

IS : 3400 (Part XVI) - 1974

Indian Standard
METHODS OF TEST
FOR VULCANIZED RUBBERS

PART XVI MEASUREMENT OF CUT GROWTH OF RUBBER
BY THE USE OF THE ROSS FLEXING MACHINE

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METHODS OF TEST
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PART XVI MEASUREMENT OF CUT GROWTH OF RUBBER
BY THE USE OF THE ROSS FLEXING MACHINE

0. FOREWORD

0.1 This Indian Standard (Part XVI) was adopted by the Indian Standards Institution on 5 April 1974, after the draft finalized by the Rubber Products Sectional Committee had been approved by the Chemical Division Council.

0.2 In the preparation of this standard considerable assistance has been derived from ASTM Designation D 1052-55 (Re-approved 1970) ' Standard method of test for measurement of cut growth of rubber by the use of the Ross flexing machine ' issued by the American Society for Testing and Materials.

0.3 In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

1. SCOPE

1.1 This standard (Part XVI) prescribes the method for determining the resistance of rubber to cut growth when subjected to repeated flexing or bending under specific conditions and for known periods on Ross flexing machine.

2. APPARATUS

2.1 Ross Flexing Machine— A schematic diagram of Ross flexing machine is shown in Fig. 1. The machine allows the pierced flexed area of the test specimen to bend freely over a rod of 10 mm diameter through an angle of 90°. The machine shall run at 100 ± 5 cycles per minute. One end of the test specimen is clamped firmly to a holder arm and the other end is placed between two rollers which permit a free bending movement of the test specimen during each cycle.

*Rules for rounding off numerical values (revised).

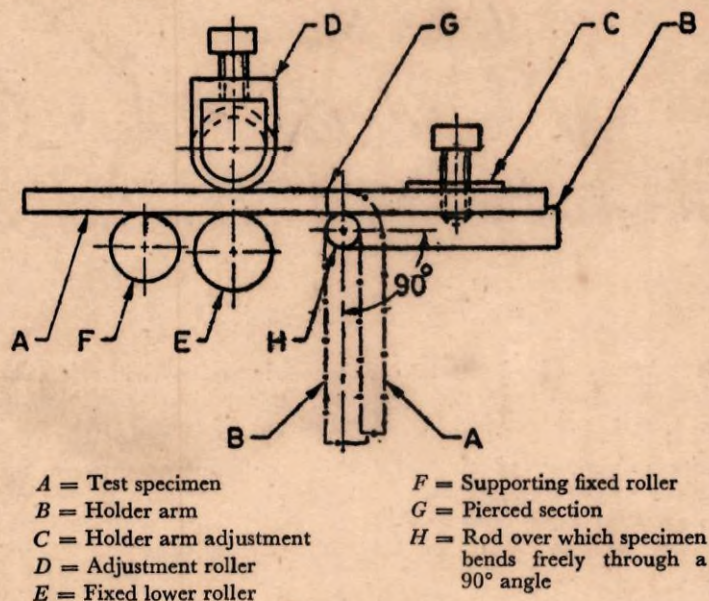


FIG. 1 SCHEMATIC DIAGRAM OF ROSS FLEXING MACHINE

2.2 Piercing Tool and Holder — The piercing tool and holder is shown in Fig. 2. The piercing tool shall have a cutting edge 2.50 ± 0.02 mm in diameter. The length of the bevel from the cutting edge along the axis of the rod shall be 6.30 ± 0.40 mm. The diameter of the holes in guide block shall be, respectively, not more than 0.20 mm larger than the diameter of the piercing tool, and not more than 0.20 mm larger than the diameter of the guide rods.

2.3 Rule — A rule of suitable length, graduated in steps of 0.25 mm shall be used for measuring the length of the cut growth.

3. TEST SPECIMEN

3.1 At least two specimens of each sample shall be tested simultaneously.

3.2 Dimensions — Each specimen shall be 25.0 ± 1.0 mm in width, a minimum of 150 mm in length and 6.30 ± 0.2 mm in thickness and shall be cut, from cured slab 6.30 ± 0.2 mm in thickness, of suitable dimensions. Unless otherwise specified, they shall be prepared so that the longitudinal dimension is parallel with the direction of the grain.

NOTE — When evaluating specimen of high hardness, thickness other than standard may be used as agreed between the purchaser and the supplier.

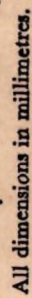


FIG. 2 PIERCING TOOL AND HOLDER

4. PROCEDURE

4.1 Storage of Samples and Conditioning of Test Specimen

4.1.1 The properties of vulcanized rubbers change continuously with time, these changes being particularly rapid during first 24 hours after vulcanization. Therefore, no test shall be carried out within this period. For accurate comparison between different rubbers it may be necessary to ensure that these are tested at substantially the same interval after vulcanization.

4.1.2 Samples and test specimen shall be protected from light as completely as possible during the interval between vulcanization and testing. The specimen shall be kept at a temperature $27 \pm 2^\circ\text{C}$ for a period of not less than 3 hours immediately prior to being measured and tested.

4.2 Temperature of Test — The recommended temperature for test is $27 \pm 2^\circ\text{C}$. Any other temperature used, shall be reported in the test report.

4.3 Method

4.3.1 The test specimen shall be pierced by the use of piercing tool. The piercing tool shall be adjusted in the holder with the cutting edge projecting 7.2 ± 0.2 mm from the base of the holder so that it will pierce completely through the test specimens when tapped. Before piercing the test specimen, the test specimen shall be lubricated with a solution of soap that will not react with the rubber compound. The cut made by the piercing tool shall be parallel to the width of test specimen, at right angle to and across the longitudinal centre lines of the specimen at a point 62.0 ± 1.0 mm from the clamped end.

4.3.2 Clamp the test specimens to the holder arm of the flexing machine in such a position that when the specimens are flexed at 90° the cuts are at the centre point of the arc of flexure. The holder arm shall be in a horizontal position when the test specimens are attached. The adjustable top rollers shall be let down until they just touch the test specimen and shall be locked in this position by means of the wing nuts, permitting free travel of the test specimen between the rollers during the bending movement.

4.3.3 Once the test specimen has been attached as described, the machine shall be started and run at a rate of 100 ± 5 cycles per minute. The number of cycles shall be recorded by the use of counter. Frequent observations shall be made, recording the number of cycles and the increase in cut length for the purpose of determining the rate of increase in cut length. Number of cycles for the initiation of the crack from the pierced hole shall also be recorded. When observing cut growth, the holder arm shall be at an angle approximately 45° from the vertical. The test shall be continued until cut growth has increased to specified length.

4.3.4 In some cases the cut growth is not in a straight line as continuation of the cut made by the piercing tool and 'star shaped' crack may develop. In this event, the cut growth shall be measured as the length of the longest continuous crack, regardless of its directions. When it is necessary to stop operation of the machine, the holder arm shall be in a horizontal position, so that the test specimens remain horizontal while not being flexed.

4.4 Report — The results from observation of at least two test specimens shall be averaged and reported as:

- a) the number of cycles for the initiation of crack, and
- b) the number of cycles for each 100 percent increase in cut growth up to and including 600 percent.

INDIAN STANDARDS
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METHODS OF TEST FOR VULCANIZED RUBBERS

IS : 3400 Methods of test for vulcanized rubbers:

- (Part I)-1965 Tensile stress strain properties
- (Part II)-1965 Hardness
- (Part III)-1965 Abrasion resistance — du pont constant load method
- (Part IV)-1965 Accelerated ageing
- (Part V)-1965 Adhesion of rubber to textile fabrics
- (Part VI)-1967 Resistance to liquid
- (Part VII)-1967 Resistance to flex-cracking
- (Part VIII)-1967 Resistance to crack-growth
- (Part IX)-1967 Density
- (Part X)-1969 Compression set and constant strain
- (Part XI)-1969 Determination of rebound resilience
- (Part XII)-1971 Tear strength — crescent test piece
- (Part XIII)-1972 Tension set
- (Part XIV)-1971 Adhesion of rubber to metal
- (Part XV)-1971 Resistivity of conducting and antistatic rubbers
- (Part XVI)-1974 Measurement of cut growth of rubber by the use of the Ross flexing machine
- (Part XVII)-1974 Tear strength — angular test piece