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Adhesives — Peel test for a flexible-bonded-to-rigid test specimen assembly —

Part 1:
90° peel

Adhésifs — Essai de pelage pour un assemblage collé flexible-sur-rigide —
Partie 1: Pelage à 90°

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In accordance with the provisions of Council Resolution 15/1993, this document is **circulated in the English language only**.

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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 2.

The main task of technical committees is to prepare International Standards. 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 document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 8510-1 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 11, *Products*.

This second edition cancels and replaces the first edition (ISO 8510-1:1990), Clause 2 and Figure 1 of which have been revised. In addition, minor editorial changes have been made in the text.

ISO 8510 consists of the following parts, under the general title *Adhesives — Peel test for a flexible-bonded-to-rigid test specimen assembly*:

— *Part 1: 90° peel*

— *Part 2: 180° peel*

Adhesives — Peel test for a flexible-bonded-to-rigid test specimen assembly —

Part 1:
90° peel

SAFETY PRECAUTIONS — People using this document should be familiar with normal laboratory practice, if applicable. This document does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate safety and health practices and to ensure compliance with any regulatory conditions.

1 Scope

This part of ISO 8510 specifies a 90° peel test for the determination, under specified conditions, of the peel resistance of a bonded assembly of two adherends where at least one adherend is flexible. If a normal tensile testing machine is used for the test, the peel angle will not be constant at exactly 90°. If a constant angle of exactly 90° is required, a roller peeling device is used (see 4.1).

The 90° peel test is particularly suitable for use with less flexible adherends for which a 180° peel test is not suitable because the adherends crack, break or delaminate.

A 180° peel test is described in ISO 8510-2.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 291, *Plastics — Standard atmospheres for conditioning and testing*

ISO 17212, *Structural adhesives — Guidelines for the surface preparation of metals and plastics prior to adhesive bonding*

3 Principle

A bonded assembly of two adherends is prepared using the adhesive under test. The adherends are then pulled apart at a substantially steady rate, starting at the open end of the bond, in such a way that separation occurs progressively along the length of the bonded adherends. The force is applied approximately normal to the plane of the bond, through the separated part of the flexible adherend.

4 Apparatus

4.1 Tensile testing machine (incorporating a roller peeling device if a constant peel angle of exactly 90° is required), capable of supplying a tensile force with a constant rate of grip separation. The machine shall be equipped with a force-measuring system complete with an indicator and/or a recorder. The indicated force shall not differ from the true applied force by more than 2 %. The response time of the machine shall be short enough not to affect the accuracy with which the force applied at the time of rupture can be measured. The force at rupture of the specimen shall lie in the range between 10 % and 80 % of the full-scale reading.

4.2 Grips, one of which shall be suitable for firmly clamping the rigid adherend (5.1.2), while the other shall be suitable for holding the flexible adherend (5.1.3), as shown in Figure 1. The latter grip shall be self-aligning, so that the force will be exerted normal to the plane of the bond, and linked to the sensor of the tensile testing machine (4.1) by a wire of minimum length 600 mm.

5 Test specimens

5.1 Adherends

5.1.1 General

The adherends shall be thick enough to withstand the expected tensile force, and their dimensions shall be measured accurately and reported in full in the test report.

The recommended thicknesses of test specimens are: metals 1,5 mm; plastics 1,5 mm; wood 3 mm; compounded rubbers 2 mm. Other thicknesses agreed on between the purchaser and the supplier of the adhesive may be used.

5.1.2 Rigid adherend

The surface to be bonded shall have a width of 25,0 mm ± 0,5 mm, and a minimum length of 150 mm.

The preferred material is mild steel, and, if this material is used, it is convenient to use a mild-steel T-piece having a stem of dimensions 75 mm × 25 mm × 10 mm.

If a material other than mild steel is used, a piece of this other material, of width 25,0 mm ± 0,5 mm and minimum length 150 mm, shall be bonded to the head of a T-piece of the kind described above. This allows the method to be used for testing an adhesive using two flexible adherends, one of which is bonded to the T-piece. The adhesive used for this purpose shall have adequate strength to ensure that this joint will not debond.

5.1.3 Flexible adherend

The flexible adherend shall be capable of being bent through an angle a little greater than 90°, without irreversible dimensional change. The flexible adherend shall be of dimensions (250 mm × 25,0 mm) ± 0,5 mm.

5.2 Preparation of test specimens

The procedure used in preparing the test specimens shall be such as to minimize variations. The use of a pneumatic or hydraulic press, hand or power-operated, that can apply a pressure of up to 1 MPa, is recommended.

Surface treatments shall be in accordance with ISO 17212, or, if this is not feasible, in accordance with the manufacturer's instructions. The adhesive under test shall be applied, allowed to set, and, if necessary, cured in accordance with the recommendations of the manufacturer of the adhesive.

NOTE A convenient method of obtaining a sharp adhesive boundary is to place a thin strip of material to which the adhesive does not adhere (anti-adhesive strip) at the end at which separation of one of the adherends will commence (see Figure 1).

If a rigid adherend other than the T-piece described in 5.1.2 is used, it shall be fastened to a T-piece of the kind described in 5.1.2 by a suitable method.

Bond the flexible adherend to the T-piece (or other rigid adherend) as shown in Figure 1, preferably using the method recommended by the manufacturer of the adhesive under test.

If a press is used to make the test specimens, it shall be capable of applying an even pressure over the entire bonded area and should preferably be fitted with a timer-controlled release mechanism. In order to provide a uniform distribution of pressure over the bonded area, the platens of the press shall be parallel. When this is impracticable, one platen shall be covered with a resilient pad. A 10 mm thick pad of rubber of Shore A hardness approximately 45 has been found to be satisfactory, using a press that applies a pressure of up to 700 kPa.

Determine the average thickness of the applied adhesive, as accurately as practicable, by weighing or another suitable technique.

5.3 Number of test specimens

A minimum of 5 specimens shall be tested.

6 Conditioning and testing atmosphere

The test specimens shall be conditioned and tested in one of the standard atmospheres specified in ISO 291.

7 Procedure

Place the stem of the T-piece in the grip at the non-sensing end of the test machine (see Figure 1). Position the test specimen in such a way that the centreline of the test machine coincides with the centre of the bonded area and is normal to the plane of the bond. Connect the free end of the flexible adherend to the wire by means of its grip. Set the machine in motion at a constant rate of grip separation.

The recommended rate of grip separation is 50 mm/min ± 5 mm/min.

Record the rate of grip separation. Also record the force as a function of grip separation, preferably autographically. Continue the test until a bonded length, of at least 50 mm each side of the centre of the T-piece, has separated. Note the type of failure, i.e. adhesive failure, cohesive failure or adherend failure.

8 Expression of results

For each specimen, determine from the curve of force versus grip separation, the average peel force in newtons, over a peel length of 50 mm each side of the centre of the T-piece. This may be done by drawing an estimated average line (see Figure 2) or by planimetry, or by another suitable means if a more accurate result is required. Record the maximum and minimum force in this range. Calculate the arithmetic mean of the average peel forces for all the specimens tested, as well as the arithmetic means of the maximum and minimum forces.

NOTE For the statistical treatment of results, see appropriate parts of ISO 5725. If required, initial peak values occurring outside the test peel length may be recorded separately, but are excluded from the averaging procedure.