

Methods of test for adhesives — Determination of bond strength in longitudinal shear for rigid adherends

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Committees responsible for this British Standard

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- BASA
- British Woodworking Federation
- Consumer Policy Committee of BSI
- Contract Flooring Association
- DETR — represented by BRE
- European Resin Manufacturer’s Association
- National Physical Laboratory
- SATRA
- The Tile Association
- TRADA
- TWI
- UK Steel Association
- University of Bristol

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Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
1 Scope	1
2 Normative references	1
3 Principle	1
4 Apparatus	2
5 Procedure	2
6 Test report	5
7 Expression of results	5
Annex A (informative) Method for determination of moisture content of wooden slips	11
Bibliography	12
Figure 1 — Single overlap joint	5
Figure 2 — Double overlap joint	6
Figure 3 — Test adhered with locating hole	6
Figure 4 — Preparation of specimen from large sheet adherends	7
Figure 5a) — Test jig with locating hole	8
Figure 5b) — Jig with lap shears assembled	9
Figure 6 — Clamping device for holding five close-contact joints	10

Foreword

This part of BS 5350 has been prepared under the direction of the Materials and Chemicals Sector Policy and Strategy Committee. It supersedes BS 5350-C5:1990 which is withdrawn. The standard provides a method of assessing the strength of adhesives by determining the shear strength of overlap joints between rectangular adherends. This method is widely practised because the adherends are of simple form and the results are reasonably reproducible. However, since the stress applied to the adhesive is not a simple shear but contains other components, the breaking load is not a simple function of the width or the length of the overlap but is also influenced by the elastic properties and dimensions of the adherends, the bond-line thickness and the rate of change of stress. Hence it is necessary to standardize the procedure in order to obtain reproducibility. The test does not necessarily reflect how the adhesive would perform in service. Such design data would normally be obtained using the construction materials and configuration used in the actual design.

In this revision, the scope has been amended to exclude testing of wood-to-wood bonds for which other standards exist, and several changes have been made to the procedure to align it with procedures in other recent parts of BS 5350. At the same time, the references to other British Standards have been brought up-to-date.

Annex A is informative.

A British Standard does not purport to include all necessary provision 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 12, an inside back cover and a back cover.

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1 Scope

This part of BS 5350 describes the method for testing adhesives using rigid adherends that can be produced to the required dimensional tolerances and that will withstand the forces applied to them. It is not normally applicable to the testing of joints between identical pieces of wood for which there are other, specific, standards, but may be used where wood is one adherend of an asymmetric assembly or where particular adhesives are not catered for by the specific standards. The method described in this part of BS 5350 is applicable to all types of adhesive. Although primarily intended for use in normal ambient conditions, the basic method is also applicable to testing under a wide range of temperature and other environmental conditions.

No account is taken of other mechanical properties of the adhesives or adherends that can affect the validity or usefulness of the test.

The use of a particular adherend to test an adhesive does not necessarily imply that adhesive is the one most suitable for the adherend.

This method of test is intended for ranking and quality control of adhesives and not for obtaining data for design purposes.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of this British Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the publication referred to applies.

BS 3757, *Specification for rigid PVC sheet*.

BS 5214-1, *Specification for testing machines for rubbers and plastics — Part 1: Tensile, flexural and compression types (constant rate of traverse)*.

BS 5214-2, *Specification for testing machines for rubbers and plastics — Part 2: Constant rate of force application machines*.

BS 5350-A1, *Methods of test for adhesives — Adherends — Part A1: Adherend preparation*.

BS 5350-A2, *Methods of test for adhesives — Adherends — Part A2: Guide to the selection of adherent materials*.

BS 5350-E1, *Methods of test for adhesives — Sampling and analysis of test data — Part E1: Guide to statistical analysis*.

BS EN 438-1, *Decorative high-pressure laminates (HPL) sheets based on thermosetting resins — Specifications*.

BS EN 10365:1995, *Adhesives — Designation of main failure patterns*.

BS L 165, *Specification for sheet and strip of aluminium-coated aluminium-copper-magnesium-silicon-manganese alloy (solution treated and artificially aged) (Cu 4.4, Mg 0.5, Si 0.8, Mn 0.8)*.

3 Principle

A single or double overlap joint (see Figure 1 and Figure 2) between rectangular adherends is strained to rupture by a longitudinal tensile force, i.e. a force that is parallel to the major dimensions of the adherends and in the same plane as the bond-plane (bond-line). The reported result is the observed force at rupture.

4 Apparatus

4.1 Testing machine

The testing machine shall comply with the requirements for machines of grade B of either BS 5214-1 or BS 5214-2 as appropriate. In addition, the response time of the machine shall be short enough not to affect the accuracy with which the breaking load can be measured. The range of the machine shall be such that the specimens break at loads between 15 % and 85 % of the full-scale reading.

4.2 Grips

The grips shall be free to swivel about axes in the mean plane of the bond plane. They shall grip the adherends sufficiently firmly to avoid slipping but not so firmly as to cause excessive crushing. Grips that operate by bolting through the adherend are acceptable unless ductile materials are involved, where distortion during test may give rise to misleading results.

5 Procedure

5.1 Adherends

5.1.1 Selection

The two adherends in a single overlap joint shall be identical unless the test is being carried out to verify compliance with a specification that requires the adherends to be of different materials. In a double overlap joint involving two adherend materials, the two outer adherends shall be of identical material and dimensions. The adherend or adherends shall be fully described in the test report.

If practicable, select the materials for the adherends from the list given in BS 5350-A2. The most commonly used materials are as follows.

a) Wood

- 1) *Beechwood* (European beech). One face of the wood shall be planed and the other planed or smoothly sawn. The wood shall be flat and free from splits, knots, whorls and dots. The angle of inclination of the grain across the face of each test specimen shall not be greater than 1 in 9, and the grain shall not be obviously inclined to the face.

NOTE 1 The angle of the growth rings relative to the face is not critical.

- 2) *Plywood*. Birch plywood, 3 ply, all layers birch, weather-proof and boil-proof (WBP) grade. The test piece shall be cut with the grain (outer layers) in the long direction, shall be flat and shall have no defects.

NOTE 2 Defects in plywood are defined in BS 1203.

NOTE 3 Specific test methods for wood adhesives are detailed in BS 1204 (relating to structural adhesives) and BS 3544 and BS 4071 (relating to non-structural adhesives).

b) Metals

- 1) Mild steel (cold rolled) type CR 1E shall be as defined in BS 1449-1.
- 2) Aluminium-coated aluminium alloy shall be as specified in BS L 165.
- 3) Any substrate as agreed by both parties.

c) Plastics

- 1) Phenolic laminated sheet of a type shall be specified in BS EN 438-1:1991.
- 2) Rigid pressed PVC sheeting of type Ai shall be as specified in BS 3757.