

Australian/New Zealand Standard™

Glued laminated structural timber

Part 1: Performance requirements and minimum production requirements



AS/NZS 1328.1:1998

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PREFACE

This Australian/New Zealand joint Standard was prepared by Joint Technical Committee TM/4 Glued timber products. It is based on performance based BS EN 386:1995 *Glued laminated timber—Performance requirements and minimum production requirements* which has been amended only where necessary to comply with Australian and New Zealand requirements. It supersedes AS 1328—1987 and NZS 3606:1987.

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

Glued laminated timber is obtained by bonding together a number of laminations having their grain essentially parallel. In this way a member with a rectangular solid cross section can be produced.

The requirements cover timber quality, the strength of end-joints and face-joints between laminations, and adhesive type which is related to Service Classes 1, 2 and 3. Service Class 3 requires weather resistant adhesives and may also require preservative treated timber. The requirements for the adhesives are given in AS/NZS 4364.

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Australian/New Zealand Standard Glued laminated structural timber

Part 1: Performance requirements and minimum production requirements

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies performance requirements for glued laminated timber members for structural use, and the minimum requirements for the production of such members.

1.2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

A1	AS	
	2082	Timber—Hardwood—Visually stress-graded for structural purposes
	2796	Timber—Hardwood—Sawn and milled products (All Parts)
	2858	Timber—Softwood—Visually graded for structural purposes
	AS/NZS	
	1328	Glued laminated structural timber
	1328.2	Guidelines for AS/NZS 1328: Part 1 for the selection, design, production and installation of glued laminated structural timber
	1748	Timber—Mechanically stress-graded for structural purposes
	4063	Characterization of structural timber (all Parts)
	4364	Timber—Bond performance of structural adhesives
	5068	Timber—Finger joints in structural products—Production requirements
	NZS	
	3631	New Zealand timber grading rules

1.3 DEFINITIONS

For the purposes of this Standard, the definitions below apply:

1.3.1 Adhesive type

adhesive types I and II as defined in AS/NZS 4364.

1.3.2 Appearance grades

defines the surface characteristics of the finished beams.

1.3.3 Delaminated length

the sum of lengths of open glue lines on both end-grain surfaces of each test specimen.

1.3.4 Drill core

specimen of cylindrical shape drilled out of the glulam.

1.3.5 End joint

a glued joint between the end of lamination segments.

1.3.6 Glued laminated timber

A structural member formed by bonding together timber laminations with the grain running essentially parallel to the beam's longitudinal axis.

1.3.7 Glulam

abbreviation of glued laminated timber.

1.3.8 Horizontal glulam

glued laminated timber with the glueplane perpendicular to the wide face of the cross section, see Figure 1.1.

1.3.9 Outer zones

the laminations wholly or partially in the two outer $0.15 D$ regions of a horizontally laminated beam where D is the beam depth, see Figure 1.1.

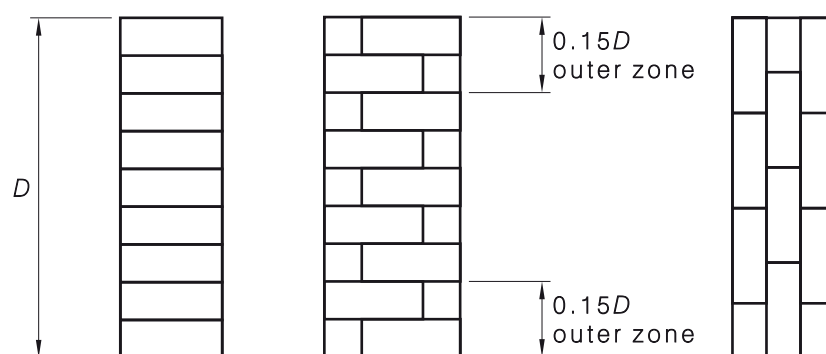


FIGURE 1.1 GLUELINES IN CROSS SECTIONS SHOWING THE NORMAL POSITION OF THE GLUELINES

1.3.10 Service Class 1

Service Class characterized by a moisture content in the materials corresponding to a temperature of 20°C and relative humidity of the surrounding air only exceeding 65% for a few weeks per year. (See Appendix A).

NOTE: In Service Class 1 the average equilibrium moisture content in most glulam will not exceed 12%.

1.3.11 Service Class 2

Service Class characterized by a moisture content in the materials corresponding to a temperature of 20°C and relative humidity of the surrounding air only exceeding 85% for a few weeks per year. (See Appendix A).

NOTE: In Service Class 2 the average equilibrium moisture content in most softwoods will not exceed 20%.

1.3.12 Service Class 3

Service Class characterized by climatic conditions leading to higher moisture contents than Service Class 2, or where timber is directly exposed to sun and/or rain. (See Appendix A).

1.3.13 Specimen

test specimen of glulam of rectangular shape.

1.3.14 Test bar

test specimen of rectangular right-angled prismatic form.

1.3.15 Vertical glulam

glued laminated timber with the glueline plane perpendicular to the narrow face of the cross section, see Figure 1.1.

1.3.16 Wood failure

rupture in or between wood fibres.

1.3.17 Wood failure percentage

percentage of the wood failure area in relation to the total sheared area.

1.4 SYMBOLS AND ABBREVIATIONS

For the purposes of this Standard, the symbols and abbreviations below apply:

A	shear area, in square millimetres
a	width of machined flat face of drill core, in millimetres
b	width of cross section, in millimetres
d	diameter, in millimetres
f_s	shear strength as measured in block shear test, in MPa
F_u	ultimate load, in newtons
f_v	shear strength, in newtons per square millimetres
h	depth of cross section, in millimetres
k	modification factor
l	length of test specimen, in millimetres
$l_{\max, \text{delam}}$	maximum delamination length of one glueline in the test specimen, in millimetres
l_{glueline}	length of one glueline, normally the width b shown in Figure C1, in Appendix C in millimetres
$l_{\text{tot, delam}}$	delamination length of all gluelines in the test specimen, in millimetres
$l_{\text{tot, glueline}}$	entire length of gluelines on the two end-grain surfaces of each test specimen, in millimetres
R	radius of curvature, in millimetres
t	thickness of test specimen, in millimetres
t_l	lamination thickness, in millimetres

SECTION 2 REQUIREMENTS

2.1 GENERAL

The timber used shall be stress graded and the bonding operations shall result in reliable and durable bonds.

These requirements shall be considered satisfied if the provisions of Sections 2, 3 and 4 of this Standard are met.

2.2 TIMBER

2.2.1 General

A1

The timber shall be stress graded in conformity with AS/NZS 1748, AS 2082, AS 2858 or NZS 3631 and have its structural properties evaluated in accordance with the AS/NZS 4063 series.

2.2.2 Moisture content

The moisture content of the timber at manufacture shall be appropriate to the species, adhesive used and preservative treatment.

2.3 ADHESIVES

The adhesive shall be capable of producing strong and durable joints which maintains the bond integrity throughout the intended lifetime of the structure.

NOTE: Acceptable strength and durability can be achieved by the use of a polycondensation adhesive of the phenolic or aminoplastic type as defined in AS/NZS 4364. The adhesives shall meet the requirements for adhesive type I or II as appropriate. The adhesive shall be chosen considering the climatic conditions in service, the timber species, any preservative if used and the production methods.

Adhesives of type I may be employed for structural members to be used in all Service Classes. Adhesives of type II may only be used for Service Classes 1 and 2 provided the temperature of the member in the structure will normally be below 50°C for Service Class 2.

2.4 COMPLETED GLULAM

2.4.1 Verification of design properties

The manufacturer shall prove that the finished glulam has the required design properties. Verification shall be provided through:

- (a) (Initial) qualification tests.
- (b) Daily quality control tests.

2.4.2 Design properties

Members shall have the design properties given by a GL grade (see Table 1.1 in Part 2), or as claimed by the manufacturer, or as required by the designer.

The design properties shall be the characteristic values for:

Bending strength	f'_b
Modulus of elasticity	E
Compression strength	f'_c
Shear strength	f'_s
Tension strength	f'_t

2.4.3 Initial qualification tests

Qualification tests shall be undertaken whenever a new process or process change involving, for example, a new adhesive/species combination, finger joint profile, lamination thickness or similar. Initial qualification tests shall be carried out either by Method 1 of Clause 2.4.3.1 or Method 2 of Clause 2.4.3.2.

2.4.3.1 Method 1

Determination from tests on completed glulam The characteristic strength of a glulam member in bending compression, tension and shear and characteristic modulus of elasticity in bending, shall be determined by undertaking tests on completed 300 mm deep glulam members in accordance with the AS/NZS 4063 series.

2.4.3.2 Method 2

Determination from lamination properties The following shall apply:

- (a) The characteristic strengths of a 300 mm deep horizontally laminated glulam member in bending and tension shall be computed using equations 1 and 2.

$$f'_b = 0.75 (1 + 0.05 S_{\min}) f'_{b,ej} \leq f'_{b,stock} \quad \dots (1)$$

$$f'_t = 0.75 (1 + 0.05 S_{\min}) f'_{t,ej} \leq f'_{t,stock} \quad \dots (2)$$

where

$f'_{b,ej}$ = characteristic bending strength of the finger joints in flatwise bending determined in accordance with AS 5068

$f'_{b,stock}$ = characteristic bending strength of the selected grade of lamination stock

$f'_{t,ej}$ = characteristic tension strength of the finger joints determined in accordance with AS 5068

$f'_{t,stock}$ = characteristic tension strength of lamination stock of the selected grade of the lamination stock

$S_{\min}$ = minimum spacing of end joints (m)

- (b) The modulus of elasticity shall be determined by bending of lamination stock about the minor axis in accordance with the provisions of the AS/NZS 4063 series. The characteristic value of the modulus of elasticity so determined shall be deemed to apply to the laminations within the glued laminated member. The effective stiffness properties shall be determined using composite beam theory.

- (c) Where manufacturers use timber, graded in accordance with the relevant grading standard for which in-grade test data are available, the values of $f'_{s,stock}$, $f'_{c,stock}$ and E_{stock} may be deemed to apply.

2.4.4 Routine tests

Routine tests described in Clause 4.3.1 shall verify the ongoing achievement of the properties established by the initial qualification tests.

NOTE: For glulam with a modulus of elasticity that is above average for a species, it may be advisable to do routine tests on laminations to check their modulus of elasticity.

2.5 END JOINTS

Finger joints shall be manufactured and tested in accordance with AS 5068. End joints other than finger joints, eg, scarf joints, shall be tested in accordance with the provisions of AS 5068. The alternative end joint shall be treated as a substitute finger joint in interpreting AS 5068. In all such specimens the end joint shall be representative of the normal production method. Where the end joints are cured with the face joints in normal production, the test specimens shall be prepared by an identical method by forming a blank billet. In a blank billet, a glulam member shall be constructed without face joint adhesive so as to provide sufficient (at least 30 for qualification and 3 per shift for routine tests) end joint test specimens. Where such joints are pre-cured they shall be taken directly after the pre-cure operation.

2.6 GLUELINE INTEGRITY

2.6.1 General

The requirements for glue-line integrity shall be based on testing of the glue-line in a full cross-sectional specimen, which shall be cut from the manufactured glulam member. The specimens shall be representative of the production. The test requirements are summarized in Table 2.1.

2.6.2 Qualification tests

Qualification tests shall be undertaken whenever a new process or process change such as a new adhesive/species combination is introduced.

For members of Service Classes 1 and 2 the testing shall be delamination tests in conformity with method A of Appendix C.

For members of Service Class 3 delamination tests shall be made in conformity with method A of Appendix C.

For each species, adhesive, treatment or process combination, a minimum of 5 full cross-sections shall be tested and shall meet the requirements of 2.6.4 or 2.6.5.

2.6.3 Routine tests

For structures of Service Class 1 the testing shall be either by delamination tests method C of Appendix C, or block shear of Appendix D, or dry cleavage of Appendix B.

For structures of Service Class 2 the testing shall be either by delamination test method C of Appendix C or block shear of Appendix D, or dry and wet cleavage of Appendix B.

For structures of Service Class 3 the testing shall be either by delamination test method A or B of Appendix C, or dry and wet cleavage of Appendix B.

For each shift in which gluing is carried out, one full cross-sectional specimen shall be tested for each press load or every 10 m³ of production.

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