

AS 1684.3:2021



STANDARDS
Australia



Residential timber-framed construction

Part 3: Cyclonic areas



AS 1684.3:2021

This Australian Standard® was prepared by TM-010, Timber Structures and Framing. It was approved on behalf of the Council of Standards Australia on 26 May 2021.

This Standard was published on 25 June 2021.

The following are represented on Committee TM-010:

- Australian Building Codes Board
- Australian Forest Products Association
- Australian Institute of Building Surveyors
- Australian Timber Flooring Association
- Engineers Australia
- Forest and Wood Products Australia
- Forest Industries Federation, WA
- Frame & Truss Manufacturers Association Australia
- Glued Laminated Timber Association of Australia
- Griffith University
- Housing Industry Association
- Housing SA
- Institution of Fire Engineers
- James Cook University
- Master Builders Australia
- Timber Development Association, NSW
- Timber Queensland
- University of Technology Sydney

This Standard was issued in draft form for comment as DR AS 1684.3:2020.

Keeping Standards up-to-date

Ensure you have the latest versions of our publications and keep up-to-date about Amendments, Rulings, Withdrawals, and new projects by visiting:

www.standards.org.au

ISBN 978 1 76113 366 4

Residential timber-framed construction

Part 3: Cyclonic areas

Originated as AS 056—1946.
Revised and redesignated as AS 1684.3—1999.
Previous edition 2010.
Fourth edition 2021.

© Standards Australia Limited 2021

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 (Cth).

Preface

This Standard was prepared by the Australian members of the Joint Standards Australia/Standards New Zealand Committee TM-010, Timber Structures and Framing, to supersede AS 1684.2—2010.

The objective of this Standard is to provide the building industry with procedures that can be used to determine building practice, to design or check construction details, and to determine member sizes, and bracing and fixing requirements for timber-framed construction in cyclonic areas.

The objectives of this revision are to —

- (a) make editorial revisions and some technical changes to correct mistakes and clarify the application of the document;
- (b) amend Section 5: Flooring and Decking to remove ambiguities and to reflect current research and experience which is able to provide for a quieter and more robust floor;
- (c) amend Table 9.25 of AS 1684.2 to include suitable nail and screw fixings for 45 mm thick roof battens;
- (d) reversing the values in [Tables 8.18\(a\)](#) to [8.18\(n\)](#) to represent JD5 capacities, while continuing to recognise JD4 capacities (an increase the values by 12.5 %) where this is known;
- (e) amend AS 1684.2 and AS 1684.3 to provide a suitable deemed-to-satisfy detail for metal tie down to timber connection that is compatible with AS 4773; and
- (f) relaxing the notching requirements for non-loadbearing walls

This is Part 3 of a series of Standards for residential timber-framed construction. The Standards in the series are as follows:

AS 1684.1, *Residential timber-framed construction, Part 1: Design criteria*

AS 1684.2, *Residential timber-framed construction, Part 2: Non-cyclonic areas*

AS 1684.3, *Residential timber-framed construction, Part 3: Cyclonic areas*

AS 1684.4, *Residential timber-framed construction, Part 4: Simplified—Non-cyclonic areas*

While AS 1720.3-2016 supersedes AS 1684.1:1999, notwithstanding this, AS 1684.1:1999 is not withdrawn as a standard, and remains relevant as the basis for Parts 2-4. AS 1684.4:2010 (derived from AS 1684.2:2010) remains current.

This Standard refers to Supplements that are an integral part of this Standard. Statements expressed in mandatory terms in Notes to the Span Tables are deemed to be requirements of this Standard.

Notes to the text contain information and guidance. They are not an integral part of the Standard.

The terms “normative” and “informative” are used in Standards to define the application of the appendices to which they apply. A “normative” appendix is an integral part of a Standard, whereas an “informative” appendix is only for information and guidance.

Contents

Preface	ii
Section 1 Scope and general	1
1.1 Scope and application	1
1.1.1 Scope	1
1.1.2 Application	1
1.2 Normative references	3
1.3 Terms and definitions	4
1.4 Limitations	7
1.4.1 General	7
1.4.2 Wind classification	7
1.4.3 Plan	8
1.4.4 Number of storeys of timber framing	8
1.4.5 Width	8
1.4.6 Wall height	8
1.4.7 Roof pitch	9
1.4.8 Spacing of bracing	9
1.4.9 Roof types	10
1.4.10 Building masses	10
1.5 Design criteria	10
1.6 Forces on buildings	10
1.7 Load paths — Offsets and cantilevers	12
1.8 Durability	13
1.9 Dimensions	13
1.10 Bearing	14
1.11 Stress grades	14
1.12 Engineered timber products and engineered wood products (EWPs)	15
1.13 Size tolerances	15
1.14 Alternative timber dimensions	15
1.15 Steel grade and corrosion protection	16
1.16 Requirements for design using this Standard	16
1.17 Interpolation	17
1.18 Alternative methods and materials	17
Section 2 Framing members	18
2.1 General	18
2.2 Terminology of framing members	18
2.3 Vertical lamination	21
2.3.1 Vertical nail lamination	21
2.3.2 Lamination of spaced ring beams	22
2.4 Stud lamination	22
2.5 Horizontal nail lamination — Wall plates only	23
2.6 Load width and area supported	23
2.6.1 General	23
2.6.2 Floor load width (<i>FLW</i>)	24
2.6.3 Ceiling load width (<i>CLW</i>)	25
2.6.4 Roof load width (<i>RLW</i>)	26
2.6.5 Area supported	28
Section 3 Substructure	30
3.1 General	30
3.2 Site preparation and drainage	30
3.2.1 General	30
3.2.2 Site clearing	30
3.2.3 Site drainage	30
3.3 Ground clearance and subfloor ventilation	30
3.4 Durability	30

3.4.1	Termite management.....	30
3.4.2	Species selection.....	30
3.5	Substructure bracing.....	30
3.6	Subfloor supports.....	31
3.6.1	General.....	31
3.6.2	Soil classification.....	31
3.6.3	Procedure.....	31
3.6.4	Determination of vertical gravity loads.....	31
3.6.5	Determination of total vertical gravity load combination for footings.....	32
3.6.6	Footing size or bearing area.....	33
Section 4	Floor framing.....	34
4.1	General.....	34
4.1.1	Application.....	34
4.1.2	Materials.....	34
4.1.3	Framing configurations.....	34
4.1.4	Weatherproofing.....	34
4.1.5	Shrinkage.....	34
4.1.6	Cuts, holes and notches in bearers and joists.....	34
4.2	Building practice.....	36
4.2.1	Bearers.....	36
4.2.2	Joists.....	37
4.3	Member sizes.....	39
4.3.1	Bearers.....	39
4.3.2	Floor joists.....	42
Section 5	Flooring and decking.....	45
5.1	General.....	45
5.2	Platform floors.....	45
5.3	Fitted strip floors (cut-in floors) direct to joists.....	45
5.4	Expansion joints in strip floor direct to joists.....	45
5.5	Laying and fixing strip and sheet flooring direct to joists.....	46
5.5.1	Structural strip flooring — Laying.....	46
5.5.2	Structural strip flooring — Cramping and fixing.....	46
5.5.3	Structural plywood flooring — Laying and fixing.....	47
5.5.4	Structural particleboard flooring — Laying and fixing.....	48
5.6	Wet area floors.....	49
5.7	Joist spacing — Flooring.....	49
5.8	Decking.....	50
Section 6	Wall framing.....	52
6.1	General.....	52
6.1.1	Application.....	52
6.1.2	Wall frame members.....	52
6.1.3	Bracing.....	53
6.2	Building practice.....	53
6.2.1	Studs.....	53
6.2.2	Plates.....	57
6.2.3	Openings.....	58
6.2.4	Framing around chimneys and flues.....	60
6.2.5	Lateral support for non-loadbearing walls.....	60
6.3	Member sizes.....	62
6.3.1	General.....	62
6.3.2	Wall studs.....	62
6.3.3	Bottom plates.....	69
6.3.4	Top plates.....	70
6.3.5	Studs, plates and noggings in non-loadbearing internal walls.....	72
6.3.6	Lintels and ring beams.....	72
6.3.7	Verandah beams (plates).....	75
6.3.8	Posts supporting roof and/or floor loads.....	76

Section 7	Roof framing	77
7.1	General	77
7.1.1	Application	77
7.1.2	Types of roofs and limitations	77
7.2	Building practice	78
7.2.1	Ceilings	78
7.2.2	Construction loads on ceiling framing	78
7.2.3	Ceiling battens	78
7.2.4	Ceiling joists	78
7.2.5	Hanging beams	79
7.2.6	Counter beams	80
7.2.7	Combined strutting/hanging beams	81
7.2.8	Combined strutting/counter beams	81
7.2.9	Strutting beams	81
7.2.10	Underpurlins	82
7.2.11	Rafters	83
7.2.12	Ridgeboards	84
7.2.13	Hip and valley rafters	84
7.2.14	Scotch valleys	85
7.2.15	Roof strutting	85
7.2.16	Collar ties	88
7.2.17	Hip ends	89
7.2.18	Alternative support systems	89
7.2.19	Non-coupled roofs	89
7.2.20	Roof battens	90
7.2.21	Trussed roofs	90
7.2.22	Bracing for raftered and trussed roofs	91
7.2.23	Fixing of ceiling framing to internal bracing walls	91
7.2.24	Eaves construction	91
7.2.25	Gable or verge construction	92
7.2.26	Lateral restraint of hanging, strutting, strutting/hanging beams, and similar members	93
7.2.27	Framing around chimneys and flues	93
7.3	Member sizes	94
7.3.1	General	94
7.3.2	Ceiling battens	94
7.3.3	Ceiling lining and non-trafficable roof decking	94
7.3.4	Loads on ceilings	96
7.3.5	Binders	96
7.3.6	Ceiling joists	96
7.3.7	Hanging beams	97
7.3.8	Counter beams	97
7.3.9	Combined strutting/hanging beams	98
7.3.10	Combined counter/strutting beams	99
7.3.11	Strutting beams	100
7.3.12	Underpurlins	101
7.3.13	Rafters and purlins	102
7.3.14	Ridge or intermediate beams — Cathedral, skillion or similar roofs	105
7.3.15	Roof battens	105
7.3.16	Cantilevered gable ends	106
7.3.17	Other members or components	107
Section 8	Racking and shear forces (bracing)	109
8.1	General	109
8.2	Temporary bracing	109
8.3	Wall and subfloor bracing	110
8.3.1	General	110
8.3.2	Wind pressure on the building	110
8.3.3	Area of elevation	110

8.3.4	Racking force.....	114
8.3.5	Subfloor bracing.....	120
8.3.6	Wall bracing.....	133
8.3.7	Roof bracing.....	161
Section 9	Fixings and tie-down design.....	164
9.1	General.....	164
9.2	General connection requirements.....	165
9.2.1	General.....	165
9.2.2	Straps, bolts, screws, coach screws and framing anchors.....	165
9.2.3	Steel washers.....	165
9.2.4	Drilling for bolts.....	165
9.2.5	Drilling for coach screws.....	166
9.2.6	Screw and coach screw penetration.....	166
9.2.7	Framing anchor and strap nails.....	166
9.2.8	Joining of top plates and ring beam.....	166
9.2.9	Tie-down of members joined over supports.....	168
9.3	Procedure flow chart.....	169
9.4	Nominal and specific fixing requirements.....	170
9.5	Nominal fixings (minimum fixings).....	171
9.6	Specific tie-down fixings.....	173
9.6.1	General.....	173
9.6.2	Uplift load width (<i>ULW</i>).....	173
9.6.3	Application.....	173
9.6.4	Wind uplift forces.....	175
9.6.5	Joint group.....	186
9.7	Shear forces.....	233
9.7.1	General.....	233
9.7.2	Bottom plate to concrete slab.....	234
9.7.3	Floor joists to bearers/walls.....	234
9.7.4	Bearers to supports.....	234
9.7.5	Shear forces on joists and bearers.....	234
9.7.6	Shear forces on external non-loadbearing walls.....	243
Appendix A	(Informative) Determination of roof mass.....	244
Appendix B	(informative) Durability.....	247
Appendix C	(normative) Interpolation.....	253
Appendix D	(informative) Examples — Foundation bearing area, distribution of bracing and shear force.....	254
Appendix E	(informative) Moisture content and shrinkage.....	257
Appendix F	(normative) Racking forces — Alternative procedure.....	263
Appendix G	(informative) Timber species and properties.....	276
Appendix H	(informative) Storage and handling.....	284
Appendix I	(normative) Collar ties with multiple rows of underpurlins.....	285
Appendix J	(informative) Building practices for engineered wood products (EWPs).....	286
Bibliography	300

Australian Standard®

Residential timber-framed construction

Part 3: Cyclonic areas

Section 1 Scope and general

1.1 Scope and application

1.1.1 Scope

This Standard specifies requirements for building practice and the selection, placement and fixing of the various structural elements used in the construction of timber-framed Class 1 and Class 10 buildings as defined by the National Construction Code and within the limitations given in [Clause 1.4](#). The provisions of this Standard also apply to alterations and additions to such buildings.

This Standard also provides building practice and procedures that assist in the correct specification and determination of timber members, bracing and connections, thereby minimizing the risk of creating an environment that may adversely affect the ultimate performance of the structure.

This Standard may also be applicable to the design and construction of other classes of buildings where the design criteria, loadings and other parameters applicable to those classes of building are within the limitations of this Standard.

NOTE 1 Refer to AS 1684.1 for details of design criteria, loadings and other parameters.

NOTE 2 While this Standard may be used to design Class 10 buildings, less conservative levels of design for this building class may be permitted by building regulations and other Australian Standards.

NOTE 3 Advisory information for the construction and specifications of timber stairs, handrails and balustrades is provided in FWPA's Design Guide 8, see Bibliography.

1.1.2 Application

Throughout this Standard, reference is made to the Span Tables in the Supplements. The Supplements are an integral part of, and shall be used in conjunction with, this Standard.

The Supplements are as follows:

Supplement 0, *General introduction and index*

C1 Supp. 1, *Wind classification C1 — Seasoned softwood — Stress grade F5*

C1 Supp. 2, *Wind classification C1 — Seasoned softwood — Stress grade F7*

C1 Supp. 3, *Wind classification C1 — Seasoned softwood — Stress grade F8*

C1 Supp. 4, *Wind classification C1 — Seasoned softwood — Stress grade MGP 10*

C1 Supp. 5, *Wind classification C1 — Seasoned softwood — Stress grade MGP 12*

C1 Supp. 6, *Wind classification C1 — Seasoned softwood — Stress grade MGP 15*

C1 Supp. 7, *Wind classification C1 — WA seasoned hardwood — Stress grade F14*

C1 Supp. 8, *Wind classification C1 — Seasoned hardwood — Stress grade F17*

C1 Supp. 9, *Wind classification C1 — Seasoned hardwood — Stress grade F27*

C1 Supp. 10, *Wind classification C1 — Unseasoned softwood — Stress grade F5*