



REGULATORY INFORMATION REPORT

Fire Hazard Properties of timber floor, wall and ceiling
linings in accordance with requirements of
NCC 2019 Volume One

Client: Forest and Wood Products Australia Limited

Job number: 41117 Issuing consultant: Mahmoud Akl

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16/11/2021	RIR 41117.10	Revised the introduction section to confirm assessment of timber species in accordance with AS 5637.1:2015

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CONTENTS

1	INTRODUCTION	4
2	SUMMARY OF REQUIREMENTS OF NCC Volume One, SPECIFICATION C1.10	4
	2.1 Wall and Ceiling Lining materials	4
	2.2 Flooring materials	6
	2.3 Tested Materials	7
3	TEST RESULTS	9
4	VALIDITY	11
5	AUTHORITY	12
	5.1 Applicant Undertakings and Conditions of Use	12
	5.2 General Conditions of Use	12
	5.3 Authorisation on Behalf of Warringtonfire Aus Pty Ltd	12
	5.4 Date of Issue	12
	5.5 Expiry Date	12

1 INTRODUCTION

This report contains the minimum information sufficient for regulatory compliance and refers to the assessment report 41117.10. The referenced report is prepared at the request of Forest and Wood Products Australia Limited (FWPA) as a summary on the fire hazard properties of various timber species to be used as floor, wall and ceiling linings, in accordance with the requirements of NCC 2019 Volume One. Specification C1.10 (Fire hazard properties) sets out requirements and relevant test standards to determine the fire hazard properties of linings, materials and assemblies in Class 2 to 9 buildings.

The referenced report also documents the findings of the assessment undertaken to determine the expected fire hazard properties of various timber species – used as wall and ceiling linings – summarised in section 3 if assessed in accordance with AS 5637.1:2015.

The referenced report is not intended to be a comprehensive assessment on the fire hazard properties of all timber species.

2 SUMMARY OF REQUIREMENTS OF NCC VOLUME ONE, SPECIFICATION C1.10

2.1 WALL AND CEILING LINING MATERIALS

The NCC requires a wall or ceiling lining system to comply with the group numbers specified in Table 1. For buildings not fitted with a sprinkler system (other than FPAA101D or FPAA101H) complying with Specification E1.5, the NCC also requires the following:

1. A smoke growth rate index not more than 100; or
2. A specific extinction area less than 250 m²/kg.

Table 1: Wall and Ceiling Lining Materials (Material Groups Permitted). Source: NCC 2019 Volume One.

Class of building	Fire-isolated exits and fire control rooms	Public corridors	Specific areas	Other areas
Class 2 or 3, Unsprinklered Excluding accommodation for the aged, people with disabilities, and children	Walls: 1 Ceilings: 1	Walls: 1, 2 Ceilings: 1, 2	Walls: 1, 2, 3 Ceilings: 1, 2, 3	Walls: 1, 2, 3 Ceilings: 1, 2, 3
Class 2 or 3, Sprinklered Excluding accommodation for the aged, people with disabilities, and children	Walls: 1 Ceilings: 1	Walls: 1, 2, 3 Ceilings: 1, 2, 3	Walls: 1, 2, 3 Ceilings: 1, 2, 3	Walls: 1, 2, 3 Ceilings: 1, 2, 3
Class 3 or 9a, Unsprinklered Accommodation for the aged, people with a disability, children and <i>health-care buildings</i>	Walls: 1 Ceilings: 1	Walls: 1 Ceilings: 1	Walls: 1, 2 Ceilings: 1, 2	Walls: 1, 2, 3 Ceilings: 1, 2, 3
Class 3 or 9a, Sprinklered Accommodation for the aged, people with a disability, children and <i>health-care buildings</i>	Walls: 1 Ceilings: 1	Walls: 1, 2 Ceilings: 1, 2	Walls: 1, 2, 3 Ceilings: 1, 2, 3	Walls: 1, 2, 3 Ceilings: 1, 2, 3
Class 5, 6, 7, 8 or 9b <i>schools</i> , Unsprinklered	Walls: 1 Ceilings: 1	Walls: 1, 2 Ceilings: 1, 2	Walls: 1, 2, 3 Ceilings: 1, 2	Walls: 1, 2, 3 Ceilings: 1, 2,

Class of building	Fire-isolated exits and fire control rooms	Public corridors	Specific areas	Other areas
				3
Class 5, 6, 7, 8 or 9b schools, Sprinklered	Walls: 1 Ceilings: 1	Walls: 1, 2, 3 Ceilings: 1, 2, 3	Walls: 1, 2, 3 Ceilings: 1, 2, 3	Walls: 1, 2, 3 Ceilings: 1, 2, 3
Class 9b other than schools, Unsprinklered	Walls: 1 Ceilings: 1	Walls: 1 Ceilings: 1	Walls: 1, 2 Ceilings: 1, 2	Walls: 1, 2, 3 Ceilings: 1, 2, 3
Class 9b other than schools, Sprinklered	Walls: 1 Ceilings: 1	Walls: 1, 2 Ceilings: 1, 2	Walls: 1, 2, 3 Ceilings: 1, 2, 3	Walls: 1, 2, 3 Ceilings: 1, 2, 3
Class 9c, Sprinklered	Walls: 1 Ceilings: 1	Walls: 1, 2 Ceilings: 1, 2	Walls: 1, 2, 3 Ceilings: 1, 2, 3	Walls: 1, 2, 3 Ceilings: 1, 2, 3

The group number is a measure of ignitability and heat release rate of a material, expressed as a number from 1 to 4, depending on when the material reaches flashover. It can be determined by either:

1. Physical testing in accordance with AS ISO 9705 – 2003; or
2. Small scale testing at 50 kW/m² irradiance in the horizontal orientation in accordance with ISO 5660-1 or AS/NZS 3837.

The procedures and test methodologies to determine the group numbers are prescribed in AS5637.1:2015. The selection of test methods depends upon the type of material, as shown in Figure 1. Refer to the standard for more details.

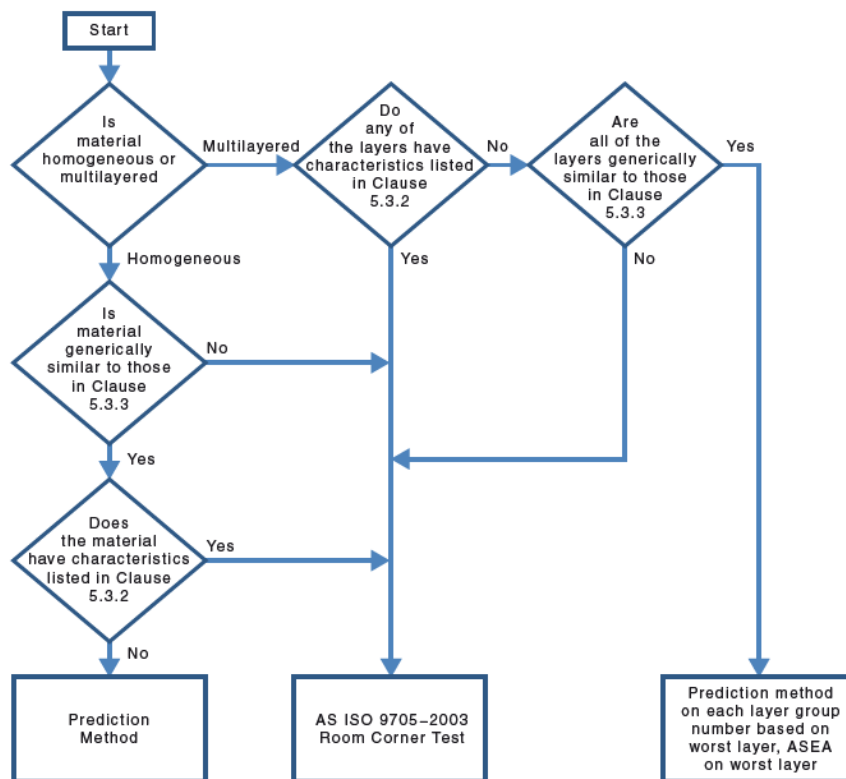


Figure 1: Guidance on selection of test methods. Source: AS 5637.1:2015

2.2 FLOORING MATERIALS

The NCC defines the performance of flooring materials in terms of the critical radiant flux and smoke development rate when tested in accordance with AS ISO 9239.1-2003 Reaction to fire tests for floorings Part 1: Determination of the burning behaviour using a radiant heat source. The critical radiant flux is the incident heat flux expressed in kW/m², at the surface of a specimen at the point where the flame ceases to advance and may subsequently extinguish.

The NCC Specification C1.10 defines the required critical radiant flux for various classes of buildings. It is reproduced below in Table 2 for reference:

Table 2 - NCC Specification C1.10 Critical Heat Flux requirements for flooring materials and floor coverings. Source: NCC 2019 Volume One.

Class of building	Building not fitted with a sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification E1.5	Building fitted with a sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification E1.5	Fire-isolated <i>exits</i> and fire control rooms
Class 2, 3, 5, 6, 7, 8 or 9b, excluding— (i) Class 3 accommodation for the aged; and (ii) Class 9b as specified below	2.2 kW/m ²	1.2 kW/m ²	2.2 kW/m ²
Class 3	4.5 kW/m ²	2.2 kW/m ²	4.5 kW/m ²

Class of building	Building not fitted with a sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification E1.5	Building fitted with a sprinkler system (other than a FPAA101D or FPAA101H system) complying with Specification E1.5	Fire-isolated <i>exits</i> and fire control rooms
Accommodation for the aged			
Class 9a <i>Patient care areas</i>	4.5 kW/m ²	2.2 kW/m ²	4.5 kW/m ²
Class 9a Areas other than <i>patient care areas</i>	2.2 kW/m ²	1.2 kW/m ²	4.5 kW/m ²
Class 9b auditorium or audience seating area used mainly for indoor swimming or ice skating	1.2 kW/m ²	1.2 kW/m ²	2.2 kW/m ²
Class 9b auditorium or audience seating area used mainly for— other sports or multi-purpose functions.	2.2 kW/m ²	1.2 kW/m ²	2.2 kW/m ²
Class 9c <i>resident use areas.</i>	N/A	2.2 kW/m ²	4.5 kW/m ²
Class 9c Areas other than <i>resident use areas.</i>	N/A	1.2 kW/m ²	4.5 kW/m ²

In a building not protected by a sprinkler system complying with Specification E1.5, a maximum smoke development rate of 750 percent-minutes is additionally prescribed by the NCC.

2.3 TESTED MATERIALS

The timber species and average densities that have been evaluated for wall and ceiling linings of the test samples are summarised in Table 3. Solid timber is considered essentially homogeneous and satisfies the requirements of clauses 4.4 and 5.3.3 of AS 5637.1:2015. Hence, group numbers and times to flashover for solid timber species were determined using empirical correlations based on cone calorimetry (AS/NZS 3837) tests.

The specimens incorporated a solid section or a single tongue and groove joint and were of smooth milled finish and 100mm x 100mm in size.

Table 3 Details of wall and ceiling test specimens

Timber species	Thickness (mm)	Density (kg/m ³)
Ash, Alpine - <i>Eucalyptus delegatensis</i>	19.2	603
Ash, Mountain – <i>Eucalyptus regnans</i>	19.5	686
Ash, Silvertop - <i>Eucalyptus sieberi</i>	19.6	838
Beech Myrtle - <i>Northofagus cunninghamii</i>	19.1	689
Blackbutt - <i>Eucalyptus pilularis</i>	19.1	898
Blackbutt, New England (1) - <i>Eucalyptus andrewsii</i>	19.1	939
Blackbutt, New England (2) - <i>Eucalyptus andrewsii</i>	19.2	874
Blackbutt, WA - <i>Eucalyptus pantens</i>	11.9	878
Blackwood - <i>Acacia melanoxylon</i>	19.2	632
Bloodwood Red - <i>Corymbia gummifera</i>	19	839
Box, Brush - <i>Lophostman confertus</i>	19.1	845
Box, Grey – <i>Eucalyptus microcarpa</i>	19	1,112
Box, Grey, Coast – <i>Eucalyptus bosistoana</i>	19	1119
Brownbarrel - <i>Eucalyptus fastigata</i>	19.5	770
Gum, Blue, Sydney - <i>Eucalyptus saligna</i>	19.1	733
Gum, Blue, Southern (TAS) - <i>Eucalyptus globulus</i>	19.1	776
Gum, Blue, Southern (VIC) - <i>Eucalyptus globulus</i>	19.3	937
Gum, Manna - <i>Eucalyptus viminalis</i>	19	769
Gum, Red, River - <i>Eucalyptus camaldulensis</i>	18.8	846
Gum, Rose – <i>Eucalyptus grandis</i>	19.1	720
Gum, Shining – <i>Eucalyptus nitens</i>	19.5	569
Gum, Spotted - <i>Corymbia maculata</i>	19.2	989
Gum, Sugar - <i>Eucalyptus cladocalyx</i>	19.1	1031
Gum, Yellow - <i>Eucalyptus leucoxyton</i>	19.1	1015
Ironbark, Grey – <i>Eucalyptus drepanophylla</i>	19	1,086
Ironbark, Red - <i>Eucalyptus sideroxyton</i>	19.2	1088
Jarrah - <i>Eucalyptus marginata</i>	19.2	834
Karri - <i>Eucalyptus diversicolor</i>	19.1	982
Mahogany, Red - <i>Eucalyptus resinifera</i>	19.2	876
Marri - <i>Eucalyptus callophylla</i>	11.9	814
Merbau - <i>Instia bijuga</i>	19	860
Messmate - <i>Eucalyptus obliqua</i>	19.3	754
Pine, Baltic - <i>Picea abies</i>	21.9	426
Pine, White Cypress - <i>Callitris glaucophylla</i>	20	667
Sheoak, WA - <i>Allocosuarina fraseriana</i>	11.9	689
Stringy Bark, Yellow - <i>Eucalyptus muellerana</i>	18.7	822
Tallowwood - <i>Eucalyptus microcorys</i>	19.2	990
Turpentine – <i>Syncarpa glomulifera</i>	19.1	1072
Wattle, Silver – <i>Acacia dealbata</i>	18.6	604

The timber species and average densities of the test samples that have been evaluated for flooring materials are summarised in Table 4. Each specimen incorporated tongue and groove joints was of smooth milled finish and 1050mm x 230mm in size.

Initial screening tests were carried out to ascertain the most severe orientation (grain parallel or perpendicular to the radiant heat source) and then the program completed by testing the most severe orientation.

Table 4 Details of flooring test specimens

Timber species	Thickness (mm)	Density (kg/m ³)
Ash, Alpine - <i>Eucalyptus delegatensis</i>	19.2	661
Ash, Mountain – <i>Eucalyptus regnans</i>	19.5	610
Ash, Silvertop - <i>Eucalyptus sieberi</i>	19.6	860
Beech Myrtle - <i>Northofagus cunninghamii</i>	19.1	736
Blackbutt - <i>Eucalyptus pilularis</i>	19.2	909
Blackbutt, New England (1) - <i>Eucalyptus andrewsii</i>	19.2	957
Blackbutt, New England (2) - <i>Eucalyptus andrewsii</i>	19.2	1060
Blackwood - <i>Acacia melanoxydon</i>	19.3	588
Bloodwood Red - <i>Eucalyptus gummifera</i>	19.0	897
Box, Brush - <i>Lophostosiphon confertus</i>	19.3	844
Box, Grey – <i>Eucalyptus microcarpa</i>	19.1	1,093
Brownbarrel - <i>Eucalyptus fastigata</i>	19.5	789
Gum, Blue, Sydney - <i>Eucalyptus saligna</i>	19.3	800
Gum, Blue, Southern (TAS) - <i>Eucalyptus globulus</i>	19.1	759
Gum, Blue, Southern (VIC) - <i>Eucalyptus globulus</i>	19.5	924
Gum, Manna - <i>Eucalyptus viminalis</i>	19.1	744
Gum, Red, River - <i>Eucalyptus camaldulensis</i>	18.9	845
Gum, Rose – <i>Eucalyptus grandis</i>	19.1	691
Gum, Shining – <i>Eucalyptus nitens</i>	19.5	708
Gum, Spotted - <i>Corymbia maculata</i>	19.2	974
Gum, Sugar - <i>Eucalyptus cladocalyx</i>	19.5	1038
Gum, Yellow - <i>Eucalyptus leucoxydon</i>	19.2	1001
Ironbark, Grey – <i>Eucalyptus drepanophylla</i>	19.1	1093
Ironbark, Red - <i>Eucalyptus sideroxydon</i>	19.1	1158
Jarraah - <i>Eucalyptus marginata</i>	19.3	853
Karri - <i>Eucalyptus diversicolor</i>	19.1	980
Mahogany, Red - <i>Eucalyptus resinifera</i>	19.2	938
Merbau - <i>Instia bijuga</i>	19.0	842
Messmate - <i>Eucalyptus obliqua</i>	19.3	771
Pine, Celerytop - <i>Phyllocladus asplenifolius</i>	19.4	588
Pine, Radiata – <i>Pinus Radiata</i>	19.6	530
Pine, White Cypress - <i>Callitris glaucophylla</i>	20.1	674
Stringy Bark, Yellow - <i>Eucalyptus muellerana</i>	18.9	820
Tallowwood - <i>Eucalyptus microcorys</i>	19.2	994
Turpentine – <i>Syncarpa glomulifera</i>	19.2	1044
Wattle, Silver – <i>Acacia dealbata</i>	19.0	597

The Messmate results were subject to high variability and therefore the lowest result was reported. Subsequent test may result in this value being increased.

3 TEST RESULTS

Table 5 summarises the test results obtained for wall and ceiling linings:

Table 5 Wall and Ceiling Lining Results

Timber species	Group Number	Average specific extinction area (m ² /kg)
Ash, Alpine - <i>Eucalyptus delegatensis</i>	3	<10
Ash, Mountain – <i>Eucalyptus regnans</i>	3	<10
Ash, Silvertop - <i>Eucalyptus sieberi</i>	3	<10
Beech Myrtle - <i>Northofagus cunninghamii</i>	3	<10
Blackbutt - <i>Eucalyptus pilularis</i>	3	<10
Blackbutt, New England (1) - <i>Eucalyptus andrewsii</i>	3	<10
Blackbutt, New England (2) - <i>Eucalyptus andrewsii</i>	3	<10
Blackbutt, WA - <i>Eucalyptus pantens</i>	3	<10
Blackwood - <i>Acacia melanoxylon</i>	3	<10
Bloodwood Red - <i>Corymbia gummifera</i>	3	<10
Box, Brush - <i>Lophostman confertus</i>	3	<10
Box, Grey – <i>Eucalyptus microcarpa</i>	3	<10
Box, Grey, Coast – <i>Eucalyptus bosistoana</i>	3	<10
Brownbarrel - <i>Eucalyptus fastigata</i>	3	<10
Gum, Blue, Sydney - <i>Eucalyptus saligna</i>	3	<10
Gum, Blue, Southern (TAS) - <i>Eucalyptus globulus</i>	3	<10
Gum, Blue, Southern (VIC) - <i>Eucalyptus globulus</i>	3	<10
Gum, Manna - <i>Eucalyptus viminalis</i>	3	<10
Gum, Red, River - <i>Eucalyptus camaldulensis</i>	3	<10
Gum, Rose – <i>Eucalyptus grandis</i>	3	<10
Gum, Shining – <i>Eucalyptus nitens</i>	3	<10
Gum, Spotted - <i>Corymbia maculata</i>	3	<10
Gum, Sugar - <i>Eucalyptus cladocalyx</i>	3	<10
Gum, Yellow - <i>Eucalyptus leucoxyton</i>	3	<10
Ironbark, Grey – <i>Eucalyptus drepanophylla</i>	3	<10
Ironbark, Red - <i>Eucalyptus sideroxyton</i>	3	<10
Jarraah - <i>Eucalyptus marginata</i>	3	<10
Karri - <i>Eucalyptus diversicolor</i>	3	<10
Mahogany, Red - <i>Eucalyptus resinifera</i>	3	<10
Marri - <i>Eucalyptus callophylla</i>	3	<10
Merbau - <i>Instia bijuga</i>	3	<10
Messmate - <i>Eucalyptus obliqua</i>	3	<10
Pine, Baltic - <i>Picea abies</i>	3	<10
Pine, White Cypress - <i>Callitris glaucophylla</i>	3	<10
Sheoak, WA - <i>Allocosuarina fraseriana</i>	3	<10
Stringy Bark, Yellow - <i>Eucalyptus muellerana</i>	3	<10
Tallowwood - <i>Eucalyptus microcorys</i>	3	<10
Turpentine – <i>Syncarpa glomulifera</i>	3	<10
Wattle, Silver – <i>Acacia dealbata</i>	3	<10

Table 6 summarises the test results obtained for flooring materials:

Table 6 Flooring Results

Timber species	Critical Radiant Flux (kW/m ²)	Smoke Development Rate (%-min)
Ash, Alpine - <i>Eucalyptus delegatensis</i>	3.6	10
Ash, Mountain - <i>Eucalyptus regnans</i>	2.7	10
Ash, Silvertop - <i>Eucalyptus sieberi</i>	4.1	16
Beech Myrtle - <i>Northofagus cunninghamii</i>	4.5	12
Blackbutt - <i>Eucalyptus pilularis</i>	4.3	5
Blackbutt, New England (1) - <i>Eucalyptus andrewsii</i>	6.5	6
Blackbutt, New England (2) - <i>Eucalyptus andrewsii</i>	4.9	8
Blackwood - <i>Acacia melanoxylon</i>	5.7	3
Bloodwood Red - <i>Eucalyptus gummifera</i>	6.2	9
Box, Brush - <i>Lophostman confertus</i>	5.0	19
Box, Grey - <i>Eucalyptus microcarpa</i>	8.8	6
Brownbarrel - <i>Eucalyptus fastigata</i>	4.3	9
Gum, Blue, Sydney - <i>Eucalyptus saligna</i>	3.9	23
Gum, Blue, Southern (TAS) - <i>Eucalyptus globulus</i>	6.4	13
Gum, Blue, Southern (VIC) - <i>Eucalyptus globulus</i>	5.0	12
Gum, Manna - <i>Eucalyptus viminalis</i>	3.6	9
Gum, Red, River - <i>Eucalyptus camaldulensis</i>	6.3	1
Gum, Rose - <i>Eucalyptus grandis</i>	3.4	16
Gum, Shining - <i>Eucalyptus nitens</i>	3.7	13
Gum, Spotted - <i>Corymbia maculata</i>	8.6	11
Gum, Sugar - <i>Eucalyptus cladocalyx</i>	6.3	1
Gum, Yellow - <i>Eucalyptus leucoxylon</i>	5.6	1
Ironbark, Grey - <i>Eucalyptus drepanophylla</i>	8.4	1
Ironbark, Red - <i>Eucalyptus sideroxylon</i>	9.6	11
Jarrah - <i>Eucalyptus marginata</i>	8.2	7
Karri - <i>Eucalyptus diversicolor</i>	5.9	4
Mahogany, Red - <i>Eucalyptus resinifera</i>	7.1	10
Merbau - <i>Instia bijuga</i>	9.9	1
Messmate - <i>Eucalyptus obliqua</i>	3.6	6
Pine, Celerytop - <i>Phyllocladus asplenifolius</i>	3.5	29
Pine, Radiata - <i>Pinus radiata</i>	3.5	7
Pine, White Cypress - <i>Callitris glaucophylla</i>	8.5	19
Stringy Bark, Yellow - <i>Eucalyptus muellerana</i>	3.5	1
Tallowwood - <i>Eucalyptus microcorys</i>	5.1	4
Turpentine - <i>Syncarpa glomulifera</i>	7.0	2
Wattle, Silver - <i>Acacia dealbata</i>	5.9	2

All the maximum smoke development rates were substantially below the limit of 750 percent-minutes.

The Messmate results were subject to high variability and therefore the lowest result was reported. Subsequent test may result in this value being increased.

4 VALIDITY

The referenced assessment report does not provide an endorsement by Warringtonfire Aus Pty Ltd of the actual products supplied.

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 hazard 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 only relate only to the actual prototype test specimens, testing conditions, and methodology described in the supporting data, 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 be reviewed on or, before, the stated expiry date.

The information contained in this report shall not be used for the assessment of variations other than those stated in the conclusions above. The assessment is valid provided no modifications are made to the systems detailed in this report. All details of construction should be consistent with the requirements stated in the relevant test reports and all referenced documents.

5 AUTHORITY

5.1 APPLICANT UNDERTAKINGS AND CONDITIONS OF USE

By using this report as evidence of compliance or performance, the applicant(s) confirms that:

- to their knowledge the component or element of structure, which is the subject of this assessment, has not been subjected to a fire test to the Standard against which this assessment is being made, and
- they agree to withdraw this assessment from circulation should the component or element of structure be the subject of a fire test by a test authority in accordance with the Standard against which this assessment is being made and the results are not in agreement with this assessment, and
- they are not aware of any information that could adversely affect the conclusions of this assessment and if they subsequently become aware of any such information, agree to ask the assessing authority to withdraw the assessment.

5.2 GENERAL CONDITIONS OF USE

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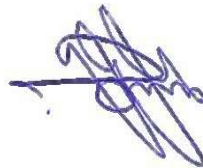
5.3 AUTHORISATION ON BEHALF OF WARRINGTONFIRE AUS PTY LTD

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5.5 EXPIRY DATE

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