

Australian/New Zealand Standard™

Plywood—Structural

Part 0: Specifications



AS/NZS 2269.0:2012

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee TM-008, Plywood Timber Products. It was approved on behalf of the Council of Standards Australia on 2 October 2012 and on behalf of the Council of Standards New Zealand on 5 October 2012.
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Engineered Wood Products Association of Australasia
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Australian/New Zealand Standard™

Plywood—Structural

Part 0: Specifications

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee TM-008, Plywood Timber Products, to supersede AS/NZS 2269.0:2008.

This Standard incorporates Amendment No. 1 (August 2015). 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.

The objective of this Standard is to provide minimum performance requirements and specifications for the manufacture and application of structural plywood, acceptable to users, specifiers, manufacturers, and building authorities in Australia and New Zealand.

The objective of this revision is to align this Standard with the latest revision of AS 1720.1, *Timber structures*, Part 1: *Design methods* and AS/NZS 4063.2, *Characterization of structural timber*, Part 2: *Determination of characteristic values*.

Plywood manufactured to this Standard is suitable for use in permanent structures. The plywood may be of either hardwood or softwood veneers, or a combination of both. The quality of veneers is judged in the finished panel.

This edition includes the following changes:

- (a) Amendments have been made to characteristic properties listed in Table 4.1.
- (b) Two new F-grades, i.e., F4 and F5, have been included to reflect the ongoing changes in resource.
- (c) Amendments have been made to the formaldehyde emission classes with the removal of emission classes E₂ and E₃ and the inclusion of a new lower 'Super E₀' emission class. This is to reflect marketplace expectations for lower formaldehyde emissions for structural plywood.

This Standard is Part 0 of the AS/NZS 2269 series, *Plywood—Structural*, which comprises the following parts:

AS/NZS

2269 Plywood—Structural

2269.0 Part 0: Specifications (this Standard)

2269.1 Part 1: Determination of structural properties—Test methods

2269.2 Part 2: Determination of structural properties—Evaluation methods

Five standard veneer qualities, A, S, B, C and D, are prescribed, as follows:

A—a high quality appearance grade, suitable for clear finishing.

S—an appearance grade, which permits characteristics as a decorative feature.

B—an appearance grade suitable for high quality paint finishing.

C—a non-appearance grade with a solid surface.

D—a non-appearance grade with permitted open characteristics.

The surface grade of the plywood is determined by the quality of the face and back veneers.

Two methods for determining the stress grade for the plywood are described using the following bases:

- (i) Mechanical F-grading of plywood panels.
- (ii) In-grade testing of plywood panels.

Three formaldehyde emission classes, Super E₀, E₀, E₁, are included.

For the design of structures or elements incorporating the use of plywood specified in this Standard, the structural grades will have characteristic strength and stiffness values as detailed in Table 4.1. These characteristic properties are to be assigned in accordance with the requirements of AS 1720.1, *Timber structures*, Part 1: *Design methods*, and NZS 3603, *Timber Structures Standard*.

This Standard covers the basic structural plywood product. Particular end uses may require additional processing, preservative treatment or surface finishing. Structural plywood that is exposed for a long term to wet or damp conditions or full weather exposure will need preservative treatment in accordance with AS/NZS1604.3, *Specification for preservative treatment*, Part 3: *Plywood*. Under these exposure conditions, the surface of the plywood will need adequate protection.

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

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

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STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard
Plywood—Structural

Part 0: Specifications

SECTION 1 SCOPE AND GENERAL**1.1 SCOPE**

This Standard specifies requirements for the manufacture, grading, finishing and branding of structural plywood. Specifications for both stress and surface grades are also provided. The Standard also specifies veneer quality, bond quality, standard lay-up construction, dimensional tolerances, joints, moisture content and characteristic strength and stiffness values for the nominated F-grades.

The following alternative methods for the determination of stress grades for structural plywood are also provided:

- (a) Mechanical F-grading of the finished sheet of plywood.
- (b) In-grade testing of finished plywood panels.

Five surface grades, based on the veneer quality of the face and back veneers, A, S, B, C and D and one bond quality, Type A bond, are prescribed.

1.2 APPLICATION

The specification for any grade of structural plywood shall consist of the requirements given in the following Sections:

- (a) General requirements Section 1.
- (b) Requirements for veneers Section 2.
- (c) Manufacturing requirements Section 3.
- (d) Application of stress grades and mechanical properties Section 4.

Relevant requirements are also specified in the following normative Appendices:

- (i) Section properties Appendix B.
- (ii) Method for mechanically F-grading structural plywood panels Appendix C.

NOTE: Further information and guidance can be found in the following informative Appendices:

- (a) For recommendations for correct storage and handling of structural plywood, see Appendix A.
- (b) For information to be supplied with inquiries and orders for structural plywood, see Appendix D.
- (c) For information relating to a procedure for continual verification of structural properties of plywood based upon testing of bending stiffness and strength, see Appendix E.

1.3 NORMATIVE REFERENCES

The following are the normative documents referenced in this Standard:

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

AS

- 1720 Timber structures
- 1720.1 Part 1: Design methods

AS/NZS

- 1604 Specification for preservative treatment
- 1604.3 Part 3: Plywood
- 2098 Methods of test for veneer and plywood
- 2098.1 Method 1: Moisture content of veneer and plywood
- 2098.2 Method 2: Bond quality of plywood (chisel test)
- 2098.3 Method 3: Bond quality and strength of scarf joints in plywood
- 2098.4 Method 4: Measurement of dimensions and shape for sheets of veneer and plywood
- 2098.11 Method 11: Determination of formaldehyde emissions for plywood
- 2269 Plywood—Structural
- 2269.1 Part 1: Determination of structural properties—Test methods
- 2269.2 Part 2: Determination of structural properties—Evaluation methods
- 2754 Adhesives for timber and timber products
- 2754.1(Int) Part 1: Adhesives for manufacture of plywood and laminated veneer lumber (LVL)
- 4063 Characterization of structural timber
- 4063.2 Part 2: Determination of characteristic values
- 4491 Timber—Glossary of terms in timber-related Standards
- NZS
- 3603 Timber Structures Standard

1.4 DEFINITIONS

For the purpose of this Standard the definitions given in AS/NZS 4491 apply.

1.5 GRADES OF STRUCTURAL PLYWOOD

1.5.1 General

Structural plywood shall be graded according to surface quality and stress grade.

1.5.2 Surface grades

The standard surface grade shall be Grade A, Grade S, Grade B, Grade C or Grade D, and shall correspond to Quality A, Quality S, Quality B, Quality C and Quality D veneers in accordance with Section 2.

The standard surface grade of structural plywood shall be designated by a combination of letters that denote the quality of the face veneer (first letter) and the back veneer (second letter).

NOTE: For example, CD grade represents structural plywood with a C grade face veneer and D grade back veneer.

The quality of veneer shall be judged in the finished panel. Procedures for non-standard surface grades shall comply with Clauses 1.12.1(d) and 3.4.1(c).

1.5.3 Stress grades

F-grades for structural plywood shall be F4, F5, F7, F8, F11, F14, F17, F22, F27 and F34. Procedures for the application of F-grades are provided in Section 4. Other stress grades with specific characteristic strength and stiffness properties shall be determined in accordance with the in-grade testing procedures specified in Clause 4.2.2.

Other stress grades shall be defined by—

- (a) a suite of published structural properties; or
- (b) publishing of span tables based on specific structural properties.

Both of the above shall be linked to the product by a unique descriptor and performance rating.

1.6 DIMENSIONS AND SHAPE

1.6.1 Dimensions

When measured in accordance with AS/NZS 2098.4, unless otherwise agreed by contract, the actual dimensions of structural plywood shall not differ from the ordered dimension by more than the following tolerances:

- (a) *Average panel thickness:*
 - (i) Sanded sheets up to and including 7.5 mm thick $\pm 7\%$.
 - (ii) Sanded sheets over 7.5 mm thick up to and including 17.5 mm thick $\pm 4\%$.
 - (iii) Sanded sheets over 17.5 mm thick up to and including 25 mm thick $\pm 3\%$.
 - (iv) Sanded sheets over 25 mm thick not specified.
NOTE: For sanded sheets over 25 mm thick, the tolerance on thickness should be agreed between the manufacturer and the purchaser.
 - (v) Unsanded sheets an additional thickness tolerance of +0.3 mm per sheet.
NOTE: Thickness dimensions apply to sheets without overlays or other coatings.
- (b) *Average panel length and width* ± 1.5 mm.

1.6.2 Shape

When measured in accordance with AS/NZS 2098.4, the structural plywood sheets shall comply with the following requirements:

- (a) *Squareness* The difference in length of the two diagonals of the sheet shall not exceed 0.2% of the length of the longer diagonal.
- (b) *Straightness of edges* Any edge of a sheet shall not deviate from a straight line by more than 0.05% of the length of that edge.
- (c) *Flatness* For an unloaded sheet, the maximum distance between the underside of the sheet and a flat horizontal surface shall not exceed the following:
 - (i) For sheets not exceeding 7.5 mm thickness 50 mm.
 - (ii) For sheets exceeding 7.5 mm thickness 30 mm.

Additionally, when the sheet is loaded as specified in the following, the sheet shall touch the flat horizontal surface vertically below the loaded area:

 - (A) For sheets not exceeding 7.5 mm thickness 10 kg.
 - (B) For sheets exceeding 7.5 mm thickness 15 kg.

When loading twisted panels in which the four corners do not touch the flat horizontal surface when the sheet is in the unloaded state, three corners shall be held in contact with the flat horizontal surface while the measurement of maximum distance is taken in the unloaded state and while the above loads are applied to the distorted area.

Flatness shall be determined prior to installation or use. At the time of test, panels shall be in accordance with the moisture content requirements of Clause 1.7.

NOTE: Recommendations for correct storage and handling of structural plywood are given in Appendix A.

1.7 MOISTURE CONTENT

At the time of dispatch of the plywood, the moisture content anywhere within a sheet when determined in accordance with AS/NZS 2098.1 shall be as follows:

- (a) Sheets not exceeding 7.5 mm thickness not less than 10% nor more than 15%.
- (b) Sheets exceeding 7.5 mm thickness not less than 8% nor more than 15%.

In the event of dispute, the moisture content shall be determined by the oven-drying method described in AS/NZS 2098.1.

NOTE: Preservative-treated plywood may have been treated after branding, and may be supplied at a higher moisture content. This may be appropriate for the application.

1.8 FINISH

Unless otherwise ordered, each sheet of structural plywood with Quality A, Quality S, Quality B or Quality C face shall have its face sanded smooth over the entire face area.

All surface fillings shall be sanded smooth and any excess filling shall be removed. Slight surface roughness associated with local characteristics, as permitted in Section 2, shall be permitted.

Edges shall be solid (no missing veneer permitted except where it is associated with permitted open characteristics, e.g., holes, splits, edge joints, etc.), clean cut and square to the face.

Backs shall be free of tapes. Sawing defects within 5 mm of the edge shall be permitted.

1.9 JOINTS IN SHEETS

If the specification allows for scarf joints in plywood sheets, the scarf joints shall be in accordance with Clause 3.2.

Where structural sheets are jointed, suitable reduction factors shall be applied to characteristic structural properties. These reduction factors shall be established using the in-grade testing method detailed in Clause 4.3, ensuring that the joints have been tested in the worst load and/or positional combinations.

1.10 IMMUNIZATION AND PRESERVATIVE TREATMENT

1.10.1 Immunization of lyctid-susceptible sapwood

Lyctid-susceptible sapwood shall not be permitted (see Notes below).

NOTES:

- 1 A method of rendering sapwood non-susceptible to lyctid includes treatment to hazard class H1 of AS/NZS 1604.3.
- 2 The method for detection of lyctid-susceptible sapwood is given in AS 1604.1.
- 3 Guidelines for the immunization of lyctid-susceptible sapwood are given in AS/NZS 1604.3 and further information is available from State forestry departments.
- 4 Attention is drawn to the provisions of the New South Wales *Timber Marketing Act 1977*, regarding the sale and use of timber, including veneer and plywood, containing lyctid-susceptible sapwood.

1.10.2 Preservative treatment

Where structural plywood is exposed to insect or fungal attack, it shall be preservative-treated in accordance with AS/NZS 1604.3.

NOTES:

- 1 In New South Wales, the *Timber Marketing Act 1977* requires approval of a preservative treatment and registration of a brand before timber (including veneer and plywood), offered for sale in NSW, may be described as 'preservative-treated'. Detailed information about the requirements of such legislation may be obtained from Forests NSW.
- 2 On special order, structural plywood may be treated against insect and fungal attack or with fire-retardant chemicals.
- 3 Some chemical treatments may affect the mechanical properties of structural plywood.
- 4 Under conditions of long-term full-weather exposure, the exposed surface of structural plywood should be adequately protected.

1.11 FORMALDEHYDE EMISSION CLASSES

When measured in accordance with AS/NZS 2098.11, the formaldehyde emissions from structural plywood shall be in accordance with the limits specified in Table 1.1, for emission classes Super E₀ to E₁.

TABLE 1.1
FORMALDEHYDE EMISSIONS FROM STRUCTURAL PLYWOOD

Emission class	Formaldehyde emission limit, mg/L
Super E ₀	Ave. 0.3, 0.4 max.
E ₀	0.5 max.
E ₁	1.0 max.

A1 | 1.12 BRANDING

1.12.1 Branding F-grade structural plywood

A1 | Each sheet of structural grade plywood shall have the following information legibly affixed thereon, at the point of manufacture, at least once:

- (a) The manufacturer's name or registered mark.
- (b) The word 'STRUCTURAL' or product description.
- (c) Reference to this Standard, i.e., AS/NZS 2269.0.
- (d) The quality of the outer plies (face first, back last), e.g., CC, CD or DD.

Where non-standard veneer qualities are used, as permitted in Clause 3.4.1(c), branding shall include a descriptor that non-standard veneer quality has been used in the plywood assembly.

A1 | NOTE: 'Text deleted'

- (e) The bond type of the glueline (i.e., A BOND).
- (f) The F-grade, or stress grade, of the sheet (e.g., F7). If different, the stress grades both parallel and perpendicular to the face grain, in that order (e.g., F17/F14). If the F-grade, or stress grade, has been determined in one direction only, as is the case using the method specified in Clause 4.2, the panel shall be marked with an indication that the F-grade, or stress grade, is applicable in one direction only (e.g., along the grain F17/–).

- (g) The panel construction code [e.g., 17-24-7 (see Table 3.1)], or the nominal thickness and the values of second moment of area (moment of inertia) (*I*) and section modulus (*Z*) in the grain orientations to which the properties are declared [i.e., parallel to grain only, perpendicular to grain only, or in both orientations (see Clause 3.4.3)].
- (h) The formaldehyde emission class [e.g., E₀ (see Table 1.1)].
- (i) If immunized or preservative treated, branding in accordance with AS/NZS 1604.3.

NOTES:

- 1 The requirements of Items (b), (c), (d), (e), (f) (g) and (h) should be set out as follows:

Example 1	Example 2
STRUCTURAL — AS/NZS 2269.0 CD — A BOND — E ₀ F7 — 17-24-7	STRUCTURAL — AS/NZS 2269.0 CD — A BOND — E ₀ F7 — 17 (236-27.8/186-25.0)

Example 1 indicates 17 mm thick structural plywood with a C quality face, a D quality back, a Type A bond, formaldehyde emission class E₀, and an F-grade of F7 in both panel dimensions with a standard construction detailed for 17-24-7.

Example 2 indicates 17 mm thick non-standard construction structural plywood with a C quality face, a D quality back, a Type A bond, formaldehyde emission class E₀, and an F-grade of F7 in both panel dimensions with a moment of inertia (*I*) of 236 mm⁴/mm parallel to grain and 186 mm⁴/mm perpendicular to grain and a section modulus (*Z*) of 27.8 mm³/mm parallel to grain and 25 mm³/mm perpendicular to grain.

- 2 If the plywood is preservative-treated, the appropriate Standard and treatment level should also be included (e.g., ‘AS/NZS 1604.3—H3’).

1.12.2 Branding other stress grade structural plywood

Each sheet of other stress-graded structural plywood, as permitted in Clause 1.5.3, shall have the following information legibly affixed thereon at the point of manufacture, at least once:

- (a) The manufacturer’s name or registered mark.
- (b) The word ‘STRUCTURAL’ or product description.
- (c) Reference to this Standard, i.e., AS/NZS 2269.0.
- (d) The reference to a product name or unique descriptor that identifies the structural performance characteristics of the plywood (see Notes 1 and 2).
- (e) The bond type of the glueline (i.e., A BOND).
- (f) The formaldehyde emission class [e.g., E₀ (see Table 1.1)].
- (g) If immunized or preservative treated, branding in accordance with AS/NZS 1604.3.

NOTES:

- 1 For the unique descriptor, see Clause 1.5.3.
- 2 Other stress grades may be applied to non-standard veneer grades.
- 3 The requirements of Items (b), (c), (d), (e) and (f) should be set out as follows:

Example

STRUCTURAL — AS/NZS 2269.0 PRODUCT NAME — A BOND — E ₀
--

Example indicates structural plywood with a Type A bond and a formaldehyde emission class E₀.

- 4 If the plywood is preservative-treated, the appropriate Standard and treatment level should also be included (e.g., ‘AS/NZS 1604.3—H3’).

SECTION 2 VENEER QUALITY

2.1 GENERAL REQUIREMENTS FOR ALL VENEERS

All the veneers in a finished sheet of structural plywood shall comply with the following requirements:

- (a) Veneers shall be free from decay and active insect attack.
- (b) In any 300 mm long line drawn across the grain anywhere on the plywood sheet, the aggregate dimension of knots, gaps in edge joints, splits, holes, patches, bark and unsound resin pockets, gum veins and areas of inactive decay shall not exceed the following:
 - (i) For Quality A and B softwood veneers 75 mm.
 - (ii) For Quality A and B hardwood veneers 45 mm.
 - (iii) For Quality S, C and D softwood veneers 120 mm.
 - (iv) For Quality S, C and D hardwood veneers 75 mm.

Measurement of aggregate defects shall be as shown in Figure 2.1.

- (c) Veneers shall be cut smoothly and tightly to a uniform thickness.
- (d) Veneers may be in more than one piece.

The veneer qualities in Clauses 2.2 to 2.6 apply to veneers on the lower limit of grade. Each pack of structural plywood shall include a reasonable distribution of panels having face veneer of quality above the lower limit.

2.2 QUALITY A VENEER

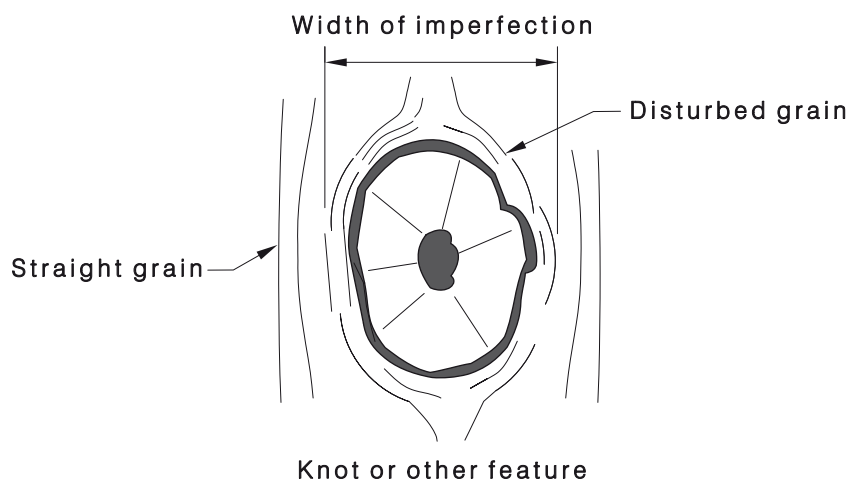
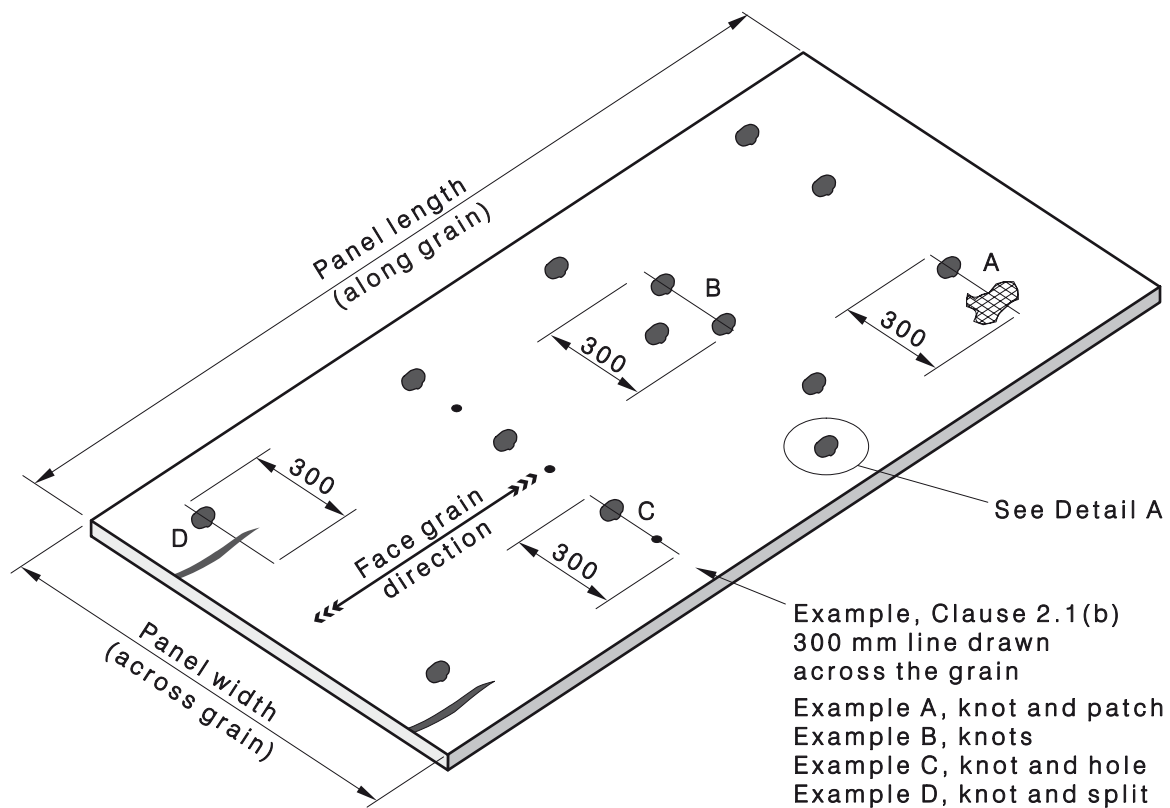
2.2.1 General

Each sheet of Quality A veneer in a finished sheet of structural plywood shall comply with Clause 2.1. When in more than one piece, veneers shall be colour matched.

2.2.2 Non-permitted characteristics

The following characteristics shall not be permitted:

- (a) Bark gum and resin pockets.
- (b) Unfilled holes, splits and open edge joints.
- (c) Gum veins.
- (d) Knots—loose, encased and unsound.
- (e) Patches.
- (f) Disfiguring discolouration or stains.
- (g) Glue bleed-through.
- (h) Resin streaks and gum blotches.

**DETAIL A**

NOTE: The width of the characteristics that is used to determine the aggregate defect dimension shall include the disturbed grain adjacent to the characteristics.

DIMENSIONS IN MILLIMETRES

FIGURE 2.1 AGGREGATE DEFECT MEASUREMENT

2.2.3 Permitted characteristics

The following characteristics shall be permitted subject to the limitations specified:

- (a) *Filled holes*—not exceeding 6 mm, measured across the grain, provided the filling is matched for colour with the surrounding wood and not more than four per sheet.