤ 25 m	M †	H	M	M
> 25 m and ≤ 60 m	H	n/a	M	n/a
> 60 m	H	n/a	H	n/a

* For a building height ≤ 10 m, cladding systems used for Importance Level 4 buildings or multi-floor buildings incorporating staged evacuation, phased evacuation, or evacuation to a place of relative safety within the building should meet the requirements for risk levels M or H given below.

† Where a NZS 4515 residential sprinkler system is installed then the non-sprinkler risk level in column 3 should be used instead (i.e. risk level H given below).

Where risk levels L, M and H are matched to fire testing protocols P1 to P5 as follows:

L	**Low**	No requirement for building height < 10 m (NZ Building Code Performance Clause C3.5).

M	**Medium**	P1. All cladding and Rigid Air Barriers (RABs) used in the external wall construction may be individually tested using ISO 5660-1 to meet requirements in C/AS2 to C/AS7 Section 5.8. Insulation products, and filler materials (not including gaskets, sealants etc) to be limited combustibility*. All external wall cavities need to be fire stopped using cavity barriers at each floor level and at the junctions to other vertical fire separations. ACP materials must be tested without Aluminium (metal) facing as per C/AS2 to C/AS7 Appendix C7.1.5. Any of options P2-P5 below are also acceptable.
H	**High**	P2. External wall cladding system may meet the performance criteria given in BR 135 for cladding systems using full scale test data from BS 8414-1:2002 or BS 8414-2: 2005; or P3. External wall cladding system may pass the NPFA 285 full scale test; or P4. External wall cladding system may meet 'EW' classification in AS 5113; or P5. All cladding, framing**, insulation products**, RAB and filler materials (not including gaskets, sealants etc) used in the external wall construction may be of *limited combustibility**. If vapour barriers, drainage mats, building wraps or similar are not of *limited combustibility** then all external wall cavities need to be fire stopped using cavity fire barriers at each floor level.

* *Limited combustibility* means the product/material meets one or more of the following criteria:

1. A1 or A2 classification in accordance with EN 13501-1:2007+A1:2009.
2. Non-combustible or not combustible when tested to AS 1530.1 or ISO 1182.
3. Concrete, brick/block masonry, stone, glass, ceramic tiles, aluminium and steel with or without paint or similar thin surface coatings not exceeding 1 mm thickness.

** Timber framing (or combustible insulation products within a framed wall assembly) may be used if a robust protective lining material (being of *limited combustibility*) is fixed to the exterior side of the framing and can be demonstrated to remain in place and protect the framing during the period of external fire exposure. 'Protect framing' can be assumed to be achieved if the protective lining material as part of a light timber frame wall exposed to the test conditions of AS 1530.4, can be shown to prevent charring of the timber frame for a period of 30 minutes. One way to determine this is to limit the temperature on the cavity

side of the fire-exposed protective lining material during the test period to be no greater than 300 ~~°C~~degrees Celsius.

5.1 Use of combustible RAB

A combustible Rigid Air Barrier (RAB) e.g. plywood, may be used for any building if it has been included as part of a representative external wall subjected to a full-scale fire test and meeting the criteria in given P2-P4 in the risk matrix.

5.2 External Walls of any height located within 1 m of a relevant boundary.

To limit potential horizontal fire spread to and from a neighbouring property, the exterior cladding material shall either be of limited combustibility or be tested using ISO 5660-1 to meet the requirements in C/AS2 to C/AS7 Section 5.8. The test specimen shall comprise the cladding material mounted over a representative substrate if the cladding material is less than 50 mm thick.

> NOTE: This is not a vertical fire spread provision and needs to be considered in addition to the requirements of Table 1.

It is also acceptable for the exterior cladding material to be tested using ISO 5660-1 using an external irradiance of 30 kW/m^2 and not ignite within the period of time given in NZBC C3.7.

5.3 Technical Assessment in Lieu of Test

Cladding products and systems range in nature and complexity. There are also a range of base wall assemblies that may impact upon how the outer weather facing part of a cladding system product will perform. Examples include:

- Exterior insulation finish systems (EIFS)
- High Pressure Laminates (HPL)
- External thermal insulation composite systems (ETICS)
- Rain screen Cladding
- Structural insulation panel systems (SIPS)
- Expanded Polystyrene Systems (EPS)
- Timber cladding

Key system performance considerations ~~which~~ that must be considered in a technical assessment are:

- Combustibility of insulation
- Combustibility of framing (e.g. timber frame)
- Composition of rigid air barrier
- Building underlay
- Uninterrupted vertical cavity
- Continuity of products.

In order for an external wall cladding system to be certified for fire safety performance, it needs to be constructed to replicate the details of the test. This includes for example, framings, substrate, flashing details, gaskets, sealants and fixing mechanisms.

A technical assessment may be presented as part of the plans and specifications to demonstrate compliance with the performance requirements of the Building Code. Situations may arise where the proposed cladding system installation differs slightly from the absolute details of that described in a fire test report. A technical assessment ~~is required to~~should be provided by an ~~from an~~ accredited testing laboratory or from a subject matter expert with knowledge and experience in fire science and fire ~~testing~~ testing~~is required~~.

6.0 Documentation and Evidence for Building Consent

When considering an application for a building consent the Building Consent Authority (BCA) needs to be satisfied on reasonable grounds that the provisions of the building code would be met if the building work were properly completed in accordance with the plans and specifications that accompanied the application.

The BCA needs evidence of which compliance pathway you are using to show how the building cladding system meets the performance requirements of the Building Code and evidence to show how it can be constructed to comply.

BCAs may wish to consider the following when assessing external wall cladding systems case-by-case:

- the extent of combustible products used on the building (i.e. is it a feature or the entire cladding?)
- the building use (occupancy type)
- the active (e.g. alarms and sprinklers) and passive (e.g. firewalls and smoke compartments) fire protection systems throughout the building
- the system tested by the manufacturer or supplier and whether its use is consistent with this (and if not, are the changes likely to negatively affect the building's fire performance?)
- the quality and accuracy of the Building Consent documentation and detailing in relation to external wall assemblies (i.e. can the cladding system be constructed from the information that has been provided?)
- the height and proximity of the building to other buildings
- the use of plastics (e.g. polyethylene core aluminium composite panel); the content of the specific product and its use
- if the design has been reviewed / peer reviewed by a suitably qualified and experienced person.

7.0 Useful Resources & References

1. New Zealand Building Code on the New Zealand legislation website -

s 9(2)(a) Suggest we add the dates associated with these documents where available. Eg AS5113, ISO5660

2. Wade, C.A., (1995), BRANZ, Report Number 133, *Fire Performance of External Wall Claddings under a Performance Based Building Code on the* BRANZ *website*. http://www.branz.co.nz/books_popup.php?id=20644
3. National Fire Protection Association (NFPA) 285, Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.
4. AS 5113 Fire propagation testing and classification of external walls of buildings.
5. ISO 5660 Reaction-to-fire tests Part 1 Heat release rate (cone calorimeter method).
6. EN ISO 1182: 2010. Fire Test for Non-Combustibility of Building Products.
7. AS 1530.1 Methods for fire tests on building materials and structures Part 1: Combustibility test for materials.
8. Lamont, S. & Ingolfsson, S. (2018) *High rise Buildings with Combustible Exterior Wall Assemblies: Fire Risk Assessment Tool* ,on the National Fire Protection Association (NFPA) website , USA.
9. White N. and Delichatsios M., (2014) Fire Hazards of Exterior Wall Assemblies Containing Combustible Components, Fire Protection Research Foundation Report (EP142293). https://www.nfpa.org/-/media/Files/News-and-Research/Fire-statistics-and-reports/Building-and-life-safety/RFFireHazardsofExteriorWallAssembliesContainingCombustibleComponents.ashx?la=en
10. BS 8414-1 & 2:2015+A1:2017 Fire performance of external cladding systems. Test method for non-loadbearing external cladding systems applied to the masonry face of a building.
11. BR 135: 2013 Fire performance of external thermal insulation for walls of multi-storey buildings: (BR 135) Third edition. BRE Trust.
12. EN 13501-1:2007+A1:2009. Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests.
13. ANSI/ASTM E2307, "Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus".
14. BS EN 1364-4:2014 “Fire resistance tests for non-loadbearing elements”

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