

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION R 1924

PAPER AND BOARD

DETERMINATION OF TENSILE STRENGTH

1st EDITION

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BRIEF HISTORY

The ISO Recommendation R 1924, *Paper and board – Determination of tensile strength*, was drawn up by Technical Committee ISO/TC 6, *Paper, board and pulps*, the Secretariat of which is held by the Association Française de Normalisation (AFNOR).

Work on this question led to the adoption of Draft ISO Recommendation No. 1924, which was circulated to all the ISO Member Bodies for enquiry in December 1970. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Australia	India	Switzerland
Belgium	Israel	Thailand
Canada	Netherlands	Turkey
Czechoslovakia	Norway	U.A.R.
Finland	Portugal	United Kingdom
France	Romania	U.S.S.R.
Germany	South Africa, Rep. of	
Greece	Sweden	

The following 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 to accept it as an ISO RECOMMENDATION.

FOREWORD

In view of the ISO policy to adopt the International System of Units, these units and their preferred multiples and sub-multiples have been adopted in this ISO Recommendation. Careful consideration had to be given to the manner of expressing results in these units. Although it might be considered that it would be preferable to express the results of the test in kilonewtons per metre or newtons per millimetre, this was not considered to be practicable at this stage for reasons largely connected with the problems of adapting the wide range of instruments currently used for the tensile test. This situation will be re-examined when this ISO Recommendation is revised in about five years' time.

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PAPER AND BOARD

DETERMINATION OF TENSILE STRENGTH

1. SCOPE

This ISO Recommendation describes a method for measuring the tensile strength of paper and board.

2. FIELD OF APPLICATION

The procedure described in this ISO Recommendation is recommended, within the limitation of the instruments used, for all types of paper and board generally up to a basis weight (substance) of 400 g/m². It does not apply to combined corrugated board.

This ISO Recommendation has been prepared in a form which has a general application and is not limited to any particular type of tensile testing apparatus.

3. DEFINITIONS

For the purposes of this ISO Recommendation, the following definitions apply :

- 3.1 *Tensile strength*. The limiting resistance of a test piece of paper or board submitted to a breaking force applied to each of its ends under the conditions defined in this ISO Recommendation.
- 3.2 *Breaking length*. The calculated limiting length of a strip of paper or board of any uniform width, beyond which, if such a strip were suspended by one end, it would break by its own weight.

4. PRINCIPLE

Measurement of the tensile force required to cause failure of a test piece of given dimensions when applied under standardized test conditions.

5. APPARATUS

Any system may be used which is capable of acting on the test piece at the defined rate and of permitting the tensile force at the moment of failure to be read to an accuracy of 1 %.

The rate of loading should be so adjustable that failure of the test piece can be obtained in a mean time of 20 ± 5 s*. When a substantially inextensible material is gripped between the clamps and a full scale reading is obtained in 20 s, the rate of loading at any time should not differ by more than 5 % from the rate of loading 1 s later.

The centreline of the clamps and of the test piece should lie along the same axis, which should also be parallel to the direction of the applied force. The clamping surfaces of the two clamps (flat clamps) or lines of contact (line contact clamps) should be in the same plane and so aligned that they hold the test piece in that plane throughout the test.

The clamps should grip the test piece firmly along its full width, without slipping, throughout the test.

At the start of the test the lines of contact (if line contact clamps are used) or the inner edges of the contact areas should be 180 ± 2 mm apart and should be perpendicular to the direction of application of the force throughout the test.

6. PREPARATION OF TEST PIECE

6.1 Sampling

Sampling should be carried out in accordance with ISO Recommendation R 186**, *Method of sampling paper and board for testing*. The samples should be conditioned in accordance with ISO Recommendation R 187, *Method for the conditioning of paper and board test samples*, and an equal number of test pieces for machine direction and cross direction tests should then be cut. No creases, obvious flaws or watermarks should be included in the test area and test pieces should not include any part of the sample within 15 mm of the edge of any sheet or roll. If it is necessary to include watermarks, this fact should be reported.

The width of the test pieces required is 15.0 ± 0.1 mm. The minimum length of test piece should in general be 250 mm but instrument jaw design may require the preparation of longer or shorter test pieces.

NOTE. — For certain materials, such as coarse building papers or boards over 3 mm thick, tissues or filter papers, a test piece of greater width, such as 25.0 ± 0.1 mm, may be used if the apparatus can accommodate such a width. If this is done, the width of the test piece should be stated in the test report.

The central 180 mm of the test piece should be handled as little as possible before testing.

6.2 Conditioning

Test pieces should be conditioned and tested in an atmosphere in accordance with ISO Recommendation R 187. The duration of the conditioning process will be determined by the type of material being tested.

6.3 Cutting of test pieces

Sufficient test pieces should be cut from each specimen to enable at least ten tests to be made in both the machine direction and cross direction.

* This rate is not always possible without modification using existing commercial testing apparatus, on all types of paper (for rapidity in routine testing, 10 ± 5 s is often used but this will give results about 2 % higher than the recommended method).

** 2nd edition, 1968.