INTERNATIONAL STANDARD 4578

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Adhesives — Determination of peel resistance of high-strength adhesive bonds — Floating roller method

Adhésifs — Détermination de la résistance au pelage des assemblages à forte cohésion — Méthode des galets mobiles

First edition — 1979-04-01

UDC 665.93 : 620.17 **Ref. No. ISO 4578-1979 (E)**

Descriptors : plastics, adhesives, adhesive bonded joints, tests, adhesion tests, peel tests.

Price based on 3 pages

FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 4578 was developed by Technical Committee ISO/TC 61, *Plastics*, and was circulated to the member bodies in November 1976.

It has been approved by the member bodies of the following countries:

Australia	Hungary	Portugal
Austria	India	Romania
Brazil	Iran	Switzerland
Bulgaria	Israel	Turkey
Canada	Korea, Rep. of	United Kingdom
Czechoslovakia	Mexico	USA
Finland	Netherlands	Yugoslavia
France	Peru	
Germany, F.R.	Poland	

The member bodies of the following countries expressed disapproval of the document on technical grounds:

Belgium
Japan

Printed in Switzerland

Adhesives — Determination of peel resistance of high-strength adhesive bonds — Floating roller method

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies a floating roller method for the determination of the peel resistance of high-strength adhesive bonds between one rigid metallic adherend and one flexible metallic adherend when tested under specified conditions of preparation and testing. The use of the floating roller produces more constant numerical data than other peel methods, but it should not be expected that the flexible adherend will conform to the surface of the roller.

2 REFERENCE

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

3 DEFINITION

peel resistance : The average force per unit width of bond line required to separate progressively the two metallic members of a bonded test specimen over the adhered surfaces under the specified conditions of test. It is expressed in kilonewtons per metre of width.

4 APPARATUS

4.1 Tensile testing machine, capable of maintaining a constant crosshead rate of 100 mm/min unless otherwise specified. It shall be provided with a suitable self-aligning grip to hold the test specimen. The jaws of this grip shall firmly engage the outer 25 mm of the end of the flexible adherend. The grip and attachments shall be so constructed that they will move into alignment with the test specimen as soon as the force is applied, so that the flexible member of the test specimen will coincide with the direction of the applied pull through the centre line of the grip assembly. The machine shall be autographic, giving a chart that can be read in terms of millimetres of crosshead movement as one co-ordinate and applied force as the other co-ordinate. All equipment shall be calibrated regularly. It is recommended that inertialess equipment be used for this test.

The machine shall permit the measurement and recording of the applied force with an accuracy of ± 2 %.

4.2 Peel test fixture, for supporting the test specimen (see figure 1). The fixture shall be attached to one of the cross-arms of the testing machine (4.1). The 25 mm diameter rollers on the test fixture shall roll freely. The angle determined by the rollers and the use of dual roller bearings are critical and shall be maintained.

5 TEST SPECIMENS

5.1 Test specimens of the dimensions shown in figure 2 may be prepared individually or cut from bonded panels. Laminated test panels, or individual test specimens, shall consist of two adherends properly prepared and bonded together.

5.2 Surface treatment shall be such as to obtain optimum strength in the bonded assembly. The preparation of the surface shall be in accordance with either the manufacturer's instructions or an appropriate International Standard.[1)]

The adhesive shall be applied according to the manufacturer's recommendations to obtain an optimum bond with a minimum of variations.

Other conditions may be used if agreed between the interested parties.

NOTE — Direct comparison of different adhesives can be made only when test specimen construction, adherend materials and dimensions, and test conditions are identical.

5.3 The thickness of the flexible adherend shall be 0,5 ± 0,02 mm and that of the rigid adherend shall be 1,6 ± 0,1 mm.

5.4 Test specimens of width 25 mm shall be cut from the bonded panels (see figure 2) by a means that is not deleterious to the bond. The method of cutting test specimens is dependent upon the adherend and adhesive compositions and the tolerance specified in figure 2. Milling and band-sawing can be used successfully.

5.5 The unbonded end of the flexible adherend shall be bent perpendicular to the rigid adherend for clamping in the grip of the testing machine. Within the limitations imposed above, other specimen widths may be used,

1) The preparation of metal surfaces for adhesive bonding will form the subject of a future International Standard.

provided that the width of the test machine grip and peel test fixtures is sufficient to permit uniform application of the load across the width of the adherends.

5.6 The number of specimens to be tested shall be as specified in the material specification or, if not so specified, shall be not less than five.

6 CONDITIONING AND TESTING ATMOSPHERE

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

7 PROCEDURE

7.1 Insert the test specimen into the peel test fixture (4.2) as shown in figure 1, with the unbonded end of the flexible adherend gripped in the jaw of the testing machine (4.1). Peel the specimen at a constant crosshead separation rate of 100 mm/min ± 5 %, unless otherwise specified. If the rigid adherend bends or is distorted during test, it is recommended that the specimen be redesigned with a rigid adherend stiff enough to ensure even peeling.

7.2 During the peel test, make an autographic recording of force versus crosshead movement (force versus distance peeled) over a length of at least 115 mm of the bond line disregarding the first 25 mm of peel.

8 EXPRESSION OF RESULTS

Determine from the autographic curve, for at least 115 mm of peeling (disregarding the first 25 mm and the last 20 mm), the average peeling force, in kilonewtons per metre of the test specimen width, required to separate the adherends. The average force should preferably be determined from the curve by one of the following methods :

a) a planimeter;

b) a gravimetric method, as follows :

Cut out the area of the chart paper surrounded by the curve and the base line (abscissa) and weigh it. Determine the area by dividing its mass by the previously determined mass per surface area of the chart paper. Divide the area thus found by the length of the base line (corresponding to 80 mm peeling length) to obtain the average height of the curve (and hence the average peeling force);

c) by drawing the best straight line through the peeling curve using a straightedge.

Also record the maximum and minimum forces for each individual specimen.

9 TEST REPORT

The test report shall include a reference to this International Standard and the following particulars :

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

b) identification of adherends, including material thickness and surface preparation;

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

d) average thickness (as precisely as practical) of the adhesive layer after formation of the bond;

e) complete description of the test specimen, whether individual or panel, including dimensions and construction of the test specimen, conditions used for cutting individual test specimens, number of test panels represented and number of individual test specimens (when edge specimens are tested they shall be designated edge specimens);

f) conditioning procedure prior to testing and test conditions;

g) if the crosshead separation rate is other than 100 mm/min, the actual crosshead separation used;

h) method of determining average force;

j) average, maximum and minimum peeling force values, in kilonewtons per metre of test specimen width, for each individual specimen (edge samples shall be reported separately);

k) type of failure.

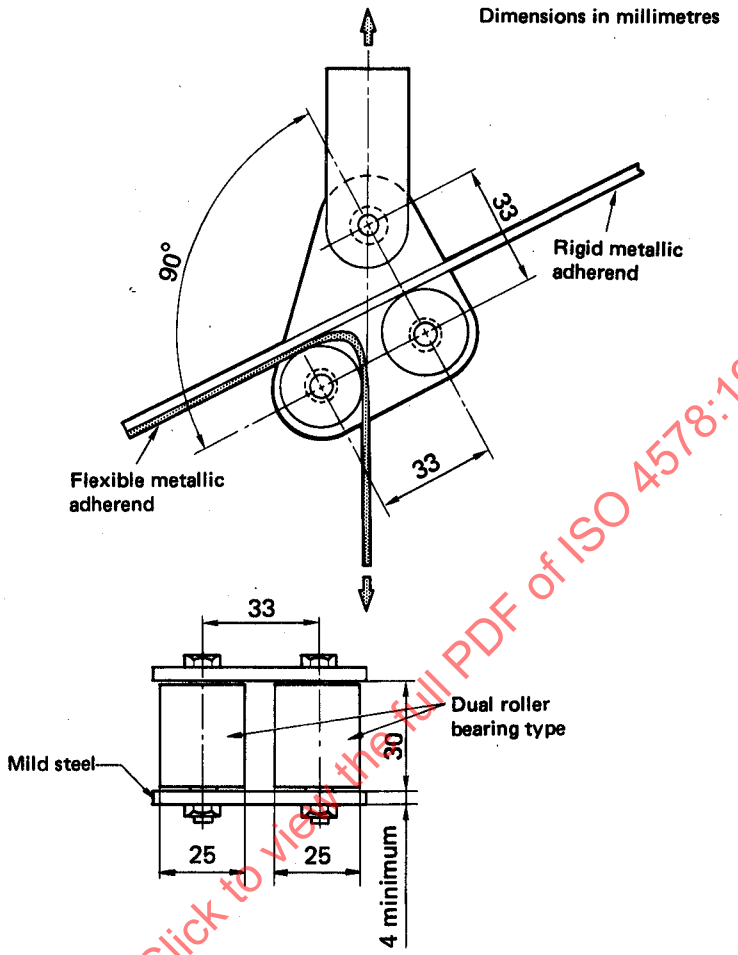

FIGURE 1 – **Peel test fixture for supporting test specimen**

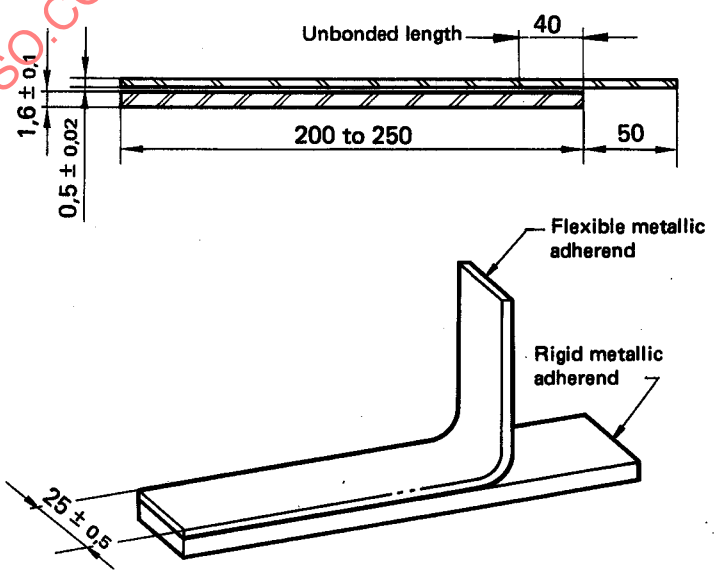

FIGURE 2 – **Test specimen**