
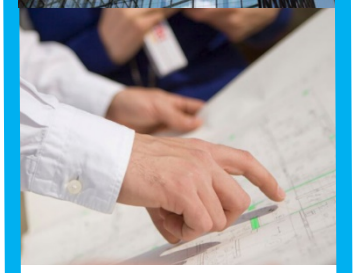
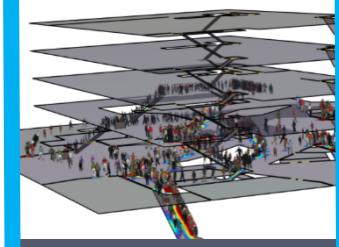
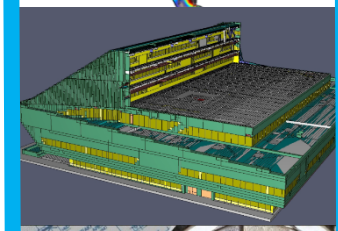

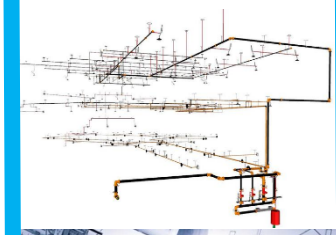

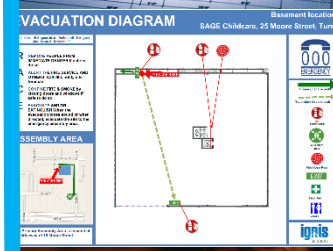

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3M DI-NOC Architectural Finish

PRODUCT and GROUP NUMBER ASSESSMENT TO AS 5637.1

IGNS-8110 I02 R00

Issued: 18.07.2023

Valid for:

- NCC Vol 1 BCA 2019 including Amendment 1

DOCUMENT REVISION HISTORY

Issue	Revision	Date	Purpose of Issue	Prepared by	Reviewed by
01	00	15.04.2020	Issued to client	JY	BHB
02	00	30.03.2021	Revised	JY	BHB
02	01	18.07.2023	Finalised	JY	BHB

Client / Manufacturer

3M
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Written by
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Authorised by
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CPEng, NER (Fire Safety / Mech) 2590091, RPEQ 11498, BPB-C10-1875, EF-39394
MFireSafety (UWS), BEng (UTS), GradDipBushFire (UWS), DipEngPrac (UTS), DipEng (CIT)

CONDITIONS AND LIMITATIONS

This assessment report does not provide an endorsement by Ignis Solutions Pty Ltd of the actual product evaluated.

The conclusions of this assessment may be used to directly assess fire hazard, but it should be recognised that a single test method will not provide a full assessment of fire hazards under all conditions.

Because of the nature of fire testing, and the consequent difficulty in quantifying the uncertainty of measurement, it is not possible to provide a stated degree of accuracy. The inherent variability in test procedures, materials and methods of construction, and installation may lead to variations in performance between elements of similar construction.

The assessment can therefore relate only to the actual prototype test specimens, testing conditions and methodology described in the referenced documents, and does not imply any performance abilities of constructions of subsequent manufacture.

This assessment is based on information and experience available at the time of preparation. The published procedures for the conduct of tests and the assessment of test results are the subject of constant review and improvement and it is recommended that this report is reviewed on or, before, the stated expiry date.

This report is prepared in good faith and with due care for information purposes only, and should not be relied upon as providing any warranty or guarantee. In particular, attention is drawn to the nature of the inspection and investigations undertaken and the limitations these impose in determining with accuracy the state of the building, its services or equipment and life safety.

Ignis Solutions' involvement in the Project is limited to the role outlined in section 2 'Scope of Service' of the Letter. This report reflects that role. Any reliance on, or use of, this report for purposes outside the scope of service is at the user's own risk.

Ignis Solutions shall not be held liable for any loss or damage resulting from any defect of the building or its services or equipment or for any non compliance of the building or its services or equipment with any legislative or operational requirement, whether or not such defect or non-compliance is referred to or reported upon in this report, unless such defect or non-compliance should have been apparent to a competent engineer undertaking the evaluation of the type undertaken for the purpose of preparation of this report.

Ignis Solutions has carefully reviewed and applied to the best of our ability the requirements of local Legislation, the current NCC and the International Fire Engineering Guidelines. Any changes to the reference documents including the NCC should warrant a review of this report.

AUTHORISER EXPERIENCE

Benjamin is a well-known and respected fire safety engineer in Australia known for his work on occupant life safety studies, design and application of fire safety systems for occupant life protection as well as establishing Australia's first multi-function private fire safety testing and research facility, Ignis Labs, in the Canberra region. Ignis Labs is accredited with the National Association of Testing Authorities (NATA) accreditation number 20534. With over 20 years experience in fire safety, Benjamin combines knowledge of industry review and regulation matters with experience in fire-safety engineering to provide expert advice. With a Masters of Fire Safety Engineering and Graduate Diploma in Bushfire Engineering from the University of Western Sydney as well as a Bachelor of Engineering from the University of Technology, Sydney. In 2012, Benjamin established Ignis Solutions, a fire safety engineering consultancy, and in 2017 established Ignis Labs, an accredited fire safety test and research facility. Benjamin continues to be the Chief Executive Officer of Ignis Solutions and Ignis Labs. Benjamin is responsible for managing Ignis Group as their Chief Executive Officer, overseeing test projects, internal research studies as well as private client research studies, client liaison, compiling BCA fire safety audits, performance solutions reports, computer modelling of fire scenarios and product compliance evaluation. Prior to establishing the Ignis Group, Benjamin has consulted on a wide range of projects including reviewing and auditing performance based designs with Australia's largest fire brigade (Fire and Rescue NSW) as their senior fire engineer. Benjamin received the highest civilian award, the meritorious service award, for his work with Fire and Rescue NSW in the evaluation of performance based designs and advancements in fire service involvement in building designs. Benjamin has completed several hundred performance based designs on a wide range of projects such as infrastructure, assembly, residential, commercial, industrial as well as high-rise buildings throughout Australia.
This report has been prepared by Benjamin Hughes-Brown, Chartered Professional Fire Safety Engineer. This advice can be considered as a certificate from professional engineer in accordance with Clause A5.2(1)(e) of BCA 2019.

TABLE OF CONTENTS

1 INTRODUCTION

1.1 General

The purpose of this assessment is to report the applicable use and compliance of 3M DI-NOC Architectural finish against the requirements of the National Construction Code – Volume One – Building Code of Australia 2019 (BCA) to be used as an internal lining to walls and ceiling as well as within internal walls of buildings of Type A, B and C.

The following evaluation considers the compliance of the 3M DI-NOC Architectural finish in accordance with AS 5637.1:2015 under BCA Clause C1.10 Clause 4. The AS/NZS 3837 testing included the specimen being a self-adhesive decorating film with the nominal composition being PVC.

The testing has been undertaken by Ignis Labs in accordance with AS/NZS 3837:1998. The 1998 version of the standard is still current and was re-affirmed in 2016.

This is a report from professional engineer in accordance with Clause A5.2 (1)(e) of BCA 2019. Benjamin Hughes-Brown is a Chartered Professional Engineer and Fellow of Engineers Australia with over 15 years experience in fire safety engineering. Benjamin satisfies the criteria established by BCA 2019 Clause A5.2 being a professional engineer. This is a report from a professional engineer.

1.2 Product

As sponsor described the product is a plasticised Polyvinyl Chloride PVC film with acrylic pressure sensitive adhesives. It has a smooth surface with a fine embossed texture. It has a nominal mass of 245gsm and a nominal thickness of 0.2mm. The colour of the tested specimens is brown. It will be used as decorative surface finish.

The 3M Di-DOC architectural finish has been evaluated finish in accordance with AS 5637.1:2015 based on the test result of AS/NZS 3837:1998 and considered to comply with the requirements of the BCA in the following for use on internal walls and/or ceilings:

BCA Clause	3M DI-NOC Architectural finish	Test Report
Clause C1.10, Specification C1.10 Clause 4	IGNL-3163-07-05R I02R00 dated 30.03.2021	
AS/NZS 3837:1998		
Group Number		1
Average Specific Extinction Area		257.77 m^2/kg

The following evaluation considers the compliance of 3DI-NOC Architectural finish in accordance with AS/NZS 3837:1998 under BCA Clause C1.10 Clause 4 being a cone calorimeter for the assignment of a NCC Group Number. All products with the exception of the DI-NOC Architectural finish can be used in a sprinklered or non-sprinklered building.

This report is issued by Benjamin Hughes-Brown, Chartered Professional Engineer or Ignis Solutions Pty Ltd, Suite 08, 14 Lonsdale Street, Braddon, ACT, 2612 for use under the Deemed-to-Satisfy requirements of the National Construction Code Volume One – Building Code of Australia 2019 (BCA).

1.3 Testing Body and Report

Ignis Labs Pty Ltd

3 Cooper Place

Queanbeyan NSW 2620

- DI-NOC Architectural finish IGNL-3163-07-05R dated 26.03.2021.

1.4 National Construction Code Clause C1.10 Fire Hazard Properties

The following clauses of the BCA (including all related Sate and Territory variations) have been evaluated and identified as being complied with:

- Performance Requirement CP2 and CP4
  - Clause C1.10
    - Sub-clause (a)(ii) wall linings and ceiling linings that comply with Specification C1.10 Clause 4

3M DI-NOC Architectural finish	
Group Number	1
Average Specific Extinction Area	257.77 m^2/kg

1.5 Application

From the above testing of the 3M DI-NOC Architectural finish has been evaluated and deemed suitable for use in Class 2-9 buildings within the building envelope for Type A, B or C construction as follows:

A | Internal Wall and/or Ceiling soffit lining

The installation is to be in a sprinkler or non-sprinkler protected compartment.

BCA Clause	**Test Report**
Clause C1.10, Specification C1.10 Clause 4	IGNL-3163-07-05R I02R00 dated 30.03.2021
AS/NZS 3837:1998	
Group Number	1
Average Specific Extinction Area	257.77 m^2/kg

Installation Conditions

3M DI-NOC Architectural finish is to be installed in accordance with the 3M installation guide and is to be installed within a sprinkler protected building.

1.6 Group Number Assessment to AS 5637.1

The group number classification for the 3M DI-NOC Architectural finish has been evaluated by Ignis Solutions in accordance with the requirements of AS 5637.1 as required by NCC 2019.

This evaluation report relates only to the product as described herein and is based on the results evidenced by the accredited test reports as detailed herein. While the results of an accredited test may be used to directly assess fire performance, no single test method or result can provide a full assessment of any product under all fire conditions.

Ignis Solutions Pty Ltd makes no warranty as to the nature of individual examples of, batches of, or individual installations of the product, including methods and workmanship.

2 AS 3837:1998 TEST

The testing has been undertaken by Ignis Labs in accordance with AS/NZS 3837:1998 and result is referenced as below:

Specimen Identification
3M DI-NOC Architectural Finish
Specimen Description
The sponsor described the tested specimens as: Self-adhesive decorating film with the nominal composition being PVC. It has nominal mass of 245gsm and nominal of 0.2mm. The colour of the tested specimens is brown. It will be used as decorative surface finish.

Test Method	
Three (3) specimens were tested in accordance with the requirements of AS/NZS 3837. 3M DI-NOC architectural finish has a nominal thickness thinner than 6mm, and hence is tested with a substrate being fibre cement. The tests were stopped 2mins after the first flaming cease.	
Specimen Orientation	Horizontal
Irradiance	50 kW/m²
Edge Frame	Present
Wire grid	Not used
Result	
The time to sustain flaming shall not exceed **36.33** s.	
The peak heat release rate per unit area shall not exceed **46.34** kW/m²	
The average heat release rate per unit area for the first 60 seconds following ignition shall not exceed **14.95** kW/m²	
The total heat release shall not exceed **1.80** MJ/m²	
The average effective heat of combustion for the entire test shall not exceed **4.55** MJ/kg.	
The total mass loss shall not exceed **0.54** kg.	
The average smoke obscuration (specific extinction area) shall not exceed **257.77** m²/kg	

3 EMPIRICAL CORRELATION BETWEEN AS ISO 9705:2003 AND AS/NZS 3837:1998

According to Clause 5.3.1 of AS 5637.1:2015, only material for which there are correlations between cone calorimeter results and room test results shall be tested in the cone calorimeter for the purpose of determining a group number.

3M Australia has completed room test in accordance with AS ISO 9705:2003 for 3M Graphic Film Series 40. As described by the Sponsor, the material is plasticised Polyvinyl Chloride (PVC) film with acrylic pressure sensitive adhesives. It is a smooth gloss finish. The product has a nominal thickness of 0.2mm and a nominal mass per unit area of 245gsm. The material was white in colour. The film was applied in sheets and self-adhered to the fire grade plasterboard wall. The product is tested with a substrate being plasterboard.

The result is referenced as below:

BCA Clause	3M Graphic Film Series 40	Test Report
Clause C1.10, Specification C1.10 Clause 4		IGNL-3090-06R I02R00 dated 30.03.2021
AS ISO 9705:2003		
Group Number		1
Average Specific Extinction Area		8.28 m²/kg

3M DI-NOC Architectural Finish and 3M Graphic Film Series 40 products are compared below in consideration of the following factors in according with Appendix C of AS 5637.1:2015 for the applicability of results.

	3M DI-NOC Architectural Finish	3M Graphic Film Series 40
Nominal composition	Plasticised Polyvinyl Chloride (PVC) film with acrylic pressure sensitive adhesives	Plasticised Polyvinyl Chloride (PVC) film with acrylic pressure sensitive adhesives
Nominal density	245gsm	245gsm
Nominal thickness	0.2mm	0.2mm
Surface texture	Smooth surface with a fine embossed texture	Smooth gloss finish surface
Colour	Brown	White
Fixing arrangements	By using acrylic pressure sensitive adhesives	By using acrylic pressure sensitive adhesives
Substrate	Fibre cement	Plasterboard
Note: both fibre cement and plasterboard are non-combustible materials and hence their effects on the result of determining group number is minor.		

The comparison of 3M DI-NOC Architectural Finish and 3M Graphic Film Series 40 shows these two products are the equivalent products. Furthermore, the testing data between the two tests has presented an equivalent Group number result. The average specific extinction area results undertaken with the cone calorimeter has presented a value greater than 250 m^2/kg. This is predominantly due to the thin nature of the test specimen as well as the limited mass loss. The results from IGNL-3163-07-05R I02R00 dated 26.03.2021 for 3M DI-NOC Architectural Finish and IGNL-3090-06R I02R00 dated 26.03.2021 for 3M Graphic Film Series 40 is considered suitable for correlations between the AS ISO 9705 and AS/NZS 3837 for the product 3M DI-NOC Architectural Finish. It is important to note that any intumescing of the specimen during the AS/NZS 3837 testing will void the application of the results. Where substantial intumescing occurs the material is to be tested in accordance with AS ISO 9705. It is noted that the tested material maintained at least 3 specimens that did not intumesce during the test and provide valid results for the application in accordance with AS/NZS 3837.

As a result, 3M DI-NOC Architectural Finish can be tested in the cone calorimeter for the purpose of determine a group number.

4 DEFINITION AND REFERENCES

4.1 Definitions

Within the BCA a hierarchy of defined terms is established. The first level is defined terms as per Clause A1.1 of the BCA. The second level is the reference standard and the third is the Australian Macquarie Dictionary.

Flammability Index means the index number as determined by AS 1530.2.

Fire hazard properties means the following properties of a material or assembly that indicate how they behave under specific fire test conditions:

(a) Average specific extinction area, critical radiant flux and Flammability Index, determined as defined in Schedule 3.

(b) Smoke-Developed Index, smoke development rate and Spread-of-Flame Index, determined in accordance with Schedule 6.

(c) Group number and smoke growth rate index ($SMOGRA_{RC}$), determined in accordance with Specification C1.10 of Volume One.

Group number means the number of one of four groups of materials used in the regulation of fire hazard properties and applied to materials used as a finish, surface, lining, or attachment to a wall or ceiling.

Insulation, in relation to an FRL, means the ability to maintain a temperature on the surface not exposed to the furnace below the limits specified in AS 1530.4.

Reflective insulation means a building membrane with a reflective surface such as a reflective foil laminate, reflective barrier, foil batt or the like capable of reducing radiant heat flow.

Sarking-type material means a material such as a reflective insulation or other flexible membrane of a type normally used for a purpose such as water proofing, vapour proofing or thermal reflectance.

Smoke-Developed Index means the index number for smoke as determined by AS/NZS 1530.3.

Smoke growth rate index ($SMOGRA_{RC}$) means the index number for smoke used in the regulation of fire hazard properties and applied to materials used as a finish, surface, lining or attachment to a wall or ceiling.

Spread-of-Flame Index means the index number for spread of flame as determined by AS/NZS 1530.3.

4.2 References

The following information sources were used in the evaluation of the product. These references should be read in conjunction with this report.

[1] National Construction Code – 2019 – Volume One – Building Code of Australia Class 2 to 9 Buildings.
[2] Guide to the Building Code of Australia 2019 – Volume One, Class 2 to Class 9 Buildings', Australian Building Codes Board, 2019 (the Guide).
[3] International Fire Engineering Guidelines, Australian Building Codes Board, Canberra, 2005
[4] AS 5637.1:2015 Determination of fire hazard properties – wall and ceiling linings
[5] AS ISO 9705:2003 Fire tests – full scale room test for surface products
[6] AS/NZS 3837:1998 Method of test for heat and smoke release rates for materials and products using an oxygen consumption calorimeter.
[7] 480 Series Print Film IGNL-3163-07-01 dated 18 November 2019
[8] Envision Overlaminate 8548/49/50 IGNL-3163-07-02 dated 18 November 2019
[9] 35 series graphic film IGNL-3163-07-03 dated 18 November 2019
[10] Overlaminate 8509/10 IGNL-3163-07-04 dated 18 November 2019
[11] DI-NOC Architectural finish IGNL-3163-07-05 dated 18 November 2019
[12] Ignis Labs IGNL-3163-07-05C I02 R00 dated 30 March 2021
[13] Ignis Labs IGNL-3090-06R I02R00 dated 30 March 2021

5 BACKGROUND

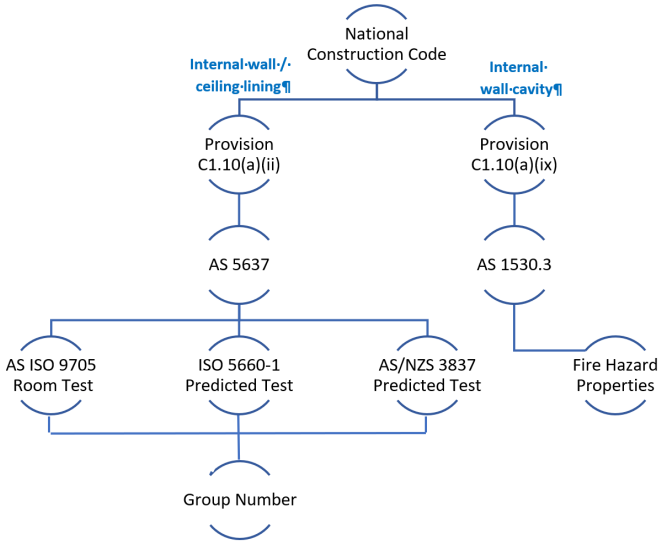
The testing of fire hazard properties in accordance with the BCA for wall/ceiling lining, insulation and sarking type material is in accordance with the requirements of Group numbers, Smoke Development Index, Spread-of-Flame Index and Flammability Index. AS 5637.1:2015 is a referenced document under the BCA whilst AS ISO 9705:2003, AS/NZS 3837:1998 and ISO 5660.1:2015 are secondary references contained within AS 5637.1:2015.

As detailed above in Definitions and further discussed below, the following test standards are referenced and applied within the BCA for determining the appropriate fire hazard properties.

The hierarchy of fire hazard property testing for internal lining and insulation cavity compliance is detailed below.

FIGURE 1:

HIERARCHY OF TEST STANDARDS FOR INTERNAL LINING COMPLIANCE



5.1 AS 5637:2015

This Standard sets out procedures for the assessment of internal wall and ceiling linings according to—

a) their tendency to ignite;
b) their tendency to release heat once ignition has occurred;
c) their tendency to cause flashover;
d) their tendency to release smoke; and
e) their contribution to fire growth,

and allows for determination of group number, smoke growth rate index ($SMOGRA_{RC}$) and, where required, average specific extinction area (ASEA).

The group number of a material shall be assigned as follows when tested in accordance with Clause 4.3 of the standard:

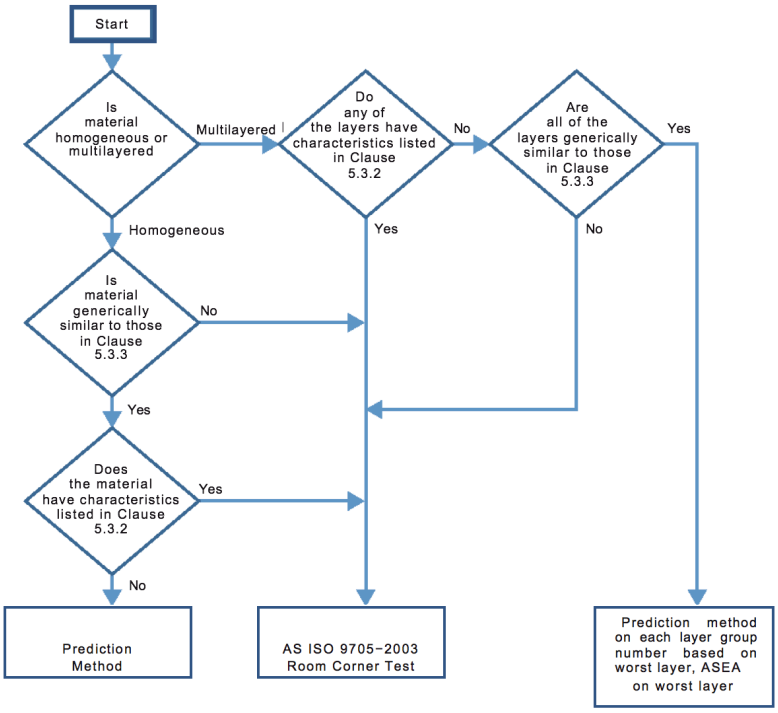
a) Group 1—material that does not reach flashover when exposed to 100 kW for 600 s followed by exposure to 300 kW for 600 s.
b) Group 2—material that reaches flashover following exposure to 300 kW within 600 s after not reaching flashover when exposed to 100 kW for 600 s.
c) Group 3—material that reaches flashover in more than 120 s but within 600 s when exposed to 100 kW.

d) Group 4—material that reaches flashover within 120 s when exposed to 100 kW.

The group number of a material shall be determined by either—

a) physical testing in accordance with AS ISO 9705:2003; or
b) if the material has a confirmed correlation, prediction in accordance with Clause 4.4 using data obtained by testing the material at 50 kW/m^2 irradiance in the horizontal orientation with edge frame in accordance with ISO 5660-1:2015 or AS/NZS 3837:1998, as appropriate to the test conducted.

FIGURE 2:
AS 5637:2015 GUIDANCE ON SELECTION OF TEST METHOD



As referenced in the above figure, Clause 5.3.2 details unsuitable materials for empirical correlations (i.e. small scale cone calorimeter testing) as well as Clause 5.3.3 which details the materials which are permitted to be tested by way of empirical correlations. Clause 5.3.2 and Clause 5.3.3 of AS 5637:2015 are detailed below.

5.3.2 Unsuitable materials

The empirical correlations shall not be used for products or assemblies—

a) with profiled facings not allowed by AS/NZS 3837:1998;
b) that contain materials that melt or shrink away from a flame;
c) with joints or openings; and
d) with a reflective surface.

5.3.3 Materials for which the correlation is permitted include—

a) painted or unpainted paper-faced gypsum plasterboard;
b) solid timber and wood products such as particleboard and plywood; and
c) rigid non-thermoplastic foams such as polyurethane.

The 3m range of timber products have been correlated through testing in accordance with AS ISO 9705 and is considered suitable for testing under AS.NZS 3837:1998.

5.2 AS/NSZ 3837:1998 / ISO 5660.1:2015

AS/NZS 3837:1998 and similarly ISO 5660.1:2015 specify a test method for measuring the response of materials exposed to controlled levels of radiant heating with or without an external igniter. The test method is used to determine the ignitability, heat release rates, mass loss rates, effective heat of combustion, and smoke release of materials and products.

Properties are determined as follows:

a) Rate of heat release, by measurement of the oxygen consumption, as determined by the oxygen concentration and the flow rate in the exhaust product stream.
b) Effective heat of combustion from a concomitant measurement of specimen mass loss rate, in combination with the heat release rate.
c) Smoke release, by obscuration of light by the combustion product stream.
d) Ignitability, as a measurement of time from initial exposure to time of sustained flaming.

The purpose of the standards is to establish a test method for material and product evaluations, mathematical modelling, design purposes or development and research. The material may comprise specimens from an end-use product or the various components used in the end-use product.

Specimens may be exposed to heating fluxes ranging from 0 to 100 kW/m2. External ignition, when used, is by electric spark. The value of the heating flux and the use of external ignition are to be as specified in the relevant material or performance standard. The normal specimen testing orientation is horizontal, independent of whether the end-use application involves a horizontal or a vertical orientation. Provisions are also made for vertical orientation testing; this is intended for exploratory or diagnostic studies only.

The test method is based on the observation that, generally, the net heat of combustion is directly related to the amount of oxygen required for combustion. The relationship is that approximately 13.1 × 103 kJ of heat are released per 1 kg of oxygen consumed. Specimens in the test are burned in ambient air conditions, while being subjected to a predetermined external heat flux, which can be set from 0 to 100 kW/m^2. Burning may be either with or without a spark ignition. The primary measurements are oxygen concentrations and exhaust gas flow rate. Additional measurements include the mass-loss rate of the specimen, the time to sustained flaming and smoke obscuration, or as required by the relevant material or performance Standard.

This test method is used primarily to determine the heat released from a fire involving products of the test material. Also included is a determination of the effective heat of combustion, mass loss rate, the time to sustained flaming and smoke released. These properties are determined on small size specimens that are representative of those in the intended end use.

This test method is applicable to various categories of products and is not limited to representing a single fire scenario.

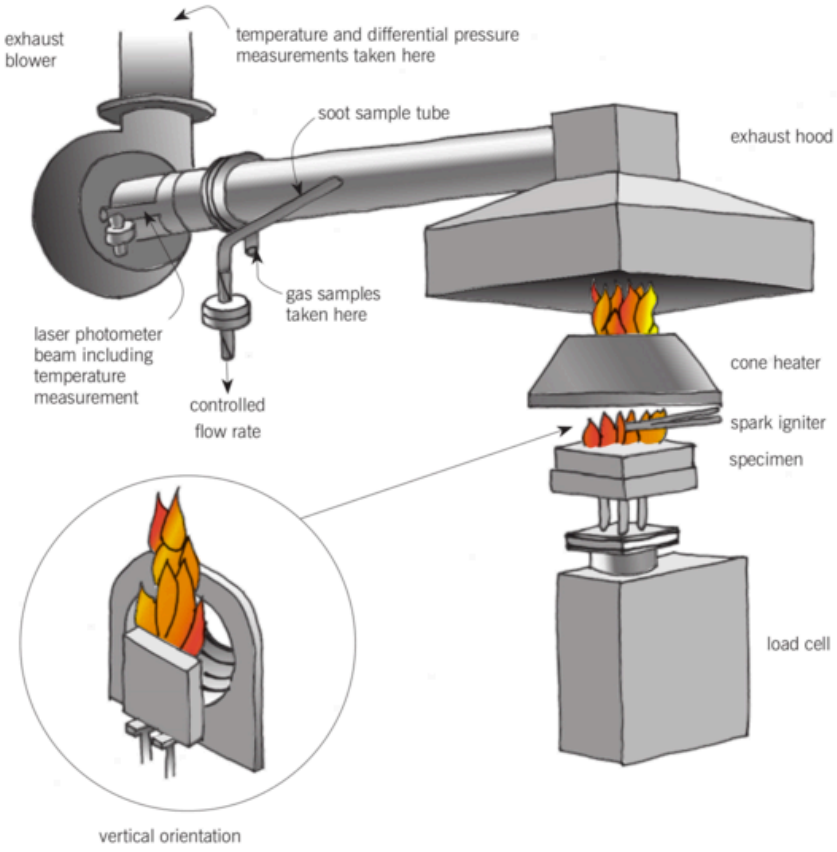
These Standards should be used to measure and describe the properties of materials, products, or assemblies in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard of materials, products, or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire hazard assessment which takes into account all of the factors that are pertinent to an assessment of the fire hazard of a particular end use.

These Standards do not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user of the Standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. Many common combustibles do not have

the geometrically simple surfaces required to make computations of this kind. Other complications, such as melting, dripping, or collapsing can also preclude a detailed mathematical analysis.

FIGURE 3:

AS/NZS 3837:1998 / ISO 5660.1:2015 CONE CALORIMETER TEST ASSEMBLY



6 SUMMARY OF TEST RESULTS

The assessment evaluates the product as an internal wall/ceiling lining achieving the following results:

BCA Clause	DI-NOC Architectural finish	Test Report
Clause C1.10, Specification C1.10 Clause 4	IGNL-3163-07-05R I02R00 dated 30.03.2021	
AS/NZS 3837:1998		
Group Number		1
Average Specific Extinction Area		257.77 m^2/kg

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