INTERNATIONAL STANDARD

ISO 8510-1

First edition
1990-12-15

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°

Reference number
ISO 8510-1:1990(E)

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.

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.

International Standard ISO 8510-1 was prepared by Technical Committee ISO/TC 61, *Plastics*.

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 degree peel*

— *Part 2: 180 degree peel*

Annex A of this part of ISO 8510 is for information only.

International Organization for Standardization
Case Postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

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

Part 1:
90° peel

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 standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 8510. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 8510 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 291:1977, *Plastics — Standard atmospheres for conditioning and testing.*

ISO 4588:1989, *Adhesives — Preparation of metal surfaces for adhesive bonding.*

ISO 5725:1986, *Precision of test methods — Determination of repeatability and reproducibility for a standard test method by inter-laboratory tests.*

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 (see 5.1.1), while the other shall be suitable for holding the flexible adherend (see 5.1.2), 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

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.

NOTE 1 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.

5.1.1 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.

5.1.2 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 4588, or, if 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 2 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 will commence of one of the adherends (see figure 1).

If a rigid adherend other than the T-piece described in 5.1.1 is used, it shall be fastened to a T-piece of the kind described in 5.1.1 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.

NOTE 3 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 4 For the statistical treatment of results, see ISO 5725. If required, initial peak values occurring outside the test peel length may be recorded separately, but are excluded from the averaging procedure.

9 Precision

The precision of this test method is not known because inter-laboratory data are not available. Inter-laboratory data are being obtained and a precision statement will be added at the next revision.

10 Test report

The test report shall include the following particulars:

a) a reference to this part of ISO 8510;

b) a complete identification of the adhesive tested, including type, source, manufacturer's code number, batch or lot number, form, etc.;

c) a complete description of the adherends, including dimensions, type of material and surface preparation;

d) a description of the bonding process, including method of application of adhesive, drying or pre-curing conditions and curing time (where applicable), and bonding temperature and pressure;

e) the average thickness of the adhesive layer after formation of the bond;

f) a complete description of the test specimens, including dimensions, construction and number tested;

g) the conditioning procedure prior to testing, and the atmosphere;

h) the rate of separation of the grips;

i) the method of determining the average peel force;

j) the maximum, minimum and average values of the peel force, in newtons, for each test specimen, and the arithmetic means of these values for all the test specimens;

k) the type of failure for each test specimen, i.e. adhesive, cohesive or adherend;

l) any deviation from the procedure specified that may have affected the results.

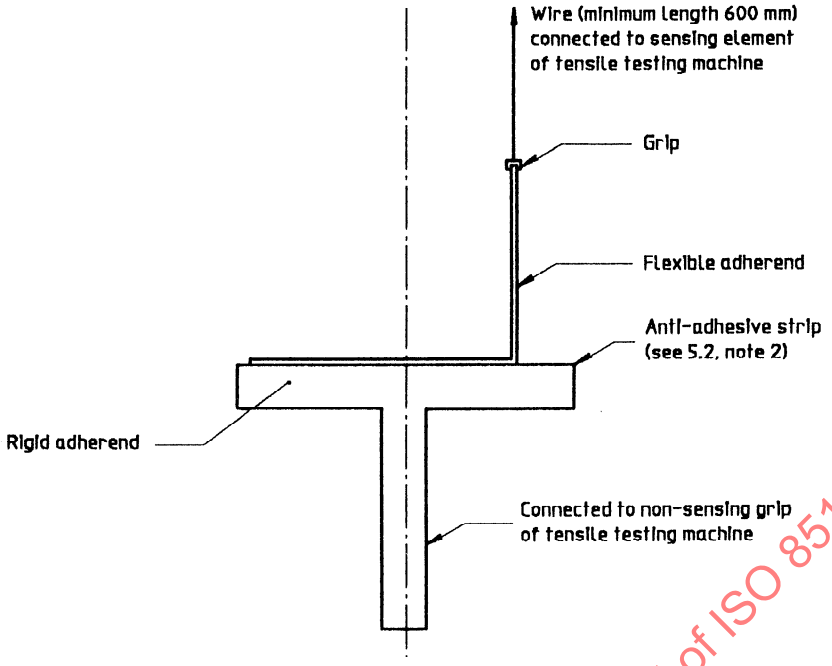

Figure 1 — Schematic diagram of 90° peel test for a flexible-bonded-to-rigid assembly

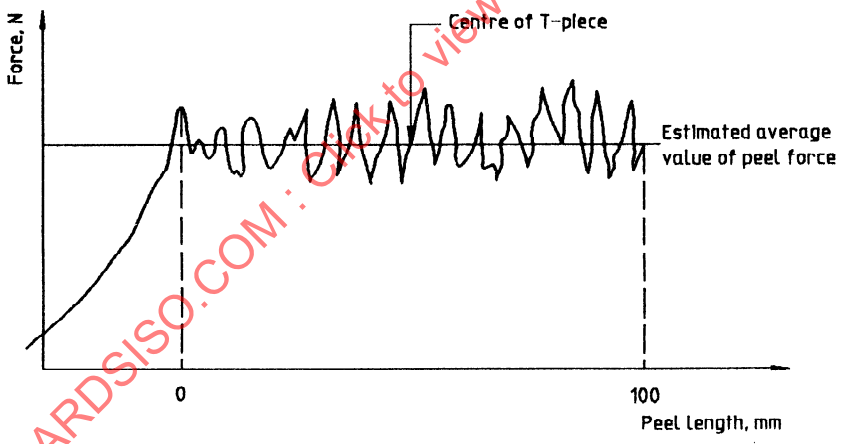

Figure 2 — Typical peel force curve