INTERNATIONAL STANDARD

ISO 10354

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Adhesives — Characterization of durability of structural-adhesive-bonded assemblies — Wedge rupture test

Adhésifs — Caractérisation de la durabilité des assemblages collés par adhésif structural — Essai de clivage au coin

Reference number
ISO 10354:1992(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.

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Adhesives — Characterization of durability of structural-adhesive-bonded assemblies — Wedge rupture test

1 Scope

This International Standard simulates in a qualitative manner the forces and effects on an adhesive-bonded joint at a metal-adhesive/primer interface. It can also be used as a method of checking the surface preparation of substrates.

The test is applicable at the present time to the bonding of aluminium and titanium alloys, but may be used for assessing the surface preparation of other metals and of plastics, provided consideration is given to the thickness and rigidity of the adherends.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard 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 4588:1989, *Adhesives — Preparation of metal surfaces for adhesive bonding.*

ISO 9142:1990, *Adhesives — Guide to the selection of standard laboratory ageing conditions for testing bonded joints.*

ISO 10365:—[1], *Adhesives — Designation of main failure patterns.*

3 Principle

The test consists of the progressive introduction of a wedge between two plates bonded together with the adhesive under test. The length of the crack thus produced is measured, as is any propagation of the crack caused by laboratory ageing tests.

4 Apparatus

4.1 Wedge, of a composition which will not interact chemically with the adherends of the specimens being tested (electrolytic corrosion). Stainless-steel wedges have been found to work well with many adherends and are very durable and reusable (see figure 1).

Dimensions in millimetres, except where indicated otherwise

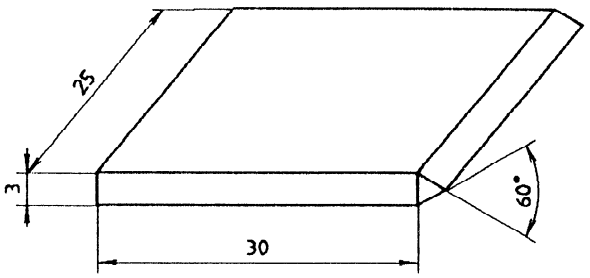


Figure 1 — Dimensions of wedge

4.2 Device for driving the wedge, of any suitable design which provides slow and regular penetration (30 mm/min ± 5 mm/min), but excludes the possibility of oblique penetration or oblique movement of the wedge.

4.3 Binocular magnifying glass, with a magnification between × 10 and × 40.

1) To be published.

4.4 Stopwatch, accurate to the nearest 1 s.

4.5 Thickness-measuring device, accurate to the nearest 0,01 mm.

5 Procedure

5.1 Preparation of specimens

Specimens shall be prepared from two plates, bonded as shown in figure 2, of dimensions 130 mm × 150 mm × (3 ± 0,1) mm.

Before bonding the plates, apply beyond the end of the zone to be bonded a strip of thin (less than 0,1 mm) anti-adhesive tape (see figure 2) to prevent any bonding outside the required zone. Polytetrafluoroethylene is generally used as tape material.

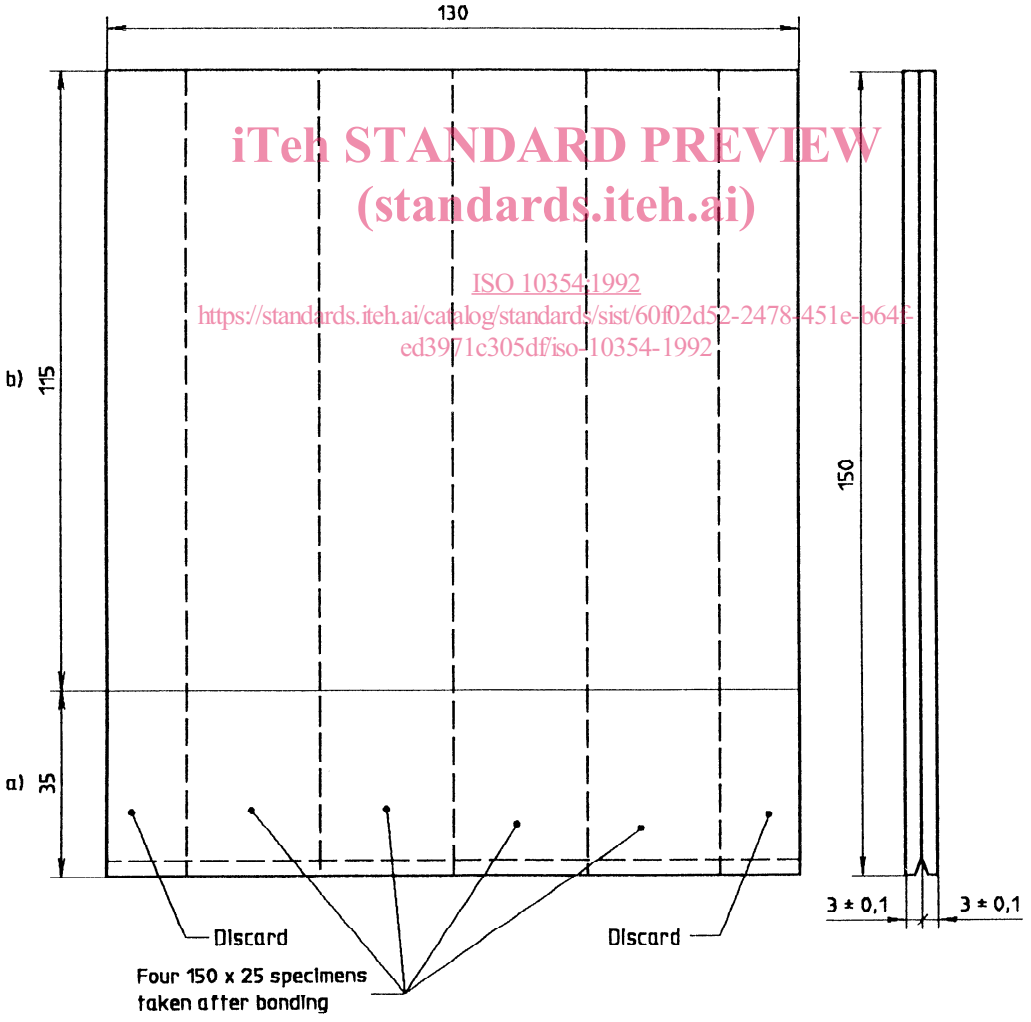
Prepare the surface and bond the plates as specified by the manufacturer of the adhesive under test. Bring the bonded plates to a temperature of 23 °C ± 2 °C if necessary. Starting from the centreline, cut four strips 27 mm in width and 150 mm in length from the bonded plates by sawing. Machine the sawn edges of these strips to give specimens 25 mm ± 0,1 mm in width. Alternatively, specimens measuring

150 mm × 27 mm × (3 ± 0,1) mm

may be prepared individually and machined to a width of 25 mm ± 0,1 mm after bonding.

Determine, for each specimen, the average thickness of the adhesive layer after bonding. To do this, make three measurements, to an accuracy of 0,01 mm, on each specimen and calculate the mean.

Dimensions in millimetres



a) Zone covered by anti-adhesive tape
b) Bonded zone

Figure 2 — Dimensions of bonded plate from which specimens are cut

5.2 Number of specimens

Conduct the test on at least 10 specimens.

5.3 Determination

For each specimen, drive the wedge (4.1) fully home with the device (4.2) as shown in figure 3. To accomplish this, open the end of the specimen that contains the anti-adhesive tape, and insert the wedge. Push the wedge into the joint so as to permit slow and regular penetration at a speed of 30 mm/min ± 5 mm/min, positioning the wedge so that the end and sides are approximately flush with the sides of the specimen.

Determine the position of the crack on each side of the specimen by examination with the binocular magnifying glass (4.3). Mark this position with a fine, indelible line.

Measure the initial crack length, in millimetres, from the wedge/adherend contact point to the mark, on each edge of the specimen. Note the mean initial crack length l_O.

Age the specimen under one of the sets of conditions specified in ISO 9142.

After ageing, allow the specimen to stand for 60 min ± 10 min (see 4.4) at ambient conditions to stabilize.

Measure the final length, in millimetres, of the crack on each edge of the specimen. Note the mean final crack length l_F.

Separate the two halves of the specimen and determine the pattern of failure in accordance with ISO 10365.

6 Expression of results

Determine, for each specimen, the average increase Δl in crack length, in millimetres, as a result of ageing (see figure 4), using the equation

$$\Delta l = l_F - l_O$$

where l_F and l_O are as defined in 5.3.

Determine, for each type of failure, the arithmetic mean of Δl.

Dimensions in millimetres, except where otherwise indicated

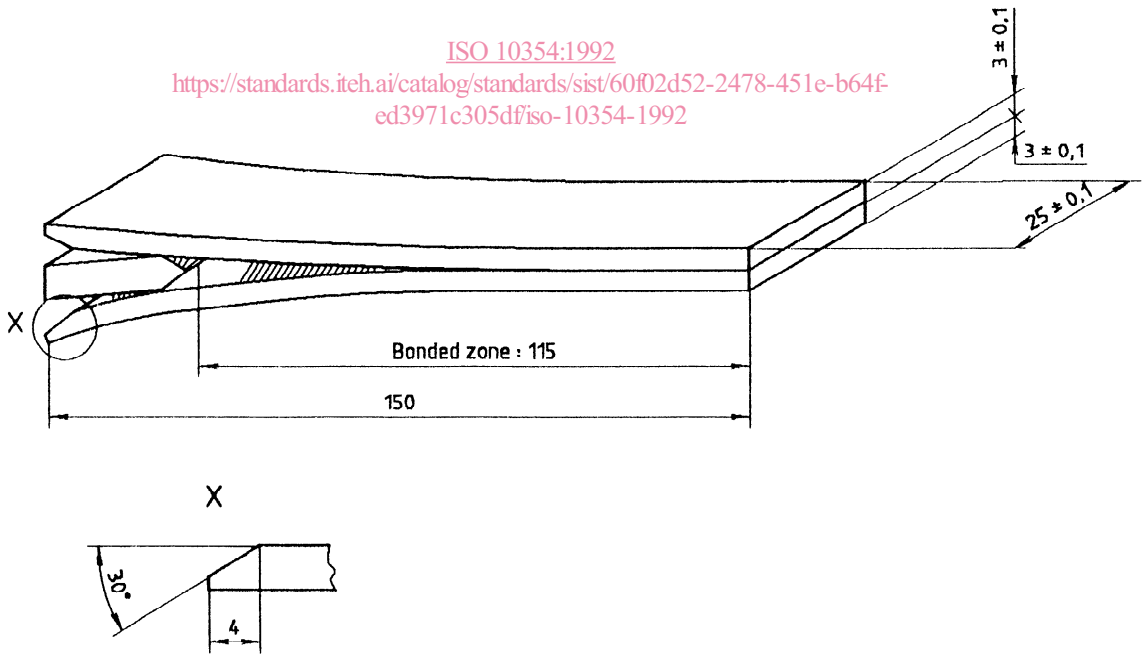


Figure 3 — Specimen with wedge

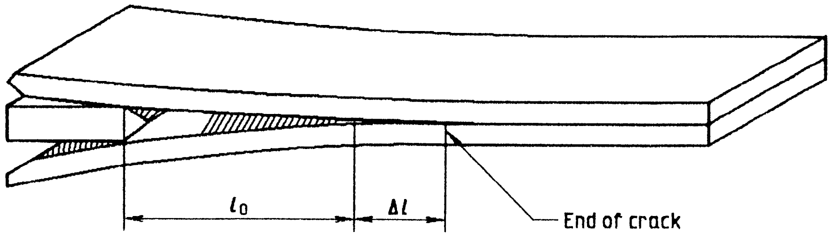


Figure 4 — Evaluation of crack propagation

7 Precision

The precision of this test method is not known because inter-laboratory data are not available. When inter-laboratory data are obtained, a precision statement will be added at the following revision.

8 Test report

The test report shall include the following information:

a) a reference to this International Standard;

b) all details necessary for complete identification of the adhesive and the primer (if involved) tested, including its nature, its origin, the manufacturer's reference number, the batch or mixture number, its form, etc.;

c) all details necessary for identification of the adherend material;

d) details of any surface preparation of the adherend plates;

e) a description of the bonding procedure, comprising the method of application of the adhesive, the drying or pretreatment conditions (where appropriate) and the bonding time, temperature and pressure;

f) the mean thickness of the adhesive layer in each specimen;

g) the ageing conditions used;

h) a description of the pattern of failure obtained with each specimen;

i) the initial crack length l_0 and final crack length l_F, in millimetres in each case, for each specimen;

j) the arithmetic mean of l_0 for each type of failure;

k) the increase Δl in crack length, in millimetres, caused by ageing for each specimen;

l) the arithmetic mean of Δl for each type of failure;

m) any deviation from the procedure specified in this International Standard, especially any other plate thickness used.

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