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

**Part 2:  
180° peel**

*Adhésifs — Essai de pelage pour un assemblage collé  
flexible-sur-rigide —*

*Partie 2: Pelage à 180°*



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Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

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## Contents

Page

Foreword.....	iv
1 Scope .....	1
2 Normative references .....	1
3 Principle .....	1
4 Apparatus .....	1
5 Test specimens .....	2
6 Conditioning and testing atmosphere .....	3
7 Procedure .....	3
8 Expression of results .....	3
9 Precision .....	4
10 Test report .....	4
Bibliography .....	6

## 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 8510-2 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 11, *Products*.

This second edition cancels and replaces the first edition (ISO 8510-2:1990), 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 2: 180° peel

**SAFETY PRECAUTIONS** — Persons 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 180° peel test for the determination, under specified conditions, of the peel resistance of a bonded assembly of two adherends where one adherend is flexible and the other is rigid.

A 90° peel test, more suitable for use with less flexible adherends that crack, break or delaminate in the 180° peel test, is described in ISO 8510-1.

### 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 substantially parallel to the plane of the bond, through the separated part of the flexible adherend.

### 4 Apparatus

**4.1 Tensile testing machine**, 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) so that the plane of the bond is parallel to the applied force, 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 parallel to the plane of the bond, and linked to the sensor of the tensile testing machine (4.1).

## 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 rigid adherend shall consist of a strip of flat material of width  $25,0 \text{ mm} \pm 0,5 \text{ mm}$  and minimum length 200 mm.

#### 5.1.3 Flexible adherend

The flexible adherend shall be capable of being bent through an angle of  $180^\circ$  without gross irreversible dimensional change. Unless specified otherwise, the flexible adherend shall be not less than 350 mm in length.

Its width shall be either

- a) the same width as the rigid adherend, or
- b) for materials prone to fraying, e.g. cotton duck, 5 mm wider at each edge.

**NOTE** Flexible adherends may cause difficulties in test specimen assembly and give rise to a greater dispersion of results than would otherwise be the case, because of distortion or fraying of the weave during assembly and testing. The use of a flexible adherend 5 mm wider at each edge than the rigid adherend is designed to reduce these effects.

### 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. Apply the adhesive, in accordance with the manufacturer's instructions, over the whole width of the adherends to a length of 150 mm on each adherend.

**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).

Allow the adhesive to set and, if necessary, cure it, in accordance with the manufacturer's instructions.

Bond the adherends using the method recommended by the manufacturer of the adhesive.

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.

As an alternative to preparing individual test specimens, panels of suitable size may be bonded to each other and test specimens cut from the bonded assembly, discarding from the bonded assembly the 12 mm strip along each of the outer edges parallel to the longer sides of the test specimens.

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

Bend back the unbonded end of the flexible adherend. Clamp the rigid adherend in the fixed grip and the flexible adherend in the other grip, taking care that the test specimen is accurately positioned between the grips so that the tension applied is distributed uniformly across the width of the test specimen (see Figure 1). Set the machine in motion at a constant rate of grip separation.

The recommended rate of grip separation is  $100 \text{ mm/min} \pm 10 \text{ mm/min}$ . If this is not practicable, other rates may be agreed on between the purchaser and supplier of the adhesive.

Record the rate of grip separation. Also record the force as a function of grip separation, preferably autographically. Continue the test until at least 125 mm of the bonded length has separated. Note the type of failure, i.e. adhesive failure, cohesive failure or adherend failure.

**NOTE** The peeled part of the flexible adherend will rub on the adhering part as separation progresses. To reduce friction, a suitable lubricant, such as glycerol or soap solution, may be used, provided it does not affect the adherends.

## 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 at least 100 mm, but not including the first 25 mm. 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.

## 9 Precision

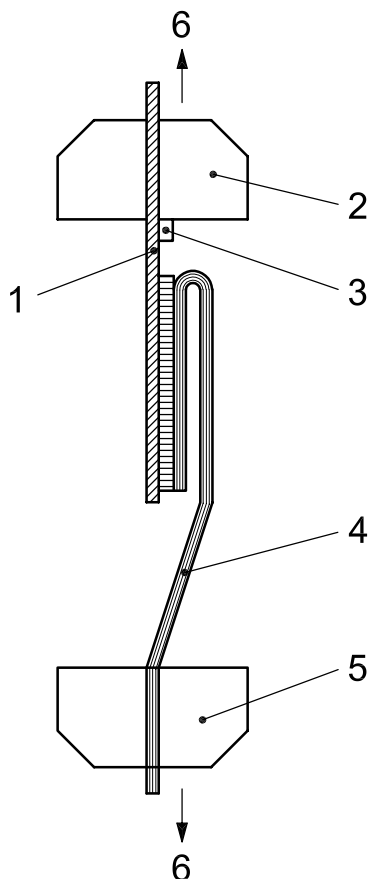
The precision of this test method is not known because inter-laboratory data are not available. Inter-laboratory data are being obtained and a precision statement will be added at the next revision.

## 10 Test report

The test report shall include the following information:

- 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 the 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 specimen, including dimensions, construction and number tested;
- g) the conditioning procedure prior to testing, and the test 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.

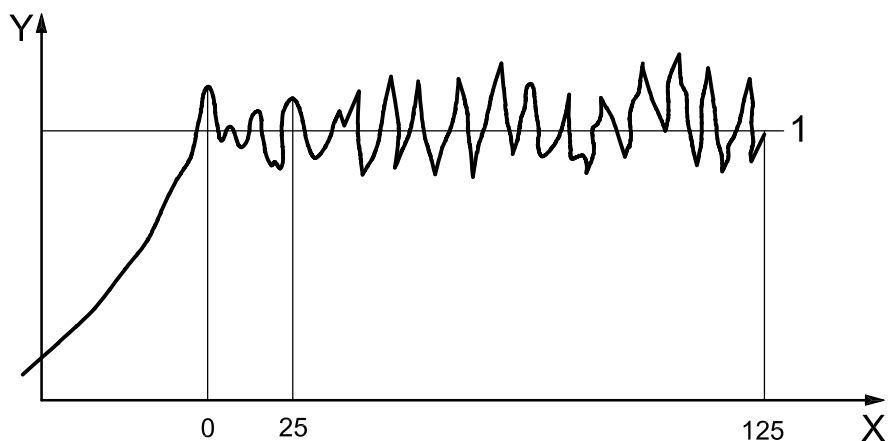




**Key**

- |   |                        |
|---|------------------------|
| 1 rigid adherend                        | 4 flexible adherend    |
| 2 grip                                  | 5 grip (self aligning) |
| 3 anti-adhesive strip (See Note in 5.2) | 6 direction of pull    |

**Figure 1 — Schematic diagram of 180° peel test for a flexible-bonded-to-rigid assembly**



**Key**

- |   |
|---|
| 1 estimated average value of peel force |
| X Peel length, mm                       |
| Y Force, N                              |

**Figure 2 — Typical peel-force curve**

## Bibliography

- [1] ISO 527-1, *Plastics — Determination of tensile properties — Part 1: General principles*
- [2] ISO 8510-1, *Adhesives — Peel test for a flexible-bonded-to-rigid test specimen assembly — Part 1: 90° degree peel*
- [3] ISO 5725 (all parts), *Accuracy (trueness and precision) of measurement methods and results*



