

Australian Standard™

**Timber—Non-structural glued
laminated—Performance and production
requirements**

This Australian Standard was prepared by Committee TM-004, Glued Timber Products. It was approved on behalf of the Council of Standards Australia on 28 March 2003 and published on 8 May 2003.

The following are represented on Committee TM-004:

Glued Laminated Timber Association
Housing Industry Association
Monash University
New Zealand Adhesives Industry
New Zealand Forest Research Institute
New Zealand Timber Certification Board
New Zealand Timber Industry Federation
New Zealand Timber Suppliers Group
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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee TM-004, Glued Timber Products. After consultation with stakeholders in both countries, Standards Australia and Standards New Zealand decided to develop this Standard as an Australian Standard rather than an Australian/New Zealand Standard.

The objective of this Standard is to specify requirements for non-structural timber assemblies manufactured from timber laminae having grain direction parallel with each other and glued together to form a single unit.

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.

Statements expressed in mandatory terms in notes to tables are deemed to be requirements of this Standard.

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STANDARDS AUSTRALIA

Australian Standard

Timber—Non-structural glued laminated—Performance and production requirements

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies requirements for non-structural timber assemblies manufactured from timber laminae having grain direction parallel with each other and glued together to form a single unit.

1.2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

- 1530 Methods for fire tests on building materials, components and structures
1530.3 Part 3: Simultaneous determination of ignitability, flame propagation, heat release and smoke release

- 1810 Timber—Seasoned cypress pine—Milled products

- 2796 Timber—Seasoned hardwood—Milled products
2796.1 Part 1: Product specification

AS/NZS

- 1080 Timber—Methods of test
1080.1 Method 1: Moisture content

- 1604 Specification for preservative treatment
1604.5 Part 5: Glued laminated timber products

- 4364 Adhesives, phenolic and aminoplastic, for load-bearing timber structures—Classification and performance requirements

- 4491 Glossary of terms used in timber related Standards

ISO/IEC

- Guide 2 General terms and their definitions concerning standardization and related activities

ABCB

- BCA Building Code of Australia

1.3 DEFINITIONS

For the purposes of this Standard, the definitions given in AS/NZ 4491 and those below apply.

1.3.1 Assembly

Timber laminae glued together in a face- and/or edge-bonded configuration (see Figure 1), commonly known as glulam.

1.3.2 Closed assembly time

The elapsed time between lamina assembly and the application of pressure.

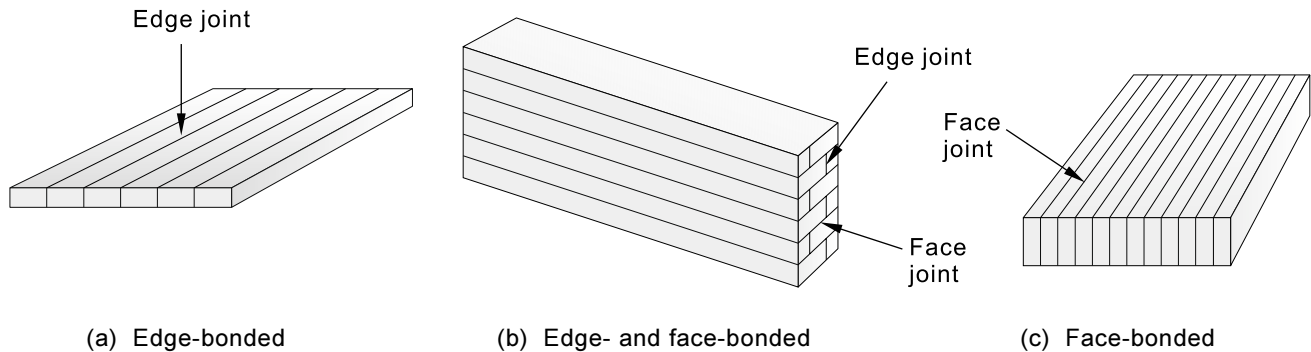


FIGURE 1 ASSEMBLY CONFIGURATIONS

1.3.3 Cramping

The application of pressure during glue curing.

1.3.4 Cramping pressure

The force per unit area applied during manufacture in cramping the contact faces of glued laminae.

1.3.5 Edge joint

The joint between the narrow faces of the laminae (see Figure 1).

1.3.6 End joint

A joint in timber end to end to make a full-length lamina (see Figure 1). This may take a form of finger-, butt-, or scarf-joint.

1.3.7 Equilibrium moisture content

When subjected to given conditions of humidity and temperature, timber will reach an equilibrium moisture content (EMC), at which it neither gains nor loses moisture while the conditions are maintained.

1.3.8 Face joint

The joint between the wide faces of the laminae (see Figure 1).

1.3.9 Glue spread

The quantity of adhesive per unit area.

1.3.10 Insert

Repairs to amend appearance features.

1.3.11 Lamina (plural: laminae)

A layer of wood in a laminated assembly. The lamina may be formed from several boards jointed end-to-end or side-by-side to extend the full width or length of the assembly. Also referred to as a lamination.

1.3.12 Laminating

The process of bonding laminae with adhesive.

1.3.13 Lay-up

The term that describes the manufacturing process of assembly of the laminae.

1.3.14 Machine skip

Machine skip or 'hit and miss' is the area on the face of a lamina, which is not machined due to the collapse of the board, undersized feedstock and other features (see Figure 3.1). The area remains in a rough sawn condition and is below the plane of the dressed surface.

1.3.15 Non-structural glulam

Glulam that is not required to carry load in situations where its failure could result in significant property damage, personal injury or loss of life.

1.3.16 Open assembly time

The elapsed time between adhesive spread on the laminae and commencement of closed assembly.

1.3.17 Permitted features

Features that are allowable in accordance with the grading rules of the timber used and those features that are permitted by this Standard.

1.3.18 Pressure area

The area of the assembly that is under cramping pressure during the glue-curing period.

1.3.19 Production batch

A volume of manufactured items, which is considered a unique unit. Each unit of the batch will have in common adhesive mix, assembly time and curing time.

1.3.20 Shooks

Short lengths of timber that are end joined to make full-length laminae.

1.3.21 Squeeze out

The excess adhesive forced out of the glue-lines when pressure is applied to the face, edge or end joint of glulam.

1.3.22 Wood failure percentage

The area of wood fibre remaining on the glue-line following completion of the cleavage and/or glue-line shear tests. It is expressed as a percentage of the total area, excluding knots, resin pockets, and skip dressing.

1.4 SERVICE CLASSIFICATION

1.4.1 Service Class 1

Service Class 1 shall be characterized by a moisture content in the materials corresponding to a temperature of 20°C and a relative humidity of the surrounding air only exceeding 65% for a few weeks per year.

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

1.4.2 Service Class 2

Service Class 2 shall be characterized by a moisture content in the materials corresponding to a temperature of 20°C and a relative humidity of the surrounding air only exceeding 85% for a few weeks per year.

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

1.4.3 Service Class 3

Service Class 3 shall be characterized by climatic conditions leading to higher moisture contents than Service Class 2, or where timber is directly exposed to sun and/or rain.

SECTION 2 MATERIAL REQUIREMENTS

2.1 GENERAL

The bonding operations shall result in reliable and durable bonds.

These general requirements shall be considered satisfied if the requirements in this Section and minimum production requirements in Section 3 are fulfilled.

2.2 TIMBER

2.2.1 General

Non-structural glulam shall be manufactured for use in Service Class 1, 2 or 3 defined in Clause 1.4.1, 1.4.2, or 1.4.3, respectively. The type of timber shall be chosen to maintain the glulam durability throughout the intended lifetime of the assembly.

Timber for assemblies in Service Class 3 shall be of a durability class suitable for its application. Timber of a lesser durability shall be preservative treated and the provisions of Clause 2.2.3 shall apply.

2.2.2 Grade

Timber used for laminating shall be visually graded for appearance appropriate to its end use. Appearance grading shall be conducted in accordance with AS 1810, AS 2796.1 or AS 4785.1, as appropriate. Where sapwood is present, the provisions of Clause 2.2.4 apply.

2.2.3 Preservative treatment

Preservative treatments shall meet the provisions of AS/NZS 1604.5.

Fire-retardant treatment shall be specified usually on the basis of requirements detailed in the Building Code of Australia. Appropriate fire treatments shall be applied such that, when tested in accordance with the methods described in AS 1530.3, the appropriate indices are met.

2.2.4 Sapwood susceptible to lyctid borers

Laminae containing sapwood that is susceptible to lyctid borers shall be treated against lyctid in accordance with AS/NZS 1604.5.

2.3 ADHESIVES

Non-structural glulam shall be manufactured for use in Service Class 1, 2 or 3 defined in Clause 1.4.1, 1.4.2, or 1.4.3, respectively. The type of adhesive shall be chosen to maintain the glulam durability throughout the intended lifetime of the assembly.

Adhesives for assemblies in Service Class 3 shall satisfy the climatic performance requirements for a Type I adhesive classification as defined in AS/NZS 4364. An adhesive of Type I classification may also be used for glulam in Service Classes 1 and 2. Alternatively, an adhesive that satisfies the climatic performance requirements for a Type II adhesive classification, as defined in AS/NZS 4364, may be used for assemblies in Service Class 1 and 2, provided that the temperature of the assemblies in the structure will normally be below 50°C.

NOTES:

- 1 AS/NZS 4364 defines two types of adhesive, Type I and Type II, according to their suitability for use in various climatic service conditions.
- 2 The adhesive should be chosen considering the climatic service conditions, the timber species, the preservative used (if any), and the production methods.
- 3 Table 2.1 gives examples of adhesives for Service Classes 1, 2 and 3.

- 4 Some types of adhesives will lose strength and stiffness and may change colour when exposed to aliphatic and aromatic solvents, which are commonly found in timber coatings. Reaction tests on coated samples should be conducted to establish if the adhesive is still appropriate.
- 5 Manufacturers are advised to use extreme caution with thermoplastic adhesives (e.g., PVA) due to their propensity to creep. Guarantees from the adhesive manufacturers should be sought prior to an adhesive being used in the production of non-structural glulam to ensure it is creep resistant.

TABLE 2.1

TYPE OF ADHESIVE FOR GIVEN SERVICE CONDITIONS (INFORMATIVE)

Description	Service Class*		
	1	2	3
	Interior dry	Interior—Humid, exterior protected	Interior—Hot and humid, exterior exposed
Timber EMC	≤12%	≤18%*	>18% untreated timber >20% multi-salts treated softwood
Typical applications	Interior framing, staircases	Kitchens, vanities etc., painted outdoor furniture	Sauna benches, unpainted outdoor furniture, landscaping application
Examples†	— Phenol-resorcinol formaldehyde — Resorcinol formaldehyde — Tannin-modified resorcinol adhesives — Urea formaldehyde — Melamine-urea formaldehyde — PVAc and aliphatic PVAc — Polyurethanes — Aqueous polymeric isocyanates/Emulsion polymeric isocyanates — Epoxies	— Phenol-resorcinol formaldehyde — Resorcinol formaldehyde — Tannin-modified resorcinol adhesives — Melamine-urea formaldehyde — Polyurethanes — Aqueous polymeric isocyanates/Emulsion polymeric isocyanates — Epoxies	— Phenol-resorcinol formaldehyde — Resorcinol formaldehyde — Tannin-modified resorcinol adhesives — Polyurethanes

* See Clause 1.4.

† These adhesive types are suitable for the typical applications as shown. However, dimensional stability of timber products may be of concern when exposed to severe climatic condition.

SECTION 3 MANUFACTURING REQUIREMENTS

3.1 GENERAL

Manufacturing procedures shall be such that the completed glulam conforms to the requirements of Section 2.

3.2 PRODUCTION CONDITIONS

Suitable machinery and equipment for the production shall be available.

3.3 TIMBER

3.3.1 Species

Species used in non-structural glulam shall be tested in a qualification process as specified in Clause 4.3.

NOTES:

- 1 Some species used may have extractives, which will hinder bond and long-term serviceability.
- 2 Some species are prone to excessive dimensional instability with change in EMC and, if used in non-structural glulam, special attention may be needed in the design of the application.

3.3.2 Moisture content

Unjointed timber shall have a moisture content and temperature within the range specified by the adhesive manufacturer according to the formulation and method of application of the adhesive.

The moisture content shall be determined by the oven drying method described in AS/NZS 1080.1, or with a calibrated electric moisture meter used in accordance with the manufacturer's instructions.

NOTES:

- 1 The average moisture content of the timber is significant in respect to the dehydration and cure of the glue, and its effect may vary to some degree with species, particularly with some hardwoods.
- 2 The moisture content requirements in this Clause are recommendations only. The range of raw materials moisture content is relevant to the environmental conditions into which the completed assembly will be finally installed. The equilibrium moisture content (EMC) of the finished assembly needs to be compatible with the anticipated changes in atmospheric conditions in service. As an example, installations into air-conditioned environments will require raw material timber inputs with very low moisture content to avoid excessive stresses in the finished assembly.
- 3 The variation between highest and lowest moisture content should not be greater than 3%.

3.4 ADHESIVE APPLICATION

The application method shall ensure that all the required surfaces of the laminae are covered with the adhesive in accordance with the adhesive supplier's instructions.

NOTE: This requirement can be assumed to be met if the adhesive is 'squeezed-out' of the joint when pressure is applied.

3.5 MANUFACTURE

3.5.1 Cleanliness

At the time of gluing, the surface of the laminae shall be clean and free from oil, dust, excessive natural resin, surface deposits of preservative salts and other substances liable to affect maximum glue-line strength.

3.5.2 Machining

The surfaces of the laminae, which are to be glued, shall be machine dressed. Surface glazing shall be avoided.

NOTE: With timbers that are difficult to glue and most of those that have been preservative treated, machining usually needs to be carried out immediately before gluing.

3.5.3 Maximum lamina thickness

In curved assemblies, the requirements of the design, the curvature and the species of timber used shall govern the thickness of the lamina.

NOTE: See also Paragraph C3.3.6, Appendix C for more information on lamina thickness.

3.5.4 Variation in lamina thickness

The variation in thickness over the length and width of the lamina shall not exceed 0.2 mm.

Machine skip is a feature, which influences variations in lamina and bond line thickness. This tolerance does not preclude local areas of machine skip, which are permissible within the limits shown in Figure 3.1.

3.5.5 Dimensions

The dimensions of the finished assemblies shall be the specified dimensions subject to the tolerances given in Table 3.1 and Figure 3.2.

3.5.6 Overlap of laminae

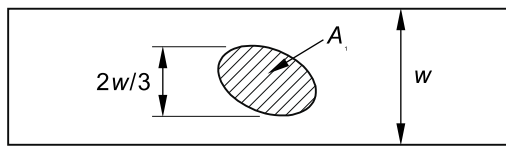
For the underside of GIS boards (see Clause 5.3) and for non-appearance grades, the overlap shall not exceed that given in Table 3.1 and Figure 3.2.

3.5.7 End joints

If butt joints, finger joints, scarf joints or any other type of end joints are used, the joints shall remain tight through the laminating process.

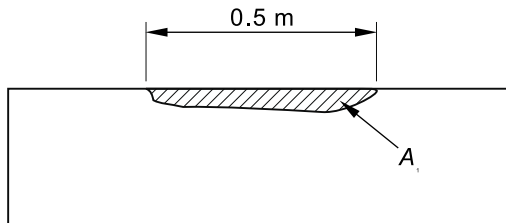
3.5.8 Tolerances on squareness

Finished assemblies shall be fabricated within a squareness tolerance of 1 mm width for each 300 mm of board width/beam heights as illustrated in Figure 3.3.

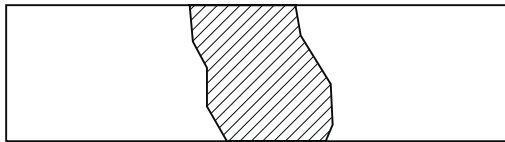


Allowable skip dressing may occur in one area as shown at left

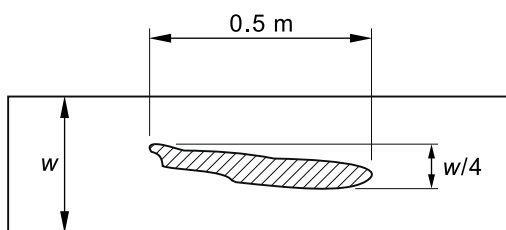
$$\text{Area } A_1 = \frac{\pi (2w/3)^2}{4}$$



Skip dressing may occur at the edge of the lamina provided it does not exceed a length of 0.5 m and area A_1



Skip dressing shall not extend through the assembly



Skip dressing not exceeding $\frac{1}{4}$ of the width of the lamina may be up to 0.5 m in length

An area of skip dressing equal to $\frac{1}{2}$ of the width of the lamina multiplies by $\frac{1}{2}$ of the width, ($w/2$), may occur at intervals of not less than 2.5 m.

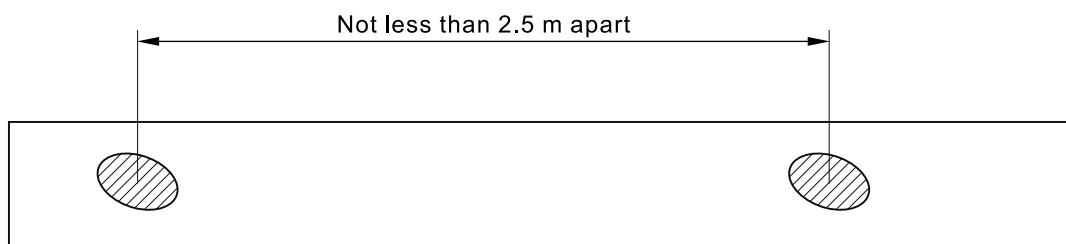


FIGURE 3.1 MACHINE-SKIP DRESS TOLERANCES