

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION R 34

DETERMINATION OF TEAR STRENGTH
OF VULCANIZED NATURAL AND SYNTHETIC RUBBERS
(CRESCENT TEST PIECE)

1st EDITION

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BRIEF HISTORY

The ISO Recommendation R 34, *Determination of Tear Strength of Vulcanized Natural and Synthetic Rubbers (Crescent Test Piece)*, was drawn up by the Technical Committee ISO/TC 45, *Rubber*, the Secretariat of which is held by the British Standards Institution (B.S.I.).

The draft proposal put forward by the Secretariat was considered and amended at the meetings held in London (1948), the Hague (1949), Akron (1950), Oxford (1951) and Paris (1953).

On 28 August 1954, the Draft ISO Recommendation proposed by the Technical Committee ISO/TC 45 was submitted to all ISO Member Bodies and approved, subject to certain editorial amendments, by the following 23 (out of a total of 34) Member Bodies:

Austria	*New Zealand
*Canada	Pakistan
Denmark	Portugal
Finland	Spain
France	Sweden
India	Switzerland
*Ireland	Union of South Africa
Israel	United Kingdom
Italy	U.S.A.
*Japan	U.S.S.R.
*Mexico	Yugoslavia
Netherlands	

No Member Body opposed the Draft.

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

* These Member Bodies stated that they had no objection to the Draft being approved.

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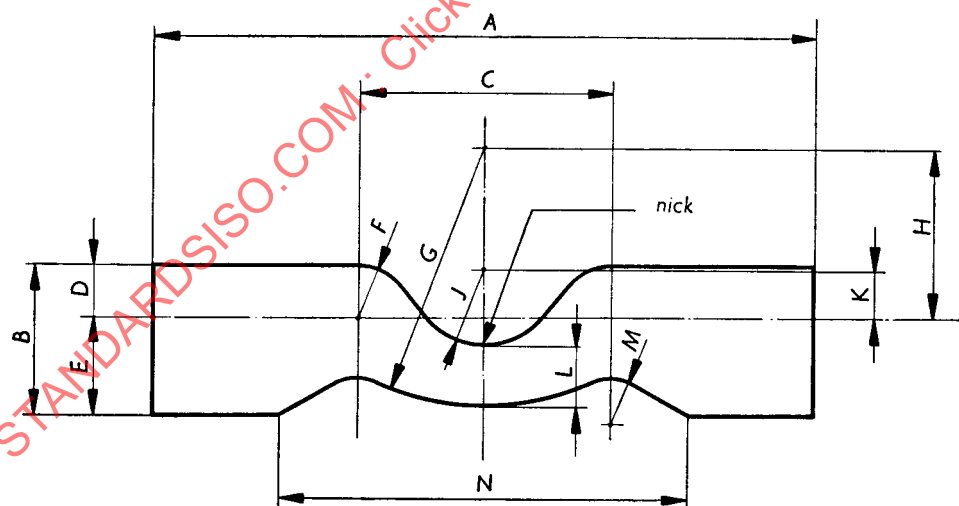
DETERMINATION OF TEAR STRENGTH OF VULCANIZED NATURAL AND SYNTHETIC RUBBERS (CRESCENT TEST PIECE)

1. SUMMARY

The test consists in inserting a slit of accurate depth in a special test piece and measuring the force required to tear across the width of the unnicked portion.

2. TEST PIECE

The test piece conforms to the shape of the die shown in the figure below. The dimensions of the die are as given in the table. The test piece is cut from a sheet by punching with the die using a single blow of a mallet or (preferably) a single stroke of a press; the rubber may be wetted with water or a soap solution and should be supported on a sheet of slightly yielding material (e.g. leather, rubber belting or cardboard) on a flat, rigid surface.



DIMENSIONS OF TEST PIECE

Dimension	Millimetres	Inches	Dimension	Millimetres	Inches
A	110	4.3	G	43.2	1.7
B	25	1	H	29	1.14
C	45	1.80	J	12.5	0.5
D	9	0.375	K	8.5	0.34
E	16	0.625	L	10.2	0.4
F	9	0.375	M	7.5	0.3
			N	68	2.7

The tear strength is particularly susceptible to grain effects in vulcanized rubber. Normally, all test pieces are prepared with the grain at right angles to their length, but in cases where grain effects are significant and are to be evaluated, two sets of test pieces are cut from the sheet, at right angles, and parallel to the grain.

The thickness of the test piece should not fall outside the limits of either 1.8 mm to 2.8 mm or 0.07 inch to 0.11 inch and should be measured by means of a micrometer gauge having a pressure foot approximately 6 mm or 0.25 inch in diameter which exerts a pressure of either 200 g/cm² or 3 lb/in² on the rubber. At least three gauge readings are taken in the region of test. If an odd number of readings is taken, the value to be used is the middle value. If an even number of readings is taken, the value to be used is the average of the middle two readings. No reading should deviate by more than 2 per cent from the value to be used.

Tests intended to be comparable are made on test pieces not varying in thickness by more than ± 7.5 per cent from the mean. In addition, the width of the test piece below the nick is measured, because it is necessary to correct the final result for both the width and thickness of the test piece. (The reasons for these corrections are given in the publication quoted under Reference 1.)*

A single nick or slit of depth of either 0.50 mm $\pm$ 0.08 mm or 0.020 inch $\pm$ 0.003 inch is cut with extreme care and accuracy across the centre of the concave inner edge of the test piece.

3. APPARATUS

The essentials of the method for introducing the nick are as follows:

The test piece is clamped firmly in a vertical plane, especially in the region where the nick is introduced. The cutting is done by means of a razor blade clamped in a vertical plane at right angles to the test piece. Either the razor blade-holder is fitted with guides to ensure an exact horizontal motion over the test piece and is supported in a manner which permits no lateral motion of the razor blade, or the blade is supported in a stationary holder, and the clamped test piece mounted on guide rails which ensure an exact horizontal motion without any lateral movement. In both cases, the guides are such as to ensure accurate centring of the nick. The cutter is fitted with a micrometer gauge for controlling the depth of the nick and is calibrated for each blade. The height of the blade-holder and/or the clamped test piece is adjusted for each blade by cutting one or two preliminary nicks, and measuring these by means of a microscope. The blade may be wetted with water or a soap solution during the nicking, and any test pieces having a depth of nick outside the limits of either 0.42 mm to 0.58 mm or 0.017 inch to 0.023 inch are discarded. A suitable apparatus for nicking tear test pieces (the *I.R.I.* tear cutter) has been described in a publication under Reference 2.**

The test piece is stretched in a tension-testing machine capable of substantially constant rate of traverse of the moving grip. This rate is between either 450 mm/min and 550 mm/min or 18 in/min and 22 in/min.

* Reference 1: J. M. Buist, *Transactions of the Institution of the Rubber Industry*, 1945, **20**, 155-172.

** Reference 2: J. M. Buist and R. L. Kennedy, *India Rubber Journal*, 1946, **110**, 7.10.