



Construction of buildings in bushfire-prone areas



This Australian Standard® was prepared by Committee FP-020, Construction of Buildings in Bushfire-Prone Areas. It was approved on behalf of the Council of Standards Australia on 23 October 2018.

This Standard was published on 14 November 2018.

The following are represented on Committee FP-020:

- Australasian Fire and Emergency Service Authorities Council (AFAC)
 - Australian Building Codes Board
 - Australian Garage Door Association
 - Australian Institute of Architects
 - Australian Institute of Building Surveyors
 - Australian Roofing Tile Association
 - Australian Steel Institute
 - Australian Window Association
 - Bushfire Building Council of Australia
 - Consumers Federation of Australia
 - Department of Health and Human Services, Vic.
 - Fire Protection Association Australia
 - Forest and Wood Products Australia
 - Housing Industry Association
 - Insulated Panel Council Australasia
 - Insurance Council of Australia
 - Master Builders Australia
 - Roofing Tile Association of Australia
 - Think Brick Australia
 - Timber Preservers Association of Australia
 - Window and Door Industry Council
-

This Standard was issued in draft form for comment as DR AS 3959:2018.

Standards Australia wishes to acknowledge the participation of the expert individuals that contributed to the development of this Standard through their representation on the Committee and through the public comment period.

Keeping Standards up-to-date

Australian Standards® are living documents that reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued.

Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments that may have been published since the Standard was published.

Detailed information about Australian Standards, drafts, amendments and new projects can be found by visiting www.standards.org.au

Standards Australia welcomes suggestions for improvements, and encourages readers to notify us immediately of any apparent inaccuracies or ambiguities. Contact us via email at mail@standards.org.au, or write to Standards Australia, GPO Box 476, Sydney, NSW 2001.

Australian Standard[®]

Construction of buildings in bushfire-prone areas

Originated as AS 3959—1991.
Previous edition 2009.
Fourth edition AS 3959:2018.

COPYRIGHT

© Standards Australia Limited

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher, unless otherwise permitted under the Copyright Act 1968.

ISBN 978 1 76072 253 1

PREFACE

This Standard was prepared by the Standards Australia Committee FP-020, Construction of Buildings in Bushfire-Prone Areas, to supersede AS 3959—2009.

This edition incorporates the following changes:

- (a) The site assessment in Section 2 has been simplified to address interpretational issues related to slope, grasslands and low threat vegetation.
- (b) Section 3 clarifies that the shielding concessions relate only to the elements of the wall and do not apply to the subfloor or roofs.
- (c) The protection of gaps and openings has been addressed by requiring suitable measures for doors and windows and providing for other gaps to be suitably sealed.
- (d) The requirements for floors at BAL-12.5 and BAL-19 relating to bearers, joists and flooring within 400 mm above finished ground level now align with BAL-29.
- (e) Windows address the framed material, hardware, glazing, seals and weather strips and screens. Doors address the door panel material, door frame material, hardware, glazing, seals and weather proofing, screens and to be tight fitting. Vehicle access doors recognise that guide tracks do not permit direct access for embers and do not require edge gap protection. Weather strips are to conform with a flammability index of no greater than five (AS 1530.2).
- (f) Roofs can now include certain translucent or transparent roof coverings at BAL-12.5 and BAL-19 for verandas, carports or awnings where the roof is separated from the main building.
- (g) Editorial changes have been made for consistency with Section 2 and to locate tables with the relevant sections of the site assessment methodology. Appendices F and H have been combined.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the appendix to which they apply. A ‘normative’ appendix is an integral part of a Standard, whereas an ‘informative’ appendix is only for information and guidance.

The use of Notes in this Standard is of an advisory nature only. They provide explanations and guidance on recommended design considerations or technical procedures, as well as an informative cross-reference to other documents or publications.

This Standard incorporates a Commentary on some clauses. The Commentary directly follows the relevant clause, is designated by ‘C’ preceding the clause number and is printed in italics in a panel. The Commentary is for information only and does not need to be followed for conformance with the Standard.

CONTENTS

	<i>Page</i>
FOREWORD.....	5
SECTION 1 SCOPE AND GENERAL	
1.1 SCOPE.....	6
1.2 OBJECTIVE.....	6
1.3 APPLICATION.....	7
1.4 NORMATIVE REFERENCES.....	7
1.5 DEFINITIONS.....	8
1.6 PROCESS OF DETERMINING CONSTRUCTION REQUIREMENTS.....	10
1.7 BUSHFIRE ATTACK LEVELS (BALs).....	11
SECTION 2 DETERMINING THE BUSHFIRE ATTACK LEVEL (BAL)	
2.1 GENERAL.....	13
2.2 SIMPLIFIED PROCEDURE (METHOD 1).....	13
SECTION 3 GENERAL CONSTRUCTION REQUIREMENTS	
3.1 GENERAL.....	34
3.2 CONSTRUCTION REQUIREMENTS FOR SPECIFIC STRUCTURES.....	34
3.3 EXTERNAL MOULDINGS.....	36
3.4 HIGHER LEVELS OF CONSTRUCTION.....	36
3.5 REDUCTION IN CONSTRUCTION REQUIREMENTS DUE TO SHIELDING.....	37
3.6 VENTS, WEEPHOLES, GAPS AND SCREENING MATERIALS.....	39
3.7 BUSHFIRE SHUTTERS.....	40
3.8 TESTING OF MATERIALS, ELEMENTS OF CONSTRUCTION AND SYSTEMS TO THE AS 1530.8 SERIES.....	41
3.9 GLAZING.....	41
3.10 SARKING.....	42
3.11 TIMBER LOG WALLS.....	42
SECTION 4 BUSHFIRE ATTACK LEVEL LOW (BAL—LOW).....	
43	
SECTION 5 CONSTRUCTION REQUIREMENTS FOR BAL—12.5	
5.1 GENERAL.....	44
5.2 SUB-FLOOR SUPPORTS.....	44
5.3 FLOORS.....	44
5.4 WALLS.....	45
5.5 EXTERNAL GLAZED ELEMENTS, ASSEMBLIES AND DOORS.....	46
5.6 ROOFS (INCLUDING PENETRATIONS, EAVES, FASCIAS AND GABLES, AND GUTTERS AND DOWNPIPES).....	49
5.7 VERANDAS, DECKS, STEPS AND LANDINGS.....	51
5.8 WATER AND GAS SUPPLY PIPES.....	53
SECTION 6 CONSTRUCTION REQUIREMENTS FOR BAL—19	
6.1 GENERAL.....	54
6.2 SUB-FLOOR SUPPORTS.....	54
6.3 FLOORS.....	54
6.4 WALLS.....	55
6.5 EXTERNAL GLAZED ELEMENTS, ASSEMBLIES AND DOORS.....	56

6.6	ROOFS (INCLUDING PENETRATIONS, EAVES, FASCIAS AND GABLES, AND GUTTERS AND DOWNPIPES).....	60
6.7	VERANDAS, DECKS, STEPS AND LANDINGS.....	62
6.8	WATER AND GAS SUPPLY PIPES	64
 SECTION 7 CONSTRUCTION REQUIREMENTS FOR BAL—29		
7.1	GENERAL.....	65
7.2	SUB-FLOOR SUPPORTS	65
7.3	FLOORS.....	65
7.4	WALLS	66
7.5	EXTERNAL GLAZED ELEMENTS, ASSEMBLIES AND DOORS	67
7.6	ROOFS (INCLUDING PENETRATIONS, EAVES, FASCIAS AND GABLES, AND GUTTERS AND DOWNPIPES).....	70
7.7	VERANDAS, DECKS, STEPS AND LANDINGS.....	72
7.8	WATER AND GAS SUPPLY PIPES	74
 SECTION 8 CONSTRUCTION REQUIREMENTS FOR BAL—40		
8.1	GENERAL.....	75
8.2	SUB-FLOOR SUPPORTS	75
8.3	FLOORS.....	75
8.4	WALLS	76
8.5	EXTERNAL GLAZED ELEMENTS, ASSEMBLIES AND DOORS	76
8.6	ROOFS (INCLUDING PENETRATIONS, EAVES, FASCIAS AND GABLES, AND GUTTERS AND DOWNPIPES).....	79
8.7	VERANDAS, DECKS, STEPS AND LANDINGS.....	81
8.8	WATER AND GAS SUPPLY PIPES	82
 SECTION 9 CONSTRUCTION REQUIREMENTS FOR BAL—FZ		
9.1	GENERAL.....	83
9.2	SUB-FLOOR SUPPORTS	83
9.3	FLOORS.....	83
9.4	WALLS	84
9.5	EXTERNAL GLAZED ELEMENTS, ASSEMBLIES AND DOORS	84
9.6	ROOFS (INCLUDING PENETRATIONS, EAVES, FASCIAS AND GABLES, AND GUTTERS AND DOWNPIPES).....	86
9.7	VERANDAS, DECKS, STEPS AND LANDINGS.....	88
9.8	WATER AND GAS SUPPLY PIPES	89
 APPENDICES		
A	WORKED EXAMPLE FOR THE ASSESSMENT OF BUSHFIRE ATTACK LEVEL (BAL)	90
B	DETAILED METHOD FOR DETERMINING THE BUSHFIRE ATTACK LEVEL (BAL)—METHOD 2	92
C	PROCESS AND PROCEDURE FOR DETERMINING THE BUSHFIRE ATTACK LEVEL (BAL) USING METHOD 1	106
D	ILLUSTRATIONS.....	107
E	TIMBER SPECIES AND DENSITIES	112
F	BUSHFIRE-RESISTING TIMBER	116
G	EXPLANATION OF BUSHFIRE ATTACK LEVELS (BALs).....	118
H	GENERIC ROOF SYSTEMS	120
 BIBLIOGRAPHY.....		
		125

FOREWORD

This Standard is primarily concerned with improving the ability of buildings in designated bushfire-prone areas to better withstand attack from bushfire thus giving a measure of protection to the building occupants (until the fire front passes) as well as to the building itself.

Improving the design and construction of buildings to minimize damage from the effects of bushfire is but one of several measures available to property owners and occupiers to address damage during bushfire. Property owners should be aware that this Standard is part of a process that aims to lessen the risk of damage to buildings occurring in the event of the onslaught of bushfire. Other measures of mitigating damage from bushfire fall within the areas of planning, subdivision, siting, building design, landscaping and maintenance.

Research is continuing with regards to the effects of bushfires on buildings, determination of bushfire-prone areas within various States and Territories and particular construction techniques designed to maximize the performance of buildings when subjected to bushfire attack. The outcomes of this research will be reflected in subsequent editions of this Standard.

The measures set out in this Standard to improve construction, and thus better equip a building to withstand the effects from bushfire, may also be used as a guide for those who wish to voluntarily adopt such measures in situations where regulatory compliance is not mandated.

Although this Standard provides for the highest Bushfire Attack Level (BAL), that is, BAL—FZ, there may be circumstances advised by authorities having jurisdiction that building in a particular bushfire location is either not recommended or not permitted based on unrealistic risk exposures.

Of significance to this Standard is the publication of methods of test in the AS 1530.8 series. Building materials, elements of construction and systems subjected to the tests of the AS 1530.8 series will satisfy the construction requirements prescribed in Sections 5 to 9 of this Standard. These methods are AS 1530.8.1, *Methods for fire tests on building materials, components and structures, Part 8.1: Tests on elements of construction for buildings exposed to simulated bushfire attack—Radiant heat and small flaming sources* and AS 1530.8.2, *Methods for fire tests on building materials, components and structures, Part 8.2: Tests on elements of construction for buildings exposed to simulated bushfire attack—Large flaming sources*.

The modelling procedure for the assessment of BAL in this Standard uses the nominal inputs shown in Appendix B, Table B1 with an assumed flame temperature of 1090 K. The outputs result in the production of Tables 2.4 to 2.7.

It should be borne in mind that the measures contained in this Standard cannot guarantee that a building will survive a bushfire event on every occasion. This is substantially due to the degree of vegetation management, the unpredictable nature and behaviour of fire, and extreme weather conditions.

The survivability of buildings is also dependent on a combination of measures such as landscaping, water supplies, access, building design and maintenance. Care should also be exercised when siting and designing for these measures when constructing a building under this Standard.

STANDARDS AUSTRALIA

Australian Standard Construction of buildings in bushfire-prone areas

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies requirements for the construction of buildings in bushfire-prone areas in order to improve their resistance to bushfire attack from burning embers, radiant heat, flame contact and combinations of the three attack forms.

Although this Standard is designed to improve the performance of buildings when subjected to bushfire attack in designated bushfire-prone areas there can be no guarantee that a building will survive a bushfire event on every occasion. This is substantially due to the unpredictable nature and behaviour of fire and extreme weather conditions.

This Standard does not provide any requirements for fencing and screen walls. Fencing and screen walls may reduce exposure of a building to embers, radiant heat and flame contact from the bushfire front and from other potential fire sources such as adjacent buildings. The efficacy of fencing and walls depends on its resistance to ember, radiant heat and flame attack and potential for ignition and subsequent sustained flaming, height and structural design and specific site configurations. Therefore no specific advice has been provided in this Standard but designers may consider utilizing fencing and walls to improve house survivability beyond the base levels provided in this Standard.

NOTES:

- 1 The construction measures contained in this Standard apply to any building class and are not the only measures that can be considered to address bushfire attack as there are other means available that are outside the scope of this Standard.
- 2 This Standard does not address the infiltration of smoke nor any associated health and safety risk. The combustion of materials and coatings during a bushfire may present a health and safety risk. Selection of external materials should be considered in relation to potential health and safety risk in a bushfire.
- 3 The vulnerability of a building is also affected by building design and maintenance. The provision of water, access and landscaping is also important but falls outside the scope of this Standard. The overall survivability of a building is dependent on a combination of these measures in achieving improved safety.

1.2 OBJECTIVE

1.2.1 Objective of this Standard

The objective of this Standard is to prescribe particular construction details for buildings to reduce the risk of ignition from a bushfire, appropriate to the—

- (a) potential for ignition caused by burning embers, radiant heat or flame generated by a bushfire; and
- (b) intensity of the bushfire attack on the building.

1.2.2 Objective of this edition

The objective of this edition is to provide additional and detailed methods of assessing bushfire attack together with the applicable construction requirements, arranged by BAL.