AS 1684.2:2021
(Incorporating Amendment No. 1)

Australian STANDARD®

STANDARDS Australia

Residential timber-framed construction

Part 2: Non-cyclonic areas



Share your feedback about this standard. Scan the QR code on your phone or click/ enter the link to take the survey

feedback.standards.org.au/1684.2:2021

AS 1684.2:2021

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 of 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 1684.2:2020.

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 389 3

Residential timber-framed construction

Part 2: Non-cyclonic areas

First published as AS O56—1946.
Second edition 1948.
Revised and redesignated as AS CA38—1971.
Revised and redesignated as AS 1684—1975.
Third edition 1992.
Revised and redesignated in part as AS 1684.2—1999.
Previous edition AS 1684.2—2010.
Fourth edition AS 1684.2:2021.
Reissued incorporating Amendment No 1 (June 2024).

© Standards Australia Limited 2024

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 Structuring and Framing, to supersede AS 1684.2—2010.

A1 *This Standard incorporates Amendment No. 1 (June 2024). The start and end of changes introduced by the Amendment are indicated in the text by tags including the Amendment number 1.* A1

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 constructions in non-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 AS1684.2 to include suitable nail and screw fixings for 45mm thick roof battens;

(d) reversing the values in Table 8.18 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 2 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 Design Criteria for timber-framed residential building 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 in the Supplements 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.

© Standards Australia Limited 2024

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 9
1.4.4 Number of storeys of timber framing 9
1.4.5 Width 9
1.4.6 Wall height 9
1.4.7 Roof pitch 10
1.4.8 Spacing of bracing 10
1.4.9 Roof types 11
1.4.10 Building masses 11
1.5 Design criteria 11
1.6 Forces on buildings 11
1.7 Load paths — Offsets and cantilevers 13
1.8 Durability 14
1.9 Dimensions 14
1.10 Bearing 15
1.11 Timber 15
1.12 Engineered timber products and engineered wood products (EWPs) 16
1.13 Size tolerances 16
1.14 Alternative timber dimensions 17
1.15 Steel grade and corrosion protection 17
1.16 Requirements for design using this Standard 17
1.17 Interpolation 18
1.18 Alternative methods and materials 18

Section 2 Framing members 19
2.1 General 19
2.2 Terminology of framing members 19
2.3 Vertical lamination 22
2.3.1 Vertical nail lamination 22
2.3.2 Lamination of spaced ring beams 23
2.4 Stud lamination 23
2.5 Horizontal nail lamination — Wall plates only 24
2.6 Load width and area supported 24
2.6.1 General 24
2.6.2 Floor load width (*FLW*) 25
2.6.3 Ceiling load width (*CLW*) 26
2.6.4 Roof load width (*RLW*) 27
2.6.5 Area supported 29

Section 3 Substructure 31
3.1 General 31
3.2 Site preparation and drainage 31
3.2.1 General 31
3.2.2 Site clearing 31
3.2.3 Site drainage 31
3.3 Ground clearance and subfloor ventilation 31
3.4 Durability 31

3.4.1 Termite management 31
3.4.2 Species selection 31
3.5 Substructure bracing 31
3.6 Subfloor supports 32
3.6.1 General 32
3.6.2 Soil classification 32
3.6.3 Procedure 32
3.6.4 Determination of vertical gravity loads 32
3.6.5 Determination of total vertical gravity load combination for footings 33
3.6.6 Footing size or bearing area 34
3.7 Footings and supports for wind classifications N1 and N2 34
3.7.1 General 34
3.7.2 Simplified footing classification 34
3.7.3 Stumps and posts 35
3.7.4 Footing type support limitations (load widths × bearer spans) 36

Section 4 Floor framing 39
4.1 General 39
4.1.1 Application 39
4.1.2 Materials 39
4.1.3 Framing configurations 39
4.1.4 Weatherproofing 39
4.1.5 Shrinkage 39
4.1.6 Cuts, holes and notches in bearers and joists 39
4.2 Building practice 41
4.2.1 Bearers 41
4.2.2 Joists 42
4.3 Member sizes 44
4.3.1 Bearers 44
4.3.2 Floor joists 47

Section 5 Flooring and decking 50
5.1 General 50
5.2 Platform floors 50
5.3 Fitted strip floors (cut-in floors) direct to joists 50
5.4 Expansion joints in strip floors direct to joists 50
5.5 Laying and fixing strip and sheet flooring direct to joists 51
5.5.1 Structural strip flooring — Laying 51
5.5.2 Structural strip flooring — Cramping and fixing 51
5.5.3 Structural plywood flooring — Laying and fixing 52
5.5.4 Structural particleboard flooring — Laying and fixing 53
5.6 Wet area floors 54
5.7 Joist spacing — Flooring 54
5.8 Decking 55

Section 6 Wall framing 57
6.1 General 57
6.1.1 Application 57
6.1.2 Wall frame members 57
6.1.3 Bracing 58
6.2 Building practice 58
6.2.1 Studs 58
6.2.2 Plates 62
6.2.3 Openings 63
6.2.4 Framing around chimneys and flues 65
6.2.5 Lateral support for non-loadbearing walls 65
6.3 Member sizes 67
6.3.1 General 67
6.3.2 Wall studs 67
6.3.3 Bottom plates 74

6.3.4 Top plates 75
6.3.5 Studs, plates and noggings in non-loadbearing internal walls 77
6.3.6 Lintels and ring beams 77
6.3.7 Verandah beams (plates) 81
6.3.8 Posts supporting roof and/or floor loads 81

Section 7 Roof framing 83
7.1 General 83
7.1.1 Application 83
7.1.2 Types of roofs and limitations 83
7.2 Building practice 84
7.2.1 Ceilings 84
7.2.2 Construction loads on ceiling framing 84
7.2.3 Ceiling battens 84
7.2.4 Ceiling joists 84
7.2.5 Hanging beams 85
7.2.6 Counter beams 86
7.2.7 Combined strutting/hanging beams 86
7.2.8 Combined strutting/counter beams 87
7.2.9 Strutting beams 87
7.2.10 Underpurlins 88
7.2.11 Rafters 89
7.2.12 Ridgeboards 89
7.2.13 Hip and valley rafters 90
7.2.14 Scotch valleys 90
7.2.15 Roof strutting 91
7.2.16 Collar ties 93
7.2.17 Hip ends 94
7.2.18 Alternative support systems 94
7.2.19 Non-coupled roofs 94
7.2.20 Roof battens 95
7.2.21 Trussed roofs 95
7.2.22 Bracing for raftered and trussed roofs 96
7.2.23 Fixing of ceiling framing to internal bracing walls 96
7.2.24 Eaves construction 96
7.2.25 Gable or verge construction 97
7.2.26 Lateral restraint of hanging, strutting, strutting/hanging beams, and similar members 98
7.2.27 Framing around chimneys and flues 98
7.3 Member sizes 99
7.3.1 General 99
7.3.2 Ceiling battens 99
7.3.3 Ceiling lining and non-trafficable roof decking 99
7.3.4 Loads on ceilings 101
7.3.5 Binders 101
7.3.6 Ceiling joists 101
7.3.7 Hanging beams 102
7.3.8 Counter beams 102
7.3.9 Combined strutting/hanging beams 103
7.3.10 Combined counter/strutting beams 104
7.3.11 Strutting beams 105
7.3.12 Underpurlins 106
7.3.13 Rafters and purlins 107
7.3.14 Ridge or intermediate beams — Cathedral, skillion or similar roofs 110
7.3.15 Roof battens 110
7.3.16 Cantilevered gable ends 111
7.3.17 Other members or components 112

Section 8 Racking and shear forces (bracing) 114

8.1 General 114
8.2 Temporary bracing 114
8.3 Wall and subfloor bracing 115
8.3.1 General 115
8.3.2 Wind pressure on the building 115
8.3.3 Area of elevation 115
8.3.4 Racking force 118
8.3.5 Subfloor bracing 126
8.3.6 Wall bracing 141
8.3.7 Roof bracing 169

Section 9 Fixings and tie-down design 173
9.1 General 173
9.2 General connection requirements 173
9.2.1 General 173
9.2.2 Straps, bolts, screws, coach screws and framing anchors 173
9.2.3 Steel washers 174
9.2.4 Drilling for bolts 174
9.2.5 Drilling for coach screws 174
9.2.6 Screw and coach screw penetration 174
9.2.7 Framing anchor and strap nails 174
9.2.8 Joining of top plates and ring beam 174
9.2.9 Tie-down of members joined over supports 176
9.3 Procedure flow chart 177
9.4 Nominal and specific fixing requirements 178
9.5 Nominal fixings (minimum fixings) 179
9.6 Specific tie-down fixings 181
9.6.1 General 181
9.6.2 Uplift load width (*ULW*) 181
9.6.3 Application 181
9.6.4 Wind uplift forces 184
9.6.5 Joint group 194
9.7 Shear forces 240
9.7.1 General 240
9.7.2 Bottom plate to concrete slab 241
9.7.3 Floor joists to bearers/walls 241
9.7.4 Bearers to supports 241
9.7.5 Shear forces on joists and bearers 241
9.7.6 Shear forces on external non-loadbearing walls 249

Appendix A (informative) **Determination of roof mass 251**

Appendix B (informative) **Durability 254**

Appendix C (normative) **Interpolation 259**

Appendix D (informative) **Examples — Foundation bearing area, distribution of bracing and shear force 260**

Appendix E (informative) **Moisture content and shrinkage 263**

Appendix F (normative) **Racking forces — Alternative procedure 269**

Appendix G (informative) **Timber species and properties 286**

Appendix H (informative) **Storage and handling 294**

Appendix I (normative) **Collar ties with multiple rows of underpurlins 295**

Appendix J (informative) **Building practices for engineered wood products (EWPs) 296**

Bibliography 310

Amendment control sheet 311

Australian Standard®

Residential timber-framed construction

Part 2: Non-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*

N1/N2 Supp. 1, *Wind classification N1/N2 — Seasoned softwood — Stress grade F5*

N1/N2 Supp. 2, *Wind classification N1/N2 — Seasoned softwood — Stress grade F7*

N1/N2 Supp. 3, *Wind classification N1/N2 — Seasoned softwood — Stress grade F8*

N1/N2 Supp. 4, *Wind classification N1/N2 — Seasoned softwood — Stress grade MGP 10*

N1/N2 Supp. 5, *Wind classification N1/N2 — Seasoned softwood — Stress grade MGP 12*

N1/N2 Supp.6, *Wind classification N1/N2 — Seasoned softwood — Stress grade MGP 15*

N1/N2 Supp. 7, *Wind classification N1/N2 — WA seasoned hardwood — Stress grade F14*

N1/N2 Supp. 8, *Wind classification N1/N2 — Seasoned hardwood — Stress grade F17*

N1/N2 Supp. 9, *Wind classification N1/N2 — Seasoned hardwood — Stress grade F27*

N1/N2 Supp. 10, *Wind classification N1/N2 — Unseasoned softwood — Stress grade F5*

© Standards Australia Limited 2024