

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION R 36

DETERMINATION OF THE ADHESION STRENGTH
OF VULCANIZED RUBBERS TO TEXTILE FABRICS

2nd EDITION
November 1969

This second edition supersedes the first edition.

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BRIEF HISTORY

The ISO Recommendation R 36, *Determination of the adhesion of vulcanized natural or synthetic rubbers to textile fabrics*, was drawn up by Technical Committee ISO/TC 45, *Rubber*, the Secretariat of which is held by the British Standards Institution (BSI).

Work on this question led to the adoption of a Draft ISO Recommendation.

In August 1954, this Draft ISO Recommendation (No. 52) was circulated to all the ISO Member Bodies for enquiry. It was approved by 22 Member Bodies; one Member Body, the U.S.A., opposed the approval of the Draft.

This Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in March 1957, to accept it as an ISO RECOMMENDATION.

BRIEF HISTORY RELATING TO THE 2nd EDITION

The work undertaken by the ISO/TC 45 Secretariat in order to bring the ISO Recommendation R 36 up to date led to the adoption of a Draft ISO Recommendation.

In March 1968, this Draft ISO Recommendation (No. 1405) was circulated to all the ISO Member Bodies for enquiry. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Australia	Hungary	Poland
Austria	India	South Africa, Rep. of
Belgium	Iran	Spain
Brazil	Israel	Sweden
Canada	Italy	Switzerland
Czechoslovakia	Japan	U.A.R.
France	Korea, Dem. P. Rep. of	United Kingdom
Germany	Netherlands	

One Member Body opposed the approval of the Draft :

U.S.A.

This Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided, in November 1969, to accept it as the second edition of ISO Recommendation R 36-1957, the title of which is modified as follows : *Determination of the adhesion strength of vulcanized rubbers to textile fabrics*.

This edition (2nd edition) cancels and replaces the first edition of ISO Recommendation R 36-1957.

DETERMINATION OF THE ADHESION STRENGTH OF VULCANIZED RUBBERS TO TEXTILE FABRICS

1. SCOPE

This ISO Recommendation describes a method of test for measuring the force required to separate, by stripping, two plies of fabric bonded with rubber, or a rubber layer and a fabric ply bonded together.

The method is applicable when the ply surfaces are approximately plane, or are cylindrical having an internal diameter greater than approximately 50 mm. For surfaces which contain sharp bends, angles or other gross irregularities that cannot be avoided, and for hose of internal diameter of less than 50 mm, special methods should be employed.

2. DEFINITION

Adhesion strength. Force required to cause a separation at the interface of the assembled components.

NOTE. — Any separation occurring at any other point, for example inside either component under test, is a failure of the component material. Such separation should be reported and should not be considered as indicating an adhesion strength.

In such cases the adhesion strength is not less than the strength of the weakest component involved.

3. PRINCIPLE OF METHOD

The test consists in measuring the force required to separate, by stripping, two plies of fabric bonded with rubber, or a rubber layer and a fabric ply bonded together, of standard dimensions in the form of a flat strip or a cylinder.

4. APPARATUS

Test machine. The test machine should be power-driven and equipped with a suitable dynamometer; it should be capable of maintaining a substantially constant rate of traverse of the moving head during the test and should be fitted with an autographic recorder. An inertialess dynamometer (of electronic or optical type, for example) should preferably be used.

NOTE. - Pendulum-type inertia dynamometers may in fact give different results because of the effects of friction and inertia. When the use of an inertia dynamometer is unavoidable, information may be obtained on the adhesion strength in the following way: the capacity of the machine, or the measuring scale selected when a variable range machine is involved, should be such that the separation force read is between 15 and 85 % of the rated capacity. During the test the arm of the lever should oscillate freely, like a pendulum, with the catches disengaged.

- 4.1 The accuracy of the machine should be such that the error in the force measurement as shown and recorded does not exceed 2.0 % of the force or 0.4 % of the maximum of the scale, whichever is the greater.
- 4.2 The machine should be fitted with grips capable of holding the test piece and the ply to be separated without slipping during the test.

5. TEST PIECE

- 5.1 The test piece should have a width of 25 ± 0.5 mm and should be of sufficient length to permit separation over a length of at least 100 mm. The minimum thickness of the constituent components, or of one of them, should be such that the weakest component can transmit the force necessary for separation without breaking.

The thickness should be suitably reduced, if necessary, in order to ensure that the line of separation of the plies, during the test, lies as close as possible to the plane of the axis of the strips of the test piece held in the grips (see Fig. 1).

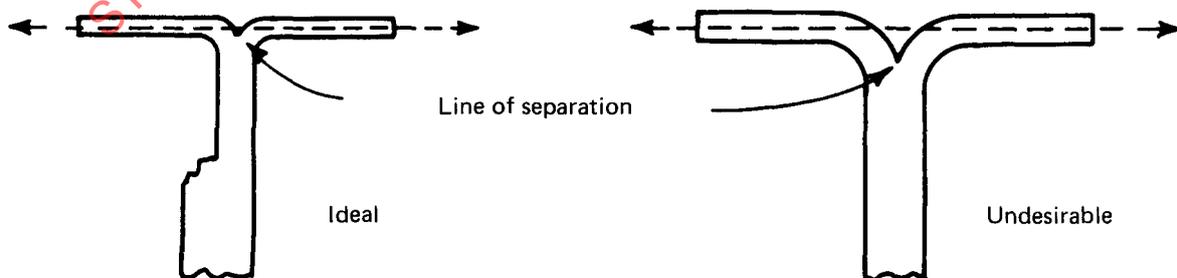


FIG. 1 - Position of line of separation of plies

5.2 The standard test piece, whenever possible, should be cut from the article even when the surface contains curves, angles or irregularities. For example, in the case of hose (of at least 50 mm internal diameter), cut out pieces, along a generating line, in the form of rings 25 ± 0.5 mm in height, and open them out to produce test pieces in the form of strips.

5.3 When the form of the article makes it impossible to cut the standard test piece, special methods should be used.

6. NUMBER OF TEST PIECES

Duplicate test pieces should be tested.

7. TIME LAPSE BETWEEN VULCANIZATION AND TESTING

Unless otherwise specified for technical reasons, the following procedures should be used :

7.1 For all test purposes the minimum time between vulcanization and testing should be 16 hours.

7.2 For non-product tests, the maximum time between vulcanization and testing should be 4 weeks, and for evaluations intended to be comparable the tests should, as far as possible, be carried out after the same time interval.

7.3 For product tests, whenever possible, the time between vulcanization and testing should not be more than 3 months. In other cases tests should be made within 2 months of the date of receipt of the product by the customer.

8. CONDITIONING OF TEST PIECES AND TEMPERATURE OF TEST

Cut test pieces should be conditioned, immediately before testing, for a minimum of 24 hours in one of the standard atmospheres given in clause 3.1 of ISO Recommendation R 471, *Standard atmospheres for the conditioning and testing of rubber test pieces*, namely : 20 ± 2 °C and 65 ± 5 % relative humidity, 23 ± 2 °C and 50 ± 5 % relative humidity or 27 ± 2 °C and 65 ± 5 % relative humidity.

The conditions should be selected so that the test is carried out at the same temperature and humidity as used in the conditioning procedure. The same temperature and humidity should be used throughout any one test or series of tests intended to be comparable.

9. PROCEDURE

Take the test piece as described in clause 5.1 and separate a ply of fabric or a rubber layer by hand for a distance of approximately 50 mm. Fix the separated ends of the test piece in the grips of the testing machine, and adjust so that the tension is distributed uniformly and so that no twisting of the test piece will occur during the test. Place the body of the test piece in the non-driven grip and the ply to be separated in the power-driven grip so that the angle of separation is approximately 180° . It is important to ensure that the axes of the strips of the test piece held in the grips lie in the same plane.

The rate of travel of the power-driven grip should be 50 ± 5 mm/min or 100 ± 10 mm/min so as to give a rate of ply separation of 25 mm/min or 50 mm/min.

Zero the force-measuring system and start the machine. Continue the ply separation and record the force over a length of separation of at least 100 mm, the recorder chart having a sufficiently large scale to allow easy interpretation of results.

10. EXPRESSION OF RESULTS

10.1 The adhesion strength of the test piece should be calculated as the mean of the lowest 50 % of peak values taken from the central 50 % of the stripping trace, as described in the following Note. The adhesion strength should be expressed in kilonewtons per metre width.

NOTE. — A typical trace for an adhesion test is reproduced opposite. For the calculation of the adhesion strength, a "peak" is defined as a part of the trace where the force measured either maintains a steady value for a significant time or shows a rise to a maximum followed by a fall. Such "peaks" are indicated by arrows on the reproduction.

In the example, "peaks" are present at the following forces, reading from left to right, in the central 50 % of the trace :

43.6, 41.0, 41.3, 43.0, 42.5, 37.8, 37.5, 36.7, 43.0, 42.8, 43.4, 43.0, 40.7, 43.3, 41.1,
42.4, 43.3, 43.2, 41.2, 42.6, 42.0, 41.7, 40.3, 40.3, 39.9, 43.2, 43.5, 42.1, 40.4, 42.5,
42.3, 42.2, 42.1, 41.1 units.

The lowest 50 % of these "peaks" are

41.0, 41.3, 37.8, 37.5, 36.7, 40.7, 41.1, 41.2, 42.0, 41.7, 40.3, 40.3, 39.9, 42.1, 40.4,
42.1 and 41.1 units.

The mean of these 17 readings is 40.4 units, which is quoted as the adhesion strength.