

Timber for and workmanship in joinery —

Part 2: Specification for workmanship

ICS 79.020

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Timber Standards Committee (TIB/-) to Technical Committee TIB/22, upon which the following bodies were represented:

British Wood Preserving Association
 British Woodworking Federation
 Department of the Environment (Building Research Establishment Princes Risborough Laboratory)
 Department of the Environment (Property Services Agency)
 Fibre Building Board Organization (FIDOR)
 Incorporated Association of Architects and Surveyors
 Institute of Clerks of Works of Great Britain Inc.
 Joinery Managers' Association Ltd.
 London Housing Consortium
 Scottish Timber Trade Association
 Steel Hinge Makers' Association
 Swedish Finnish Timber Council Ltd.
 Timber Research and Development Association
 Timber Trade Federation

This British Standard, having been prepared under the direction of the Timber Standards Committee, was published under the authority of the Board of BSI and comes into effect on 31 May 1988

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First published December 1944
 First revision September 1955
 Second revision November 1971
 Third revision May 1988

The following BSI references relate to the work on this standard:
 Committee reference TIB/22
 Draft for comment 86/13650 DC

Amendments issued since publication

Amd. No.	Date of issue	Comments
9385	April 1997	Indicated by a sideline in the margin

Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
<hr/>	
0 Introduction	1
1 Scope	1
2 Definitions	1
3 Moisture content	1
4 Joints permitting movement	1
5 Adhesives for all framed glued joints, finger joints and laminated timber	2
6 Fixed joint	2
7 Edge to edge jointed timber	4
8 Laminated timber	4
9 Finger jointed timber	4
10 Adhesives	5
<hr/>	
Appendix A Guidance on machined surfaces and their treatment	7
Appendix B Guidance on timber movement	7
Appendix C Method of test for the assessment of finger joint strength	8
<hr/>	
Figure 1 — Typical hand cut, lapped dovetail joint	3
Figure 2 — Typical machine cut, lapped dovetail joint	3
Figure 3 — Through dovetail joint	3
Figure 4 — Secret dovetail joint	3
Figure 5 — Restrictions on knots	6
Figure 6 — Plain-sawn timber (tangential)	8
Figure 7 — Quarter-sawn timber (radial)	8
Figure 8 — Illustration of three-point and four-point loading	8
Figure 9 — Three-point loading test	10
Figure 10 — Four-point loading test	10
<hr/>	
Table 1 — Guide to the efficiency in bending of some softwood finger jointed profiles	5
Table 2 — Number of jointed specimens to be taken from each production batch	9
Table 3 — Recording of failure loads for unjointed timber	9
<hr/>	
Publications referred to	Inside back cover

Foreword

This Part of BS 1186 has been prepared under the direction of the Timber Standards committee and supersedes BS 1186-2:1971, which is withdrawn. The other Part of BS 1186 is Part 3 Specification for wood trim and its fixing. Part 1 Specification for timber, is superseded by BS EN 942:1996 Timber in joinery — General classification of timber quality.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 10, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

0 Introduction

0.1 This Part of BS 1186 is intended to provide a specification and recommendations useful for most requirements of joinery.

0.2 The requirements for traditional methods of forming joints are given. In addition, the new but well established methods of laminated, finger jointed and edge jointed wood are included to enable more effective use to be made of the available supplies of timber, and to promote greater consistency of production and economy of products of improved stability. Laminating, finger jointing and edge to edge jointing are not detrimental to the joinery item and are likely to confer additional dimensional stability.

1 Scope

This Part of BS 1186 specifies requirements for the fit of parts in various details of joinery, and indicates a degree of care to be exercised in the forming of joints and the application of adhesives.

The suitability and selection of joints for specific applications are not included in this Part of BS 1186.

This Part of BS 1186 does not apply to wood trim.

Guidance on machined surfaces and their treatment and on timber movement are given in Appendix A and Appendix B respectively. Methods of test for the assessment of finger joint strength are given in Appendix C.

NOTE The titles of the publications referred to in this Part of BS 1186 are listed on the inside back cover.

2 Definitions

For the purposes of this Part of BS 1186, the definitions given in BS 6100-4 and in BS EN 942 apply, together with the following.

2.1 flush panel

assembly in which one or both faces are flush with the framework

2.2 push fit

fit requiring pressure that can be applied manually

2.3 tight fit

fit requiring pressure that needs to be mechanically applied

3 Moisture content

The average percentage of moisture content of timber during the manufacturing process shall be such as to ensure compliance with 4.3 of BS EN 942:1996.

4 Joints permitting movement

4.1 Wood based panel products fitted into grooves

NOTE 1 Except where required otherwise by a design, the following recommendations apply in the case of plywood panels fitted into grooves.

- The grooves should be not less than 9 mm deep.
- The face of the panel should fit closely to the sides of the grooves, subject to a total tolerance of -0.5 mm.
- The panel should be smaller in length and width, to a maximum of 3 mm, than the distance between the bottoms of the grooves.

The recommendations in items b) and c) also apply when other wood based panel products are fitted, except where required otherwise by a design.

When a wood based panel product (other than plywood) is to be jointed, guidance shall be obtained from the manufacturer in respect of the moisture related movement that can be expected, in order that the correct depth of groove required can be provided to ensure that there is provision for any expansion or contraction that may arise.

NOTE 2 The degree of moisture related movement varies according to the type of panel product used, particularly when the panel is treated by, for example, impregnation with a flame retardant.

4.2 Solid timber panels fitted into grooves

When a solid timber panel is fitted into grooves, the following requirements apply.

- The grooves shall be not less than 9 mm deep, appropriate to the anticipated extent of moisture related movement (see Appendix B) and having regard to the properties of the timber and the dimensions of the parts.
- The faces of the panel shall fit closely to the sides of the grooves.
- In the direction of the grain, the panel shall be a maximum of 3 mm shorter than the distance between the bottoms of the grooves.
- Across the grain, the panel shall be less than the distance between the bottoms of the grooves to provide for any expansion or contraction that may arise due to changes in the moisture content of the material used (see Appendix B).
- The panel shall not be fixed in any way that will prevent its free expansion and contraction.

The following additional requirements apply to any flush panel.

- 1) The face of the panel shall be flush with that of the surrounding framing, subject to a tolerance of $\begin{matrix} -0 \\ +1 \end{matrix}$ mm.
- 2) Any moulded tongue of a panel shall not exceed two-fifths of the panel thickness and shall be not less than 5 mm.
- 3) When the joint between the edge of the panel and the adjoining framing member is "broken" by a bead or other feature, the clearance between the parts shall be appropriate for the anticipated extent of moisture related movement (see Appendix B).

4.3 Profiled boarded surfaces

Profiled boards shall be joined together with either tongued and grooved or rebated joints that provide a coverage of one board over another appropriate to the anticipated extent of moisture related movement (see Appendix B), having regard to the properties of the timber and the dimensions of the components.

The tongue at its widest point shall be not less than one-third of the thickness of the board.

The tongued and grooved or rebated joints shall permit free swelling and shrinkage of the boards in their width but shall not allow play in the thickness. Fixing shall be carried out so that each board is able to swell and shrink freely in its width but is not able to move as a whole.

5 Adhesives for all framed glued joints, finger joints and laminated timber

Adhesives shall be selected from those specified in 10.1. The selection shall have regard to the conditions to which the finished joinery will be exposed. Adhesives shall be applied as specified in 10.2.

6 Fixed joints

6.1 Framed joints

6.1.1 General. The faces of members shall be flush or stepped or relieved. Where faces of members are relieved or the edges are moulded, the faces shall be in alignment subject to a tolerance of ± 1 mm.

There shall be a tight fit on the exposed face(s) of a shaped scribe or a square shoulder. In other respects the two surfaces shall not at any point be more than 0.5 mm apart.

In a mortice and tenon, combed or halving joint, where part of the end grain of one member shows upon a finished face or edge, it shall be flush with that face or edge.

On the face of the work, the end of the one member shall be in close contact with the edge of the other throughout the length of the shoulder, except that defects caused by slight tearing of the end grain shall be permitted to an extent not exceeding 1 mm in depth, 3 mm across the grain and 3 mm along the grain, unless restricted or excluded by the specifier.

6.1.2 Dowelled joint. Dowels shall be grooved for adhesive, shall be a tight fit into the dowel holes and shall fill the holes to within 6 mm at each end when the joint is assembled.

All dowelled surfaces shall be fully coated with adhesive after assembly (see 10.2).

6.1.3 Mortice and tenon joint. In their thickness, the tenon and the mortice shall be parallel to each other and the tenon shall (in its thickness) be a push fit in the mortice. Tenons shall be secured in the mortice by the use of wedges, wood or metal dowels, staples, plastics or metal fasteners or patented fixings.

Where wedges are used they shall be of the same thickness as the tenon. The taper of the wedges shall be the same as the taper of the mortice or tenon, and when driven in the wedges shall fit tightly for at least three-quarters of the length of the tenon. Where wedges are not used the tenon shall, in its thickness and width, be a push fit in the mortice.

Where a wooden dowel is used, it shall be a tight fit and shall engage every member of the joint; it shall finish flush with the surface of the work. Where a metal dowel or staple is used it shall engage every member of the joint and shall not protrude beyond the surfaces.

Where draw-boring of a mortice and tenon joint is required the drilling of the holes shall be offset so that the shoulders are drawn up tight.

NOTE Surfaces of tenons and wedges should be fully coated with adhesive after assembly, except where otherwise required by the design (see 10.2).

6.1.4 Combed joint. Each face of a tenon of a combed joint shall be parallel to the corresponding faces of the other tenons and each individual tenon shall be a push fit in its slotted counterpart.

Dowels or pins shall engage all members of the joint.

Wooden dowels shall be flush with the surface of the work and metal dowels or pins shall not protrude above the surface of the work.

Surfaces shall be fully coated with adhesive after assembly (see 10.2).

6.1.5 Halving joint. Each part of a halving joint shall be cut to half the thickness of the members forming the joint.

Mating surfaces shall be smooth and in close contact and shall be fully coated with adhesive (see 10.2).

6.2 Joints between wide board surfaces meeting at right or other angles

6.2.1 Dovetail joint (see Figure 1 to Figure 4).

Dovetail joints shall be so made that the mating surfaces at the sides of the tails and at the shoulders will be in close contact.

Dovetail joints shall not be split or broken in the end pins.

The sides of the tail and pin shall be inclined to their axes at a slope (see Figure 2) of not less than one-in-eight for multidovetail joints, and not less than one-in-six and not more than one-in-four for single dovetail joints.

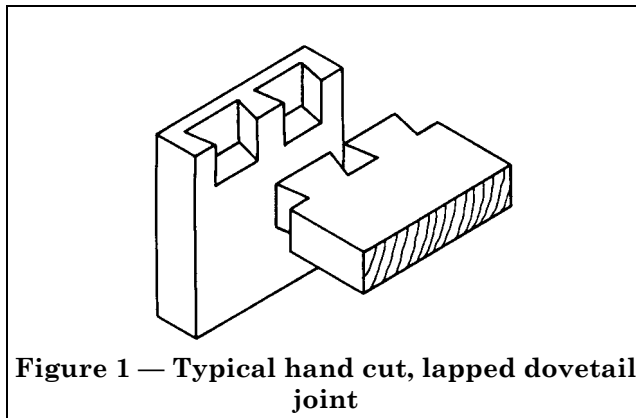


Figure 1 — Typical hand cut, lapped dovetail joint

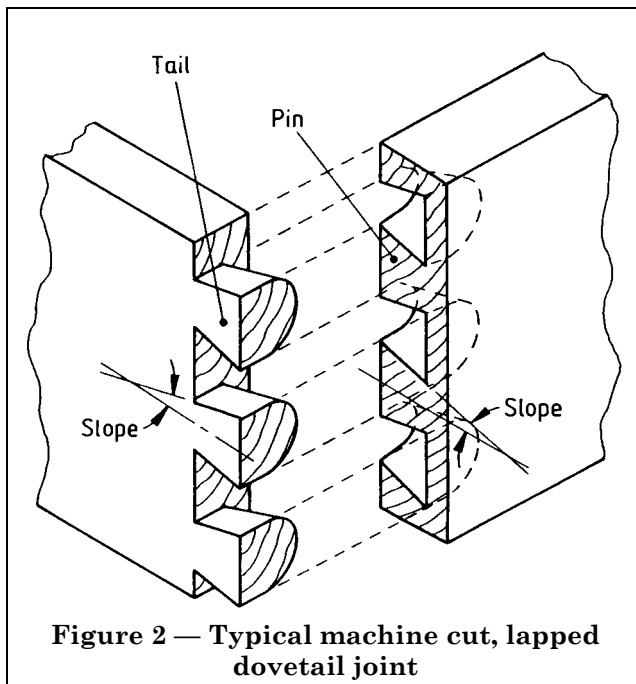


Figure 2 — Typical machine cut, lapped dovetail joint

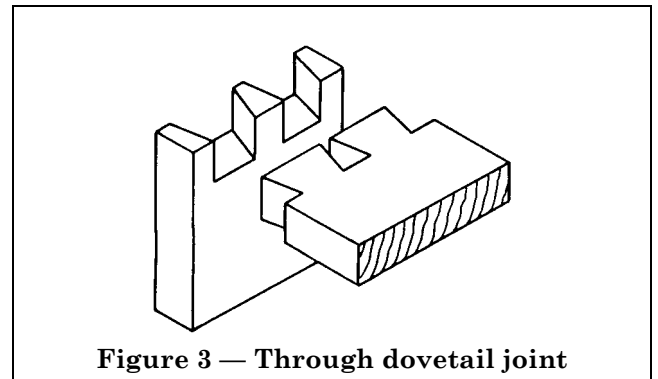


Figure 3 — Through dovetail joint

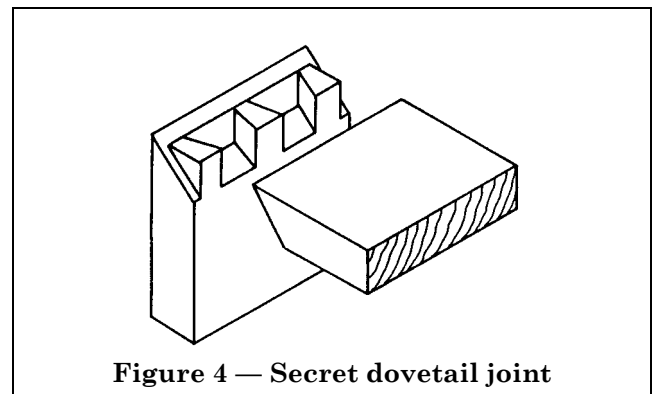


Figure 4 — Secret dovetail joint

Dovetail joints shall be hand or machine cut.

All mating surfaces shall be fully coated with adhesive (see 10.2).

6.2.2 Housed joint. The width of the housing shall accurately fit the thickness of the members inserted, except where the housing is wedged, as in stairs, in which case the member and the wedge shall accurately fit the taper of the groove.

The end of the member inserted in the housing shall fit against the bottom of the housing groove.

The joint shall be screwed or nailed unless the housing is dovetailed.

In a stopped housing the shoulder of the inserted member shall fit closely against the surface it abuts. Also, the front edge of the inserted member shall be a close fit in the end of the housing groove.

The mating surfaces of the wedge shall be fully coated with adhesive (see 10.2).

6.2.3 Rebated joint. The shoulder of the rebate shall be square with the face of the member rebated or shall be finished accurately at such other angle as the design requires.

NOTE Unless otherwise required by the design, the exposed end of the rebated member and the face of the member meeting it should be flush with one another.

The end of the member inserted shall fit against both faces of the rebated joint.

The joint shall be screwed or nailed.

If the joint is stopped, the shoulder of the inserted member shall fit closely against both faces of the rebated joint.

The depth of the rebate shall not exceed two-thirds of the thickness of the rebated member.

6.2.4 Tongued and grooved joint between members meeting at an angle (see 4.3). The thickness of the tongue shall not exceed two-fifths of the thickness of the member on which it is formed and shall be not less than 5 mm and the length of the tongue shall not exceed one and a half times its thickness.

The shoulder of the grooved member shall be square with the face of the member tongue or shall be finished accurately at such other angle as the design requires.

The width of the groove shall accurately fit the thickness of the tongue inserted and the depth of the groove shall not exceed the length of the tongue by more than 1.5 mm.

If the joint is stopped, the shoulder of the inserted member shall fit closely against the surface it abuts.

6.2.5 Glued blocks. When a block is used to stiffen a joint given in 6.2.2 to 6.2.4, it shall accurately fit the angle of the joint and mating surfaces shall be fully coated with adhesive (see 10.2).

7 Edge to edge jointed timber

The faces of the pieces joined shall be flush with one another.

The edges of the joint showing on both faces of the work shall be fully coated with adhesive (see 10.2) and shall be in contact throughout their length.

NOTE Except where it is necessary for locating purposes to have a profiled joint, a butt joint may be used.

8 Laminated timber

8.1 Machine preparation of laminations

Surfaces to be laminated shall be machined to provide a clean cut surface without torn or damaged grain.

8.2 Thickness variation

The variation in actual thickness throughout the length of an individual lamination shall not exceed ± 0.5 mm.

NOTE Any lamination may consist of two or more pieces joined in length and/or width.

8.3 End joints

8.3.1 Laminations that appear on surfaces intended to be exposed to the weather shall not be joined by heading joints other than finger joints. If laminations are not intended to be exposed to the weather, heading joints shall be permitted. In both cases no two such joints shall be less than 300 mm apart in the same or adjacent laminations.

8.3.2 Finger joints shall comply with 9.

8.4 Moisture content

At the time of gluing the maximum difference between the moisture content of the laminations to be assembled into a single member shall not exceed 5 percentage points. The moisture content of each lamination shall not exceed 18 % and shall be within ± 3 percentage points of the average equilibrium moisture content that is expected to be attained in service conditions as defined by Table B.1 of BS EN 942:1996.

8.5 Gluing

All mating surfaces shall be fully coated with adhesive (see 10.2).

9 Finger jointed timber

9.1 General

Finger joints shall comply with 9.2 to 9.6. Machine cutters shall be kept sharp. Sloping mating surfaces of the fingers shall be in close contact throughout their length. Finger joints that are to be on a visible face (see BS EN 942) shall be of a type having no gap at the tips.

9.2 Moisture content

At the time of gluing the maximum difference between moisture content of the pieces being joined into a single member shall not exceed 5 percentage points. The moisture content of each piece shall not exceed 18 % and shall be within ± 3 percentage points of the average equilibrium moisture content that is expected to be attained in the service conditions shown in Table B.1 of BS EN 942:1996.

9.3 Assembly

9.3.1 Adhesive application shall comply with 10.2. In addition, 9.3.2 to 9.3.6 shall be complied with.

9.3.2 Joints shall be glued as soon as possible, and not more than 24 h after being cut.

9.3.3 Between cutting and assembly the cut surfaces of the fingers shall be kept clean and the timber shall be stored in conditions that will not lead to distortion.

9.3.4 At the time of assembly, the temperature of the timber at the joint shall be not less than 15 °C and, until curing is completed, shall not fall below 10 °C.

9.3.5 The recommendations of the adhesive manufacturer shall be followed with respect to:

- a) end use conditions (including moisture content);
- b) mixing;
- c) the use of fillers;
- d) preheating of the timber (by radio frequency, infra-red or other methods);
- e) application;
- f) open and closed assembly times;
- g) temperature of the air and the timber before and during curing;
- h) curing.

9.3.6 The recommendations of the manufacturer of the finger jointing machinery shall be followed with respect to the required end pressure. Adhesive shall be uniformly applied to the fingers to ensure some surplus adhesive is squeezed out when end pressure is applied. The end pressure shall not cause splitting of the timber, except as permitted in **9.6**.

NOTE 1 The end pressure required depends on the joint profile, species and size of the timber. For softwoods, end pressures of approximately 1.5 N/mm^2 are recommended for finger joints over 20 mm long, while for shorter joints end pressures of 5.0 N/mm^2 to 15.0 N/mm^2 are recommended. There is insufficient data to make recommendations for hardwoods.

NOTE 2 Short term application of pressure is generally sufficient to allow the jointed timber to be moved with reasonable care prior to storage or subsequent machining.

Machining shall only be carried out after curing of the adhesive.

9.4 Efficiency in bending

Finger jointed material used for joinery items shall have a joint of not less than 40 % efficiency in bending when tested in accordance with Appendix C. In addition, the requirements of **9.5** and **9.6** shall apply.

NOTE 1 When finger jointed material is used as core material in flush doors, infillings and blockings, there are no strength requirements.

NOTE 2 Guide efficiencies in bending for some finger joints in softwood are given in Table 1.

NOTE 3 For joinery components that can have a structural function, e.g. curtain walling, specifiers should refer to BS 5291 with regard to structural softwood finger joints. There is no standard for finger joints in hardwood.

Table 1 — Guide to the efficiency in bending of some softwood finger jointed profiles

Length, <i>l</i>	Pitch, <i>p</i>	Tip width, <i>t_w</i>	Efficiency in bending
mm	mm	mm	%
55	12.5	1.5	75
50	12.0	2.0	75
40	9.0	1.0	65
32	6.2	0.5	75
30	6.5	1.5	55
30	11.0	2.7	50
25	10.0	2.0	35 ^a
20	6.2	1.0	65
20	8.0	2.0	30 ^a
15	3.8	0.5	75
12.5	4.0	0.7	65
12.5	3.0	0.5	65
10	3.7	0.6	65
10	3.8	0.6	65
7.5	2.5	0.2	65

^a See 9.4.

9.5 Knots

The maximum dimension of knots within the length of the fingers shall not be greater than 5 mm or one half the pitch of the fingers, whichever is smaller. Fingers shall not contain zones of localized grain disturbance associated with knots. Outside the length of the fingers for a distance of 36 mm, the size of the knots shall not exceed 12 mm or the specified class limit as defined in BS EN 942 whichever is less. (See Figure 5.)

9.6 Fissures

After assembly of the joint, fissures originating from the finger roots shall not exceed 1.5 mm in width and/or 10 mm in length and shall not penetrate through the thickness of the piece of timber.

10 Adhesives

10.1 Types

Adhesives shall be compatible with wood preservatives to be applied and with the intended end use of the timber. Adhesives used for joinery shall be one of the following:

- a) animal glue complying with BS 745;
- b) synthetic resin gap filling adhesives (phenolic and aminoplastic) complying with BS 1204-1 and BS 1204-2;
- c) one part polyvinyl acetate emulsion adhesives complying with BS 4071;
- d) two part polyvinyl acetate emulsion adhesives in accordance with the recommendations of DD 74;

e) other adhesives that are in accordance with the appropriate performance recommendations of DD 74.

10.2 Adhesive application

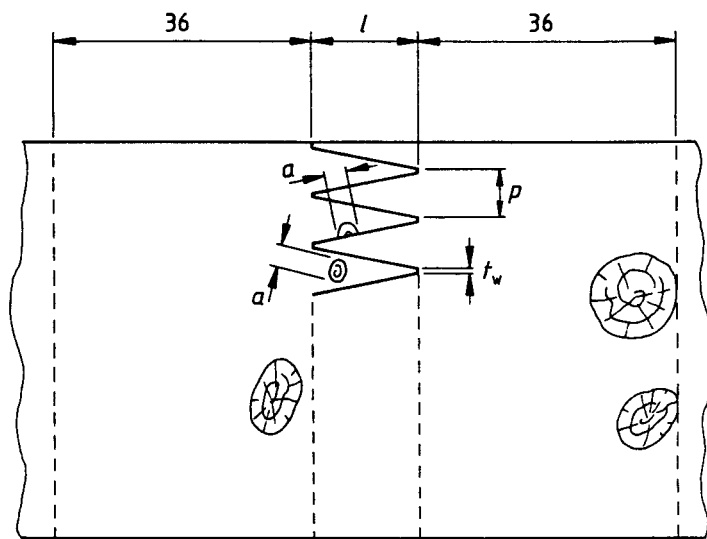
Each adhesive type shall be stored, mixed and applied following the recommendations of the adhesive manufacturer.

The fit of the parts and method of assembly shall maintain the mating surfaces in close contact to ensure adhesion during the setting time.

NOTE 1 Reference should be made to BRE Digest 314 "Gluing Wood Successfully"¹⁾.

NOTE 2 Joint lines may become more pronounced with the use of certain adhesives, e.g. resorcinol compounds.

The application of adhesive shall be such that the required extent of surface area to be coated with adhesive (see 6.1.2 to 6.1.5, 6.2.1, 6.2.2, 6.2.5, clause 7 and 8.5) will be coated when the joint has been assembled.



l is the finger joint length;
 p is the finger pitch;
 t_w is the tip width;
 a is the maximum size of knots in the fingers, i.e. $p/2$ or 5 mm, whichever is smaller.

All dimensions are in millimetres.

Figure 5 — Restrictions on knots

¹⁾ Obtainable from The Building Research Establishment, Garston, Watford, Herts WD2 7JR.

Appendix A Guidance on machined surfaces and their treatment

A.1 Machining of solid timber

It is not possible to give a practical method of measuring the smoothness of timber surfaces for joinery. Even a reference to the spacing of cutter marks is not relevant if the surface being described is to be sanded. Therefore, only general guidance can be given.

The cutting angle should be chosen to suit the species and moisture content.

Machining should be carried out at a moisture content related to the in-service moisture content condition.

If no sanding is to be employed, the number of cutter marks per 25 mm should normally be between 12 and 16.

A.2 Arrised edges

Whenever the design permits, it is desirable that exposed arrises should be removed to avoid local reduction in the thickness of the paint film.

A.3 Surface imperfections

Any chipping or surface damage at or around knots etc., which would spoil the final finish, should be sanded away or filled. The filler should comply with clause 6 of BS EN 942.

A.4 Surface finishes

The surface of timber to be coated should be suitable for the application of the paint primer or base coat (varnish, stain or polish). Wood based panel products may require additional preparation (e.g. filling) prior to the application of finishes.

The priming or base coat, which should be compatible with any wood preservative treatments, may be applied either at a factory or on site. Sufficient time should be allowed for solvent evaporation if organic solvent wood preservatives are applied, before the application of finishes.

It should be noted that all priming coats give limited protection against the ingress of moisture. The degree of protection varies with the material used.

Water-borne primers should comply with BS 5082.

Solvent-borne primers should comply with BS 5358.

Before applying any subsequent coats, it may be necessary for sanding or de-nibbing to be carried out.

NOTE Reference should also be made to BS 6150.

Appendix B Guidance on timber movement

Timber is a hygroscopic material and will therefore gain or lose moisture in response to changes in relative humidity.

The speed at which a change occurs depends upon the species, the temperature and the permeability of any surface coatings applied to the wood.

Below fibre saturation point (fsp) timber will "move", i.e. change in shape and dimension with changes in its moisture content. Not all species have the same amount of movement in response to changing moisture content (see BRE/PRL Technical Note No. 38 "The Movement of Timber"²⁾, which uses three categories, small, medium and large, to characterize timbers). Fsp for most species is about 30 % moisture content.

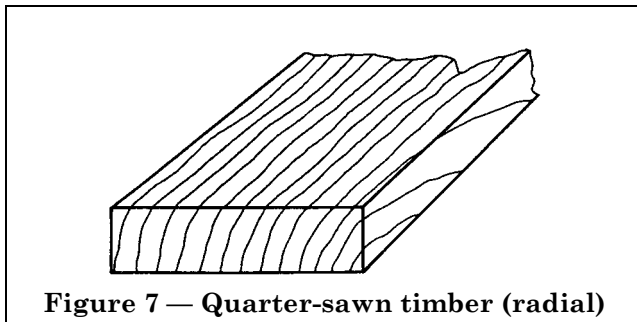
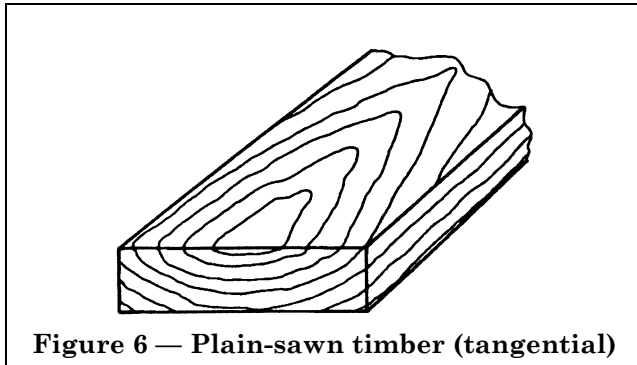
With the vast majority of species longitudinal movement is so small that it can be ignored and only tangential and radial movements need to be considered.

Tangential movement for most species is approximately twice that of radial movement but for most purposes the mean of tangential/radial may be used. However, where mostly flat sawn material is to be used the larger tangential movement figures should be used.

For most practical purposes the following guidelines should suffice.

- a) Timber does not shrink or swell along the grain.
- b) Shrinkage starts as the timber dries below 30 % moisture content.
- c) Timber shrinks and swells approximately twice as much in tangential direction as it does radially (see Figure 6 and Figure 7).
- d) Tangential shrinkage or swelling may be estimated for large movement timbers as 1% movement for every 3% moisture content change in the wood, and for small movement timbers as 1 % of movement for every 5% moisture content change.

²⁾ Obtainable from The Building Research Establishment, Garston, Watford, Herts WD2 7JR.



Appendix C Method of test for the assessment of finger joint strength

C.1 Testing

The testing shall be carried out by three-point or four-point loading (see Figure 8). The span (l) shall be at least 12 times the depth of the specimen (h) except when this would lead to l being more than 500 mm, in which case the testing company should have the option to use a test span of 500 mm.

The rate of loading shall be such as not to cause failure of unjointed or jointed specimens in less than 1 min or more than 2 min. Specimens that fail outside this period shall not be considered in any analysis of results.

NOTE Specimens that fail outside the test period may indicate why failure has occurred and hence could be significant.

C.2 Finger jointing in European Redwood, European Whitewood, Canadian Douglas Fir-Larch and Canadian Hemlock

There is extensive knowledge of the strength of finger joints in these species, therefore there is no need to test unjointed specimens as well as jointed specimens, and quality control tests in normal production may be carried out and analysed in accordance with C.5, C.6 and C.7.

NOTE See also C.3.

C.3 Finger jointing in species other than those in C.2

For these species (or for the species in C.2 if the manufacturer wishes) unjointed specimens shall first be tested as detailed in C.8 to establish an S value. Then, in normal production, the failure load for jointed pieces shall be not less than F_u , as calculated from the formula in C.8. In addition, testing shall comply with C.6.

C.4 Unjointed specimens

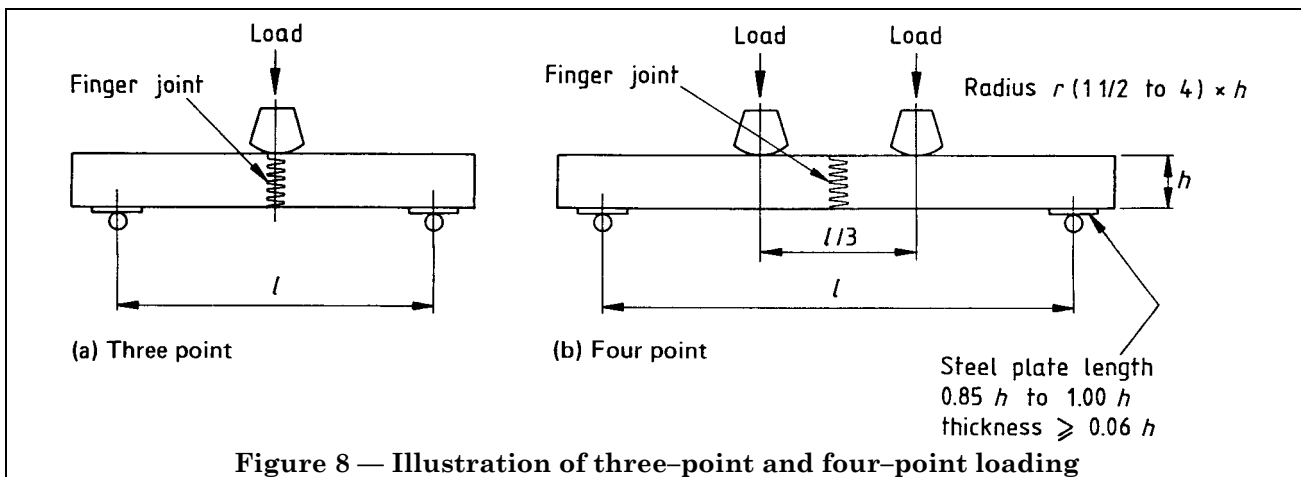
Unjointed control specimens shall be selected to be as representative of the species, size and moisture content of the jointed section to be used in practice as is practical when comparing with machined/moulded sections.

Even if the finger joints are to occur in a moulded section, the testing shall be of rectangular specimens of or from the basic size from which the production sample is moulded; except that when this would lead to the test specimen having a depth of more than 100 mm, test specimens having a depth of not less than 95 mm shall be permitted.

NOTE The middle one third of span should be free from any obvious defect.

C.5 Jointed specimens

Jointed specimens shall be of the same dimension as the unjointed specimens with which they will be compared. The finger joint shall occur at centre span. The finger profile may appear parallel to or perpendicular to the line of action of the load. The grading of the specimen shall comply with 9.5 and 9.6.



C.6 Number of jointed specimens to be taken from normal production

Jointed specimens shall be taken, at regular intervals, from each production batch in the numbers given in Table 2 and shall be tested in accordance with C.1. If any jointed specimen fails at a load of less than the relevant F_u value, the production batch shall be deemed not to comply with this Part of BS 1186.

Table 2 — Number of jointed specimens to be taken from each production batch

Number of joints produced	Number of jointed specimens to be tested
≤ 25	1
> 25 ≤ 500	2
> 500 ≤ 1 000	3
For each additional 1 000	1 additional specimen

C.7 Calculation of the minimum failure value for a finger joint requiring 40 % efficiency in European Redwood, European Whitewood, Canadian Douglas Fir-Larch and Canadian Hemlock

F_u is the minimum failure value of the test machine in newtons that shall be supported by the finger jointed specimen taken out of production and is calculated as follows.

- a) For a three-point loading test

$$F_u = \frac{ybh^2}{6l}$$

where

y is a constant of 40 N/mm² that is established by laboratory test;

h , l and b are as shown in Figure 9 (in mm).

- b) For a four-point loading test

$$F_u = \frac{ybh^2}{6(l-A)}$$

where

y is a constant of 40 N/mm² that is established by laboratory test;

h , l , b and A are as shown in Figure 10 (in mm).

C.8 Procedure for establishing the minimum failure value for a finger joint requiring 40% efficiency in species other than those in C.7

Test, in accordance with C.1, 10 specimens of unjointed timber complying with C.4. Record the failure loads in newtons (F_1 , F_2 , etc.) and calculate the average value (F_a) (see Table 3).

Table 3 — Recording of failure loads for unjointed timber

Failure loads	Difference between F_a and F_1 , F_2 , etc.	Difference squared
N	N	N ²
F_1		
F_2		
F_3		
F_4		
F_5		
F_6		
F_7		
F_8		
F_9		
F_{10}		
Record average, F_a		Record total, T_{fs}

Take the difference between each failure load and the average value and square it. Total the 10 squared values to give T_{fs} . (See Table 3.)

Calculate S (see C.2) from the equation

$$S = \frac{\sqrt{T_{fs}}}{9}$$

Test, in accordance with C.1, specimens of jointed timber complying with C.5, taken from normal production in accordance with C.6.

The minimum failure value of the test machine that shall be supported by the finger jointed specimen taken out of production F_u (in N) is given by the equation

$$F_u = 0.4 (F_a - 1.645S).$$

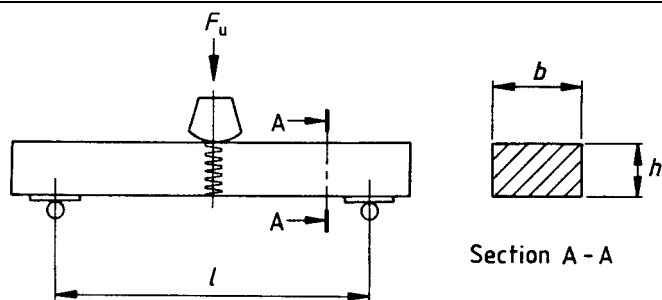


Figure 9 — Three-point loading test

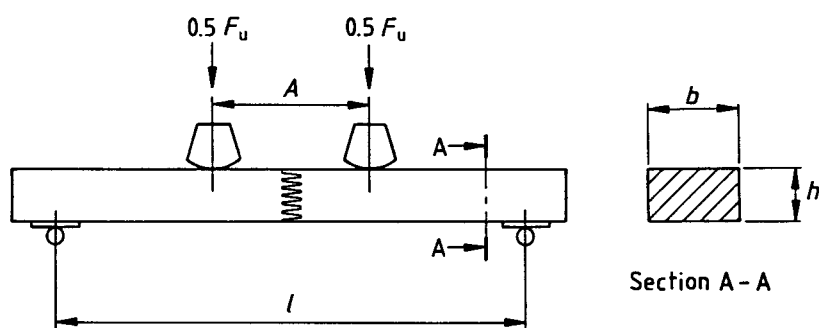


Figure 10 — Four-point loading test

Publications referred to

- BS 745, *Specification for animal glue to wood (joiner's glue) (dry glue; jelly or liquid glue).*
- BS 1186, *Timber for and workmanship in joinery.*
- BS 1186-3, *Specification for wood trim and its fixing.*
- BS 1204, *Synthetic resin adhesives (phenolic and aminoplastic) for wood.*
- BS 1204-1, *Specification for gap-filling adhesives.*
- BS 1204-2, *Specification for close-contact adhesives.*
- BS 4071, *Specification for polyvinyl acetate (PVA) emulsion adhesives for wood.*
- BS 5082, *Specification for water-borne priming paints for woodwork.*
- BS 5291, *Specification for manufacture of finger joints of structural softwood.*
- BS 5358, *Specification for solvent-borne priming paints for woodwork.*
- BS 6100, *Glossary of building and civil engineering terms.*
- BS 6100-4, *Forest products.*
- BS 6150, *Code of practice for painting of buildings.*
- DD 74, *Performance requirements and test methods for non- structural wood adhesives.*
- BRE Digest 314, *Gluing Wood successfully*, Building Research Establishment, Garston, Watford.
- BRE/PRL Technical Note No. 38, *The Movement of Timber*, Building Research Establishment, Garston, Watford.
- BS EN 942, *Timber in joinery — General classification of timber quality.*

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