

Methods for determining the

Bursting strength of paper and board

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Amendments issued since publication

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Foreword

This British Standard is one of a series relating to the testing of paper and board, published under the authority of the Paper Industry Standards Committee. The first edition, published in 1959, specified methods of measurement using pneumatic and hydraulic testers, and applied only to papers having bursting strengths up to 85 lbf/in² (586 kN/m²).

This revision, which is based on two proposals likely to be adopted by the relevant committee of the International Organization for Standardization (ISO), is divided into two methods, the first dealing with the determination of the bursting strength of paper and the second dealing with board. This is considered necessary because board manufacturers require to test higher bursting strengths and consequently need more robust clamps and diaphragms than are suitable for paper testing. The methods are in agreement with the ISO proposals except for certain editorial adjustments and a few minor changes that are not of technical significance.

Separate methods are provided for testing paper and board. However, in practice there is a wide overlap area. In consequence, while Section 2 is applicable to papers with bursting strengths in the range from 70 kN/m² to 1 100 kN/m², for materials with bursting strengths greater than 350 kN/m² (or 250 kN/m² for components of combined materials) the method in Section 3 may also be used.

The board method described in Section 3 is suitable for materials with bursting strengths up to 5 500 kN/m². It is recognized that the method is in practice sometimes used for materials with considerably higher bursting strengths, and consideration will be given to the possibility of extending the scope of this standard in due course. Meanwhile it is emphasized that great care should be taken when the upper limit of 5 500 kN/m² is exceeded to ensure that the particular instrument employed is capable of being used safely and reliably at such pressures.

In order to be consistent with the proposed international documents, and having regard to the general policy of the paper industry on the use of the International System of units, kN/m² has been used as the basis for these methods. However, many instruments in use for determining this property are at present scaled in kgf/cm². For the purposes of this British Standard 1 kgf/cm² equals 98.1 kN/m².

It will be noted that the pneumatic method that was included in the previous edition of BS 3137 has been excluded from the main text of the current revision. However, the pneumatic bursting test is still regularly used in some laboratories, particularly those concerned with testing pulp handsheets and weak papers. Consequently some information on the method has been included as Appendix H.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 14, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 General

1.1 Scope

This British Standard describes methods for measuring the bursting strengths of paper and board. Section 2 specifies a method for measuring the bursting strength of paper subjected to rising hydraulic pressure.

The method is applicable to paper with bursting strength within the range from 70 kN/m² to 1 100 kN/m². It should not, however, generally be used for the components (such as fluting medium or linerboard) of a combined board, for which the method specified in Section 3 is more suitable. Paper of bursting strength less than 70 kN/m² may also be tested by bursting a number of sheets together.

Section 3 of this British Standard specifies a method for measuring the bursting strength of board subjected to rising hydraulic pressure.

The method is applicable, in principle, to all types of board (including solid and corrugated fibreboard) with bursting strength within the range from 350 kN/m² to 5 500 kN/m² ¹⁾.

It may also be used for papers or boards with bursting strength as low as 250 kN/m² if the paper or board is to be used to prepare a material of higher bursting strength, such as corrugated board. In such instances, the measurements will not necessarily have the accuracy or precision stated for this method and the report should carry a note that the test gave results that were below the minimum value required by the method.

NOTE The titles of the British Standards referred to in this standard are listed on the inside back cover.

1.2 Definitions

For the purposes of this British Standard the following definitions apply:

1.2.1

bursting strength

the maximum uniformly distributed pressure, applied at right angles to its surface, that a test piece of paper or board will stand under the conditions of this test

1.2.2

burst ratio

the bursting strength of the paper or board divided by the grammage of the conditioned paper determined by the standard method of test

1.3 Principle

A test piece, placed in contact with a circular elastic diaphragm, is rigidly clamped at the periphery but is free to bulge with the diaphragm. Hydraulic fluid is pumped at a constant rate, bulging the diaphragm until the test piece ruptures. The bursting strength of the test piece is the maximum value of the applied hydraulic pressure.

2 Determination of the bursting strength of paper

2.1 Apparatus

2.1.1 Clamping system. Means are provided for clamping the test piece firmly and uniformly between two annular plane parallel hard surfaces which shall be smooth (but not polished) and grooved as described in Appendix A, which indicates the dimensions of the clamping system.

The upper clamping plate is held in a swivel joint to ensure alignment of the plates under pressure.

During tests the apertures in the two clamping plates shall be concentric to within 0.25 mm and the clamping surfaces shall be flat and parallel.

Methods of checking the clamps are given in Appendix B.

The clamping load shall be sufficient to prevent slipping during a test (see 2.4), but not so great as to damage the test piece in such a way that rupture occurs around the periphery of the test area.

Normally the clamping load shall be not less than 2 700 N (see Appendix C). For some papers clamps of larger area than the minimum specified may be required to prevent slipping.

A maximum clamping load and also a minimum differing from that stated above may be agreed between the parties concerned, in which case the agreed limit or limits of clamping load shall be stated in the test report.

2.1.2 Diaphragm. A circular diaphragm of elastic material is clamped securely with its upper surface about 3.5 mm below the top plane of the lower clamping plate. The material and construction of the diaphragm shall be such that the pressure required to bulge the diaphragm 9 mm above the top face of the lower clamping plate is 30 ± 10 kN/m².

¹⁾ See Foreword.