AS 1720.1—2010
(Incorporating Amendment Nos 1, 2 and 3)

AS 1720.1—2010

Timber structures

Part 1: Design methods

This Australian Standard® was prepared by Committee TM-001, Timber Structures. It was approved on behalf of the Council of Standards Australia on 28 October 2009.
This Standard was published on 21 June 2010.

The following are represented on Committee TM-001:

- A3P
- Association of Consulting Engineers Australia
- Australian Building Codes Board
- Australian Timber Importers' Federation
- Australian Wood Panels Association
- BRANZ
- CSIRO Manufacturing and Materials Technology
- Curtin University of Technology
- Department of Primary Industries and Fisheries Queensland
- Engineers Australia
- Frame and Truss Manufacturers Association Australia
- Glued Laminated Timber Association of Australia
- Master Builders Australia
- Monash University
- New Zealand Timber Industry Federation
- Scion
- Standards New Zealand
- Timber Queensland
- University of Auckland
- University of Technology, Sydney
- Wood Processors Association

Additional Interests:

- Mr Bruce Hutchings

This Standard was issued in draft form for comment as DR 08053.

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.

Australian Standard®

Timber structures

Part 1: Design methods

First published as part of AS CA65—1972.
Revised and redesignated as AS 1720—1975.
Revised and redesignated in part as AS 1720.1—1988.
Third edition of 2010.
Reissued incorporating Amendment No. 1 (December 2010).
Reissued incorporating Amendment No. 2 (August 2015).

Published by SAI Global Limited under licence from Standards Australia Limited, GPO Box 476, Sydney, NSW 2001, Australia

ISBN 978 0 7337 9429 2

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee TM-001, Timber Structures, to supersede AS 1720.1—1997.

This Standard incorporates Amendment No. 1 (December 2010), Amendment No. 2 (August 2011) and Amendment No. 3 (August 2015). The changes required by the Amendments are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure or part thereof affected.

The decision to prepare this Standard as an Australian Standard was by consensus agreement of the Joint Committee.

The objective of this Standard is to provide a code of practice for the design and acceptance of timber structures and elements. It includes design methods and design data appropriate for commonly encountered structural elements and materials and requirements to be met for specification of the design, installation and maintenance of timber structures.

Capacity factors for the timber materials represented in this Standard have been reviewed and, in some cases, modified to better reflect the safety levels appropriate for the wide range of applications for which timber structural elements may be used.

For housing, the increasing sizes of houses and increasingly larger areas that are in some cases supported by a single structural element has resulted in a need to limit application of category 1 capacity factors according to the area likely to be affected by failure of the individual element. For structures other than houses, the definition of 'primary structural element' has been changed to recognise that even a partial structural collapse of some structures can have severe consequences.

Conceptually, the limit state design principles of this Standard do not differ from the 1997 version. Only essential changes and editorial improvements have been made, which reflect experience with the application of the Standard over the past decade; these changes relate to layout improvements and clarification of meaning.

Differences from the 1997 edition include the following:

(a) The notation and terminology for actions have been aligned with AS/NZS 1170 series.

(b) For easier referencing, the design properties for commonly available structural sawn timber (F-grades, MGP-grades and A17-grade) are now consolidated and presented together in an appendix.

(c) The presentation of requirements for selection of capacity factors for member and joint design has been simplified and clarified.

(d) For consistency with the AS/NZS 4063 series, characteristic properties are now uniformly defined as including the effect of size.

(e) Issues associated with evaluation methods, verification procedures, monitoring and quality control in production and manufacture are not relevant to design and are not therefore directly referred to in this revised Standard.

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.

CONTENTS

Page

SECTION 1 SCOPE AND GENERAL
1.1 SCOPE AND APPLICATION 5
1.2 NORMATIVE REFERENCES 5
1.3 TIMBER 5
1.4 GENERAL DESIGN CONSIDERATIONS 6
1.5 DESIGN AND SUPERVISION 10
1.6 WORKMANSHIP AND MAINTENANCE 11
1.7 DEFINITIONS 11
1.8 NOTATION 15
1.9 UNITS 15

SECTION 2 DESIGN PROPERTIES OF STRUCTURAL TIMBER ELEMENTS
2.1 GENERAL 16
2.2 DESIGN PROPERTIES 17
2.3 CAPACITY FACTOR 17
2.4 MODIFICATION FACTORS 20

SECTION 3 DESIGN CAPACITY OF BASIC STRUCTURAL MEMBERS
3.1 GENERAL 27
3.2 BEAM DESIGN 27
3.3 COLUMN DESIGN 35
3.4 TENSION MEMBER DESIGN 39
3.5 COMBINED BENDING AND AXIAL ACTIONS 41

SECTION 4 DESIGN CAPACITY OF JOINTS IN TIMBER STRUCTURES
4.1 GENERAL 42
4.2 DESIGN OF NAILED JOINTS 45
4.3 DESIGN OF SCREWED JOINTS 53
4.4 DESIGN OF BOLTED JOINTS 58
4.5 DESIGN OF COACH SCREWED JOINTS 70
4.6 DESIGN OF SPLIT-RING FASTENER JOINTS 73
4.7 DESIGN OF SHEAR-PLATE FASTENER JOINTS 77

SECTION 5 PLYWOOD
5.1 GENERAL 79
5.2 DESIGN PROPERTIES 79
5.3 MODIFICATION FACTORS 80
5.4 LOADING NORMAL TO THE PLANE OF THE PLYWOOD PANEL 81
5.5 LOADING IN THE PLANE OF THE PLYWOOD PANEL 83
5.6 JOINTS IN COMPOSITE PLYWOOD TO TIMBER CONSTRUCTION 87

SECTION 6 ROUND TIMBERS
6.1 GENERAL 89
6.2 CHARACTERISTIC VALUES FOR STRUCTURAL DESIGN 89
6.3 DESIGN 89
6.4 ADDITIONAL MODIFICATION FACTORS 91
6.5 DESIGN DETAILS 92

Page

SECTION 7 GLUED-LAMINATED TIMBER CONSTRUCTION
7.1 GENERAL ... 93
7.2 STRUCTURAL DESIGN ... 93
7.3 DESIGN PROPERTIES ... 93
7.4 MODIFICATION FACTORS ... 94

SECTION 8 STRUCTURAL LAMINATED VENEER LUMBER
8.1 GENERAL ... 96
8.2 STRUCTURAL DESIGN ... 96
8.3 DESIGN PROPERTIES ... 96
8.4 MODIFICATION FACTORS ... 9
8.5 JOINT DESIGN ... 9

APPENDICES
A NORMATIVE REFERENCES ... 99
B GUIDELINES FOR SERVICEABILITY ... 100
C JOINTS IN TIMBER STRUCTURES ... 105
D ACCEPTANCE TESTING OF TIMBER STRUCTURES AND ELEMENTS ... 111
E FURTHER DESIGN METHODS FOR MEMBERS ... 117
F NOTATION AND FACTORS ... 142
G MISCELLANEOUS DESIGN INFORMATION ... 153
H DESIGN PROPERTIES FOR STRUCTURAL GRADED TIMBER ... 154
I BUCKLING STRENGTH OF PLYWOOD DIAPHRAGMS ... 161

BIBLIOGRAPHY ... 171

STANDARDS AUSTRALIA

Australian Standard
Timber structures

Part 1: Design methods

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE AND APPLICATION

1.1.1 Scope

This Standard sets out limit state design methods for the structural use of timber, which are based on the principles of structural mechanics and on data established by research. It provides design data for sawn timber, laminated timber, timber in pole form, plywood, laminated veneer lumber and various types of fastenings. In addition, it provides methods of test for components or assemblies of unconventional design which may not be readily amenable to detailed analysis.

For ease of use, the simpler design situations are set in the main body of the text. Related appendices, which form an integral part of the Standard, give acceptable procedures for detailed design situations.

1.1.2 Application

This Standard is intended for use in the design or appraisal of structural elements or systems comprised of timber or wood products and of structures comprised substantially of timber.

1.2 NORMATIVE REFERENCES

The normative documents referenced in this Standard are listed in Appendix A.

NOTE: Documents referenced for informative purposes are listed in the Bibliography.

1.3 TIMBER

1.3.1 General

All timber used in accordance with this Standard shall comply with the requirements of the appropriate Australian Standards, as follows:

(a) *Visually graded sawn timber* Visually graded sawn timber shall conform to the requirements of AS 2082 or AS 2858.

(b) *Mechanically graded timber* Mechanically graded timber shall conform to the requirements of AS/NZS 1748.

(c) *Proof-graded timber* Proof-graded timber shall conform to the requirements of AS 3519.

(d) *Structural plywood* Structural plywood shall conform to the requirements of AS/NZS 2269.0.

(e) *Structural laminated veneer lumber* Structural laminated veneer lumber shall conform to the requirements of AS/NZS 4357.0.

(f) *Glued laminated timber* Glued laminated timber shall conform to the requirements of AS/NZS 1328.1