

Specification for

**Manufacture of glued
structural components of
timber and wood based panels**

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Committees responsible for this British Standard

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- British Adhesives and Sealants Association
- British Woodworking Federation
- Department of the Environment (Building Research Establishment)
- Glued Laminated Timber Association
- Institution of Civil Engineers
- Nordic Timber Council (UK)
- Timber Research and Development Association
- Timber Trade Federation
- Wood Panel Industries Federation

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Foreword

This British Standard has been prepared by Subcommittee B/518/3, Glued laminated timber. It supersedes BS 6446 : 1984, which is withdrawn.

This edition of BS 6446 has been revised to take account of the deletion of BS 1204 : Part 1, and its replacement by BS EN 301. This affects the scope, **6.3** and **7.1**. The climate conditions given in the previous edition have been replaced by the corresponding 'service classes' referred to in DD ENV 1995-1-1 and BS 5268 : Part 2 (see list of standards on the inside back cover). Other minor revisions have been made to accommodate the revision or deletion of the standards referred to in this 1997 edition of this standard. The contents of the standard have in parts been re-arranged to reflect more closely component manufacturing processes, and annex A has been re-written so that it is compatible with related European standards.

When the original edition of this standard was prepared, the only woodbased panels for which design stresses were available (from BS 5268 : Part 2) were plywood and tempered hardboard. Both BS 5268 : Part 2 and DD ENV 1995-1-1 now recognize design stresses for other types of woodbased panel, and this term has been substituted for 'plywood' and/or 'tempered hardboard'.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 12, an inside back cover and a back cover.

Specification

Introduction

There is a long history of structural components being successfully assembled from pieces of timber and plywood glued together, particularly in the aircraft industry. The use in buildings of glued structural components (e.g. box beams, single web beams, stressed skin panels, gusseted trusses, etc.) made from timber, and wood based panels poses various problems with regard to the preparation of materials and the selection of adhesives because of the wide range of environmental conditions that can be encountered in service.

The gluing process is a sensitive operation. Changes in either environment of the production area or in the conditions of materials can have adverse effects upon the performance of the component in service. The work should be supervised by skilled and experienced personnel and throughout the manufacturing operations strict control of quality should be maintained. Routine testing of glue line strength together with records of production are essential aspects of the quality assurance required by this standard.

The handling, storage and protection of components after manufacture, including transportation to site, erection and any protection that may be required until the building is completed, are of equal importance to the manufacturing requirements given in this standard. Due regard should be given in this respect to the recommendations of BS 5268 : Part 2.

The requirements of this standard are the minimum to achieve sound glued joints and consequently an adequate performance in service.

1 Scope

This British Standard specifies the requirements for the manufacture of structural components which have been designed using either:

- a) design or load testing data from BS 5268 : Part 2;
- b) properties established from European Technical Approvals;
- c) information derived from prototype testing according to BS 5268 : Part 2.

In such components (e.g. box beams, single web beams, stressed skin panels, gusseted trusses) made from separate pieces of timber, plywood or other wood based panels that are glued together, the continued integrity of the glue line is essential for satisfactory performance in service.

Requirements are specified for production facilities, materials, types of joint, production, production control, the use of preservative and flame retardant treated materials and storage.

Glued laminated timber structural members and finger joints in structural softwood are specified in accordance with BS EN 386 and BS EN 385 respectively.

NOTE. Components manufactured in accordance with this British Standard may not be suitable for use in service class 3 of DD ENV 1995-1-1 and BS 5268 : Part 2 where they are exposed directly to the weather, e.g. marine structures.

2 Normative references

This British Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are made at the appropriate places in the text and the cited publications are listed on the inside back cover. For dated references, only the edition cited applies; any subsequent amendments to or revisions of the cited publication apply to this British Standard only when incorporated in the reference by amendment or revision. For undated references, the latest edition of the cited publication applies, together with any amendments.

3 Definitions

For the purposes of this British Standard the definitions given in BS 6100 : Part 4 and BS 6138 apply together with the following:

3.1 adhesive spread

Amount of adhesive applied to the surfaces to be bonded. In a single spreading this amount is applied to one surface, in double spreading it is divided between the two surfaces to be joined.

3.2 closed assembly

A number of pieces spread with adhesive and assembled in a component prior to the application of pressure.

3.3 open assembly

A number of pieces spread with adhesive prior to closed assembly.

3.4 clenching

Method of securing the point side of a protruding nail by driving it sideways thereby forming a right angled bend.

3.5 cold-setting adhesive

Adhesive that can be applied and will set at a temperature of 23 °C or lower.

3.6 curing time

Curing time is that time interval between mixing the adhesive and the attainment of full bond strength.

NOTE. Full water resistance may not be attained for considerably longer. The glue lines of components should therefore be protected from wetting (e.g. due to weather or by water-based finishes and preservative treatment) for at least 7 days after assembly.

3.7 cramping pressure

Force applied to the contact faces of glued pieces divided by the area of the glued surface over which the force is deemed to act.

3.8 glue line (bond-line)

The adhesive layer in a bonded joint.

NOTE. The term 'glue line' is deprecated in BS 6138; the preferred term is 'bond-line'. 'glue line' has been used throughout this document, however, as it is the term most widely used and understood in the woodworking industry.

3.9 hardener

Curing agent for use with resins that yield rigid (hard) products.

NOTE. It may be supplied in either liquid or powder form, or may be incorporated in the adhesive by the manufacturer. It is an essential part of the adhesive, the properties of which depend on using the constituent parts of the adhesive as directed.

3.10 jigs

Formers that are used at the time of manufacture to give the member its finished shape.

3.11 pot life

Period during which the adhesive can be used after mixing the constituents.

NOTE. This varies with the volume and temperature of the mixed adhesives and the ambient temperature.

3.12 run off

Reduction of a finished cross-sectional dimension at the end of a piece of timber that occurs during a machining operation.

3.13 setting temperature

Temperature of the adhesive during the setting process.

3.14 setting time

Time interval between the commencement of the setting process, e.g. the application of heat and/or pressure to an assembled joint, and the attainment of sufficient bond strength to enable the components to be handled.

3.15 storage life (shelf life)

The time of storage under stated conditions during which an adhesive may be expected to retain its working properties.

3.16 synthetic resin adhesive

Adhesive substantially composed of a synthetic resin or resins, including any hardener or modifier that may have been added by the manufacturer or that may be required to be added before use according to the adhesive manufacturer's instructions.

4 Design parameters to be established prior to production

4.1 Service conditions

The manufacturer shall obtain details of the anticipated service conditions and moisture content prior to production.

4.2 Manufacturing specification

Those elements of the specification which can affect manufacture shall be established before commencing production. The following are examples of such elements:

- a) the types of material (see clause 5);
- b) preservative and flame retardant treatments (see 4.3);
- c) the moisture content of the component in service;
- d) the dimensions of individual pieces and the component;
- e) the location of joints and splices;
- f) the camber;
- g) the surface finishes.

4.3 Preservative and flame retardant treatments

The manufacturer of the structural components shall obtain and follow advice from the manufacturer of the preservative or flame retardant and from the adhesive manufacturer on the compatibility of materials, both where treatment of individual pieces is to take place before gluing and where treatment of a component is to take place after gluing. This shall be done at the earliest possible opportunity.

5 Materials

5.1 Timber and wood based materials

The species or type and strength class of timber, and wood based panels shall be those specified in the design of the component and shall be selected either from those for which mechanical properties are given in BS 5268 : Part 2 or for which there is a European Technical Approval.

NOTE. Other materials may be used which have been established as suitable by prototype testing.

5.2 Mechanical fasteners

Unless otherwise specified by the designer the following mechanical fasteners shall be used to apply glue line pressure (see the note in 7.1.3):

- a) nails;
- b) woodscrews;
- c) staples.