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Plywood — Bonding quality —

Part 1: Test methods

Contreplaqué — Qualité de collage —

Partie 1: Méthodes d'essai

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO 12466 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 12466-1 was prepared by Technical Committee ISO/TC 89, *Wood-based panels*, Subcommittee SC 3, *Plywood*.

ISO 12466 consists of the following parts, under the general title *Plywood — Bonding quality*:

- *Part 1: Test methods*
- *Part 2: Requirements*

Annex A forms a normative part of this part of ISO 12466.

Plywood — Bonding quality —

Part 1: Test methods

1 Scope

This part of ISO 12466 specifies methods for determining the bonding quality of veneer plywood by shear testing.

NOTE If it is proved that there is a correlation between the methods defined in this part of ISO 12466 and other methods, these may be used.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 12466. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 12466 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 12466-2, *Plywood — Bonding quality — Part 2: Requirements.*

EN 326-1:1994, *Wood-based panels — Sampling, cutting and inspection — Part 1: Sampling and cutting of test pieces and expression of test results.*

3 Test pieces

3.1 Sampling

Sampling of veneer plywood panels shall be in accordance with EN 326-1.

Test pieces shall be without any visible defect in the testing area.

3.2 Shape and size

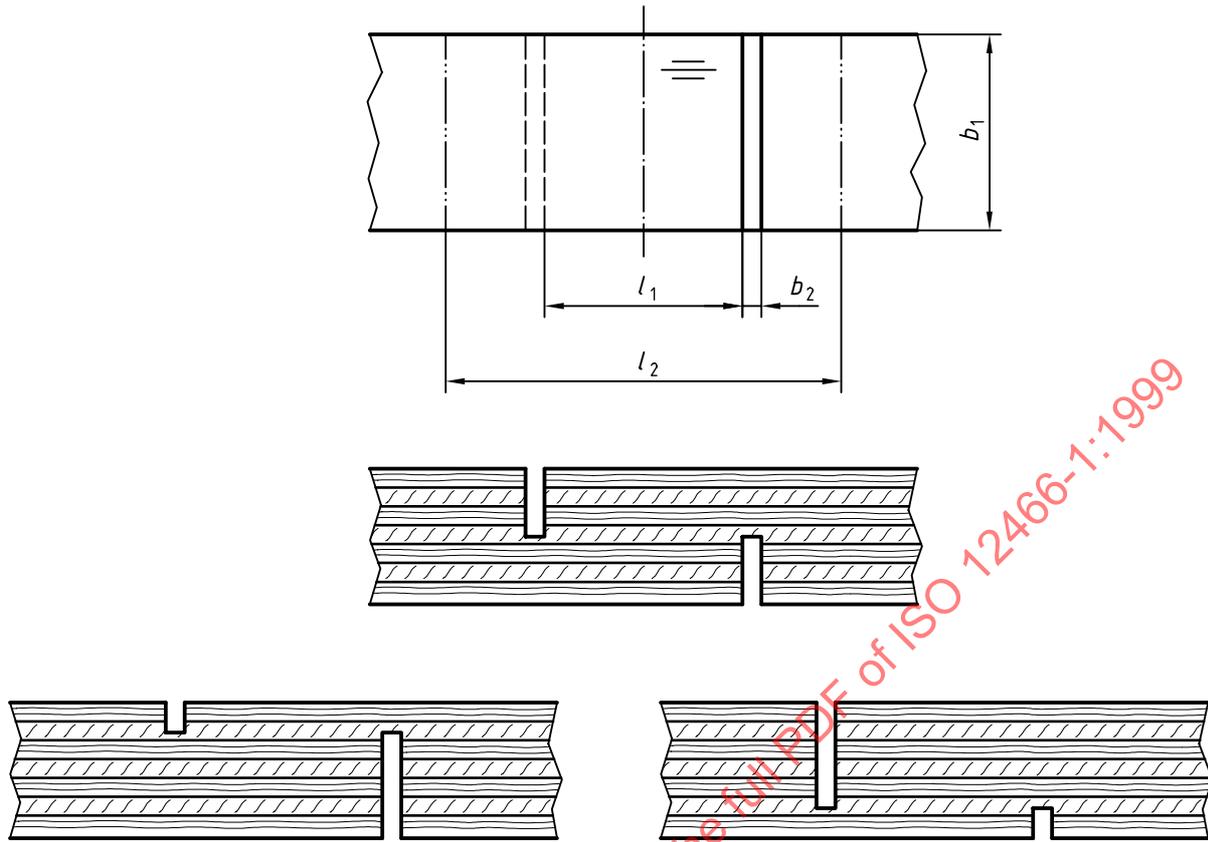
The test pieces shall be prepared as shown in Figure 1.

Each test piece shall be cut so that the grain direction of the layer (ply) between the gluelines under test is perpendicular to the length of the test piece.

The test pieces shall be prepared and nicking (saw cuts) made to allow the examination of each glueline of the panel.

The saw cuts shall extend inside the layer.

Test pieces of full-panel thickness may be used for panels with three to nine layers (plies). For panels of more than nine layers, excess layers shall be removed by planing, cutting or sanding.



Key

- Shear length: $l_1 = (25 \pm 0,5) \text{ mm}$ ^{a)}
- Shear width (width of test piece): $b_1 = (25 \pm 0,5) \text{ mm}$
- Width of saw cuts: $b_2 = 2,5 \text{ mm to } 4 \text{ mm}$
- Thickness: panel thickness
- Minimum distance between clamps: $l_2 = 50 \text{ mm}$
- Direction of face grain for all types of lay-up =

^{a)} In some cases (see 6.2) length $l = 25 \text{ mm}$ can be reduced to 10 mm.

Figure 1 — Examples of test pieces with seven plies

4 Apparatus

4.1 Pretreatment

- 4.1.1 Thermostatically controlled waterbath** suitable for immersing test pieces and capable of maintaining a temperature of $(20 \pm 3) \text{ }^\circ\text{C}$.
- 4.1.2 Boiling tank** enabling the test pieces to be immersed in boiling water.
- 4.1.3 Ventilated drying oven** capable of maintaining a temperature of $(60 \pm 3) \text{ }^\circ\text{C}$ at all points.

4.2 Shear test

- 4.2.1 Tensile testing machine** fitted with serrated wedge action grips, capable of operating continuously and measuring the load to an accuracy $\pm 1 \%$.

5 Pretreatment

5.1 Sequence of pretreatment

One of the following sequences of pretreatment shall be followed.

- a) Immersion for 24 h in water at (20 ± 3) °C;
- b) immersion for 6 h in boiling water, followed by cooling in water at (20 ± 3) °C for at least 1 h to decrease the temperature of the test pieces to 20 °C;
- c) immersion for 4 h in boiling water, then drying in the ventilated drying oven for 16 h to 20 h at (60 ± 3) °C, then immersion in boiling water for 4 h, followed by cooling in water at (20 ± 3) °C for at least 1 h to decrease temperature of the test pieces to 20 °C;
- d) immersion for (72 ± 1) h in boiling water, followed by cooling in water at (20 ± 3) °C for at least 1 h to decrease temperature of the test pieces to 20 °C.

5.2 Choice of pretreatment

The choice of pretreatment for particular plywood classes shall be made in accordance with ISO 12466-2.

5.3 Positioning of test pieces

The test pieces shall be placed, well separated and free to move, in a wire basket. During soaking, each test piece shall remain completely immersed in water.

6 Procedure

6.1 Determination of behaviour of ply bonding by shear test

Before the water treatment, measure the length and width of the shear area to an accuracy of 0,1 mm and record.

Carry out the shear test on wet test pieces from which excess surface moisture has been removed.

Arrange the shear test pieces in the centre of the clamping device in such a way that the load can be transmitted from the testing machine, via the ends of the test pieces, to the shear area without any transverse load. If slipping occurs, it shall only be allowed in the initial stage of the loading.

Apply the load at a constant speed such that failure occurs within (30 ± 10) s.

Determine and record the load at failure, to an accuracy of 1 N. Calculate the shear strength, in newtons per square millimetre, in accordance with clause 7.

After the shear test, determine the apparent cohesive wood failure in accordance with 6.2.

6.2 Determination of percentage of apparent cohesive wood failure

Allow the test pieces to dry before determination of apparent cohesive wood failure.

The percentage of apparent cohesive wood failure shall be determined by comparison with the standard illustrations in annex A, if possible by 5 % increments from 0 % to 100 %, and recorded.

Failure should normally occur in the wood or in the gluelines between the saw cuts, i.e. within the shear test area. If failure occurs outside the test area, or by cross-grain breaking within 50 % or more of the surface of a face veneer, reject the result and repeat the test with a shear length of 10 mm.

Failures resulting from the presence of strength-reducing defects shall also be excluded, with the exception of test pieces containing tape. Test pieces with such defects should normally be identified and replaced during the cutting operation. If the number of test pieces rejected exceeds 20 %, it is necessary to resample. If the resampling is also rejected on this basis, then the batch shall be rejected.

7 Expression of results

Calculate the shear strength f_v of each test piece, in newtons per square millimetre, from the following equation:

$$f_v = \frac{F}{l \cdot b}$$

where

F is the force (load) at failure of the test piece, in newtons;

l is the length of the shear area, in millimetres;

b is the width of the shear area, in millimetres.

Calculate the mean shear strength, to the nearest 0,01 N/mm², and the standard deviation.

Also determine the average percentage cohesive wood failure, to an accuracy of 5 %.

8 Test report

The test report shall be in accordance with EN 326-1, and shall also contain the following information:

- a) mean shear strength value and the standard deviation, in newtons per square millimetre (N/mm²);
- b) average percentage apparent cohesive wood failure;
- c) details of pretreatment (see 5.1).

Annex A (normative)

Determination of percentage of apparent cohesive wood failure by comparison with reference illustrations

Determine the percentage of apparent cohesive wood failure of the dried individual specimens to the nearest 10 % by comparison of the failed test specimen with a reference illustration (see Figures A.1 to A.3).

NOTE For technical reasons of photography, the figures illustrate only plywood bonded with a brown glue.

The determination shall take into account wood fibres present on the broken surfaces. Very fine fibres, which may be difficult to see without the use of a hand lens ($\times 10$ magnification) shall be given a weighting equal to easily visible, large fibres. Wood dust shall not be taken into account.

The determination of percentage wood fibres is subjective and is a skill not instantly acquired. While trained and experienced operators obtain accurate and reproducible results, differences between operators and laboratories may occur. To minimize this possibility, it is essential to adhere to the above guidelines.

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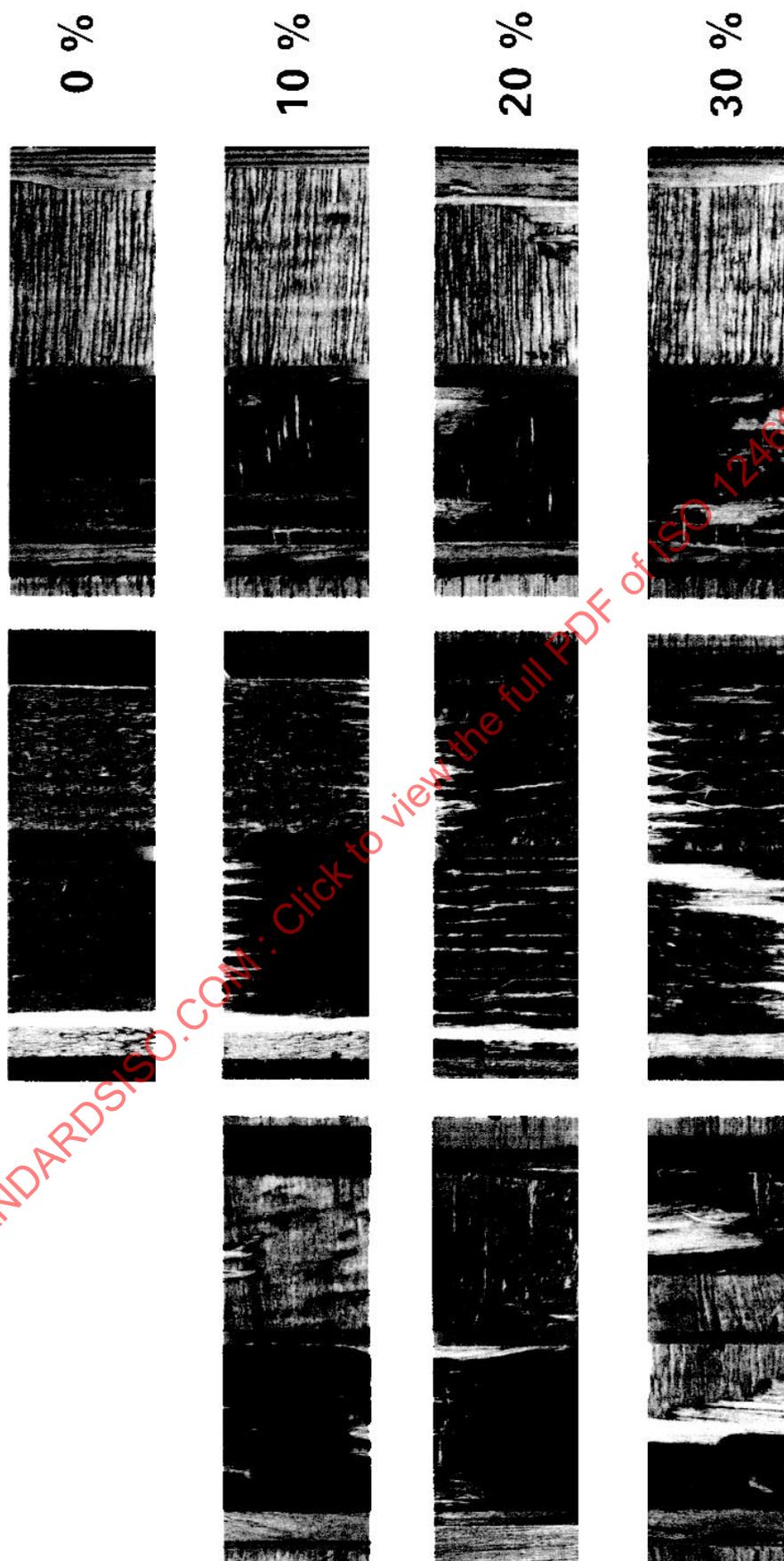


Figure A.1 — Reference illustrations — Wood fibre failure 0 % to 30 %

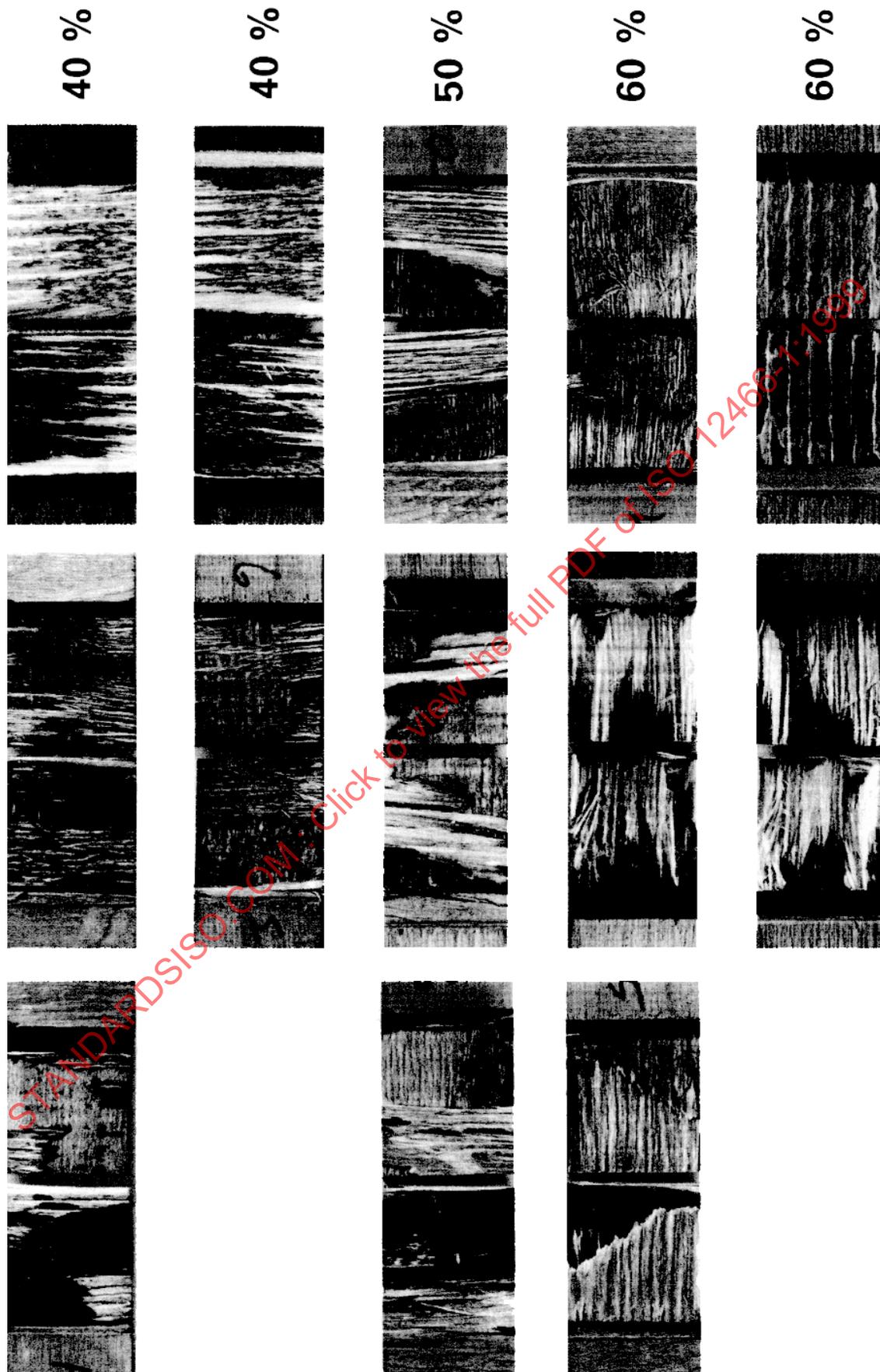


Figure A.2 — Reference illustrations — Wood fibre failure 40 % to 60 %