BRITISH STANDARD

BS 5229:1975

*Incorporating Amendment No. 1*

Method for

# Determination of tuft withdrawal force of carpets

Confirmed May 2009

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# Co-operating organizations

The Textile Divisional Council, under whose supervision this British Standard was prepared, consists of representatives from the following Government department and scientific and industrial organizations:

British Railways Board*
Consumer Standards Advisory Committee of BSI
Consumers' Association
Cotton Industry Standards Committee
Jute Industry Standards Committee
Linen Industry Standards Committee
London Transport Executive
Man-made Fibres Industry Standards Committee
Ministry of Defence*
Ropes and Cordage Industry Standards Committee
Silk Industry Standards Committee
Society of Dyers and Colourists
Textile Institute*
Textile Machinery Industry Standards Committee
Textile Research Conference*
Trades Union Congress
Wool Industry Standards Committee

The Government department and industrial and scientific organizations marked with an asterisk in the above list, together with the following, were directly represented on the subcommittee entrusted with the detailed preparation of this British Standard.

This subcommittee was set up by the Standing Joint Committee for Textile Test Methods, the members of which were appointed by the Textile Institute and the British Standards Institution.

Bradford Conditioning House
British Carpet Industry Technical Association
British Man-made Fibres Federation
Cotton Silk & Man-made Fibres Research Association
Department of the Environment
European Flooring Institute
Federation of British Carpet Manufacturers
Fibre Bonded Carpet Manufacturers' Association
International Wool Secretariat
Retail Trading-Standards Association Inc.
Tufted Carpet Manufacturers' Association
University of Leeds
University of Manchester
Wira

This British Standard, having been approved by the Textile Divisional Council, was published under the authority of the Executive Board on 30 September 1975



The following BSI references relate to the work on this standard:
Committee reference T/16/5
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# Foreword

This British Standard was prepared under the direction of the Fibres, Yarns and Fabrics Standards Committee. It is in close conformity with ISO 4919:1978, *"Carpets — Determination of tuft withdrawal force"* published by the International Organization for Standardization (ISO).

The background work relating to the development of this British Standard is published in *Textile Institute and Industry,* Volume 11 (1973), No. 7, and is concerned chiefly with methods of gripping tufts and loops.

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 and ii, pages 1 to 4, 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 Scope

This British Standard describes a method for determination of tuft withdrawal force and is applicable to all carpets with a cut or loop pile yarn structure.

## 2 References

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

## 3 Principle

A loop is hooked, or one end of a tuft is gripped, and the maximum force registered during the removal process is recorded.

## 4 Apparatus

A tensile testing apparatus with suitable ranges and an accuracy of ± 5 % (normally a range equivalent to 10 N, 20 N, 50 N or 100 N would be required). Preferably the apparatus shall have a constant rate of loading but, alternatively, constant rate of traverse or extension may be used; in any case the average test time for the withdrawal of one tuft or loop should be greater than 5 s. This may be achieved in machines which would give very short test times, e.g. those using load cells, by inserting a spring between the loading mechanism and the specimen.

The apparatus shall have a means of clamping a specimen of carpet to a base plate so that it is flat in a plane perpendicular to the direction of pull upon the tuft or loop. The flat, horizontal part of the clamp which is brought into contact with the specimens during testing shall be at least 60 mm × 60 mm in area, shall have a circular cut-out of 12 mm radius around the tuft or loop to be withdrawn and shall restrain the specimen outside this cut-out area (see Figure 1). The cut-out may have a throat to allow easier positioning of the specimen with the tuft grip or hook attached.

For cut pile carpets, a suitable means of selecting and gripping one end of a tuft shall be provided (e.g. surgical forceps); for loop pile carpets, a suitable hook (e.g. knitting machine needle) is required. These tuft grips are attached to the upper jaw of the tensile tester.

The load sensing mechanism of the machine shall be calibrated with the tuft grip or hook in position.

## 5 Atmosphere for conditioning and testing

The conditioning and testing atmosphere shall be the standard atmosphere for testing textiles defined in BS 1051, i.e. an atmosphere of relative humidity 65 ± 2 % and a temperature 20 ± 2 °C.

## 6 Test samples and specimens

Take samples from at least five places across the width of the carpet selected to be representative of the material under test in accordance with BS 4664. Condition the samples for not less than 24 h in the standard atmosphere for testing textiles, as defined in clause **5**. Cut the specimens (one from each sample) to a size which is convenient for clamping on the testing machine and which will allow for at least 10 tufts to be removed from each. No tuft shall be removed from within 25 mm of the edge of a specimen or of any previously withdrawn tuft.

## 7 Test procedure

**7.1** Conduct the test in the standard atmosphere for testing textiles, as defined in clause **5**.

**7.2 For cut pile carpets.** Select one end of one tuft and attach the tuft grip. The selection of the tuft is easier if the carpet is bent backwards slightly to open out the tuft structure. Clamp the carpet as described in clause **4**, and attach the tuft grip to the upper jaw. Set the machine in motion and withdraw the tuft completely. Check that only one complete tuft was withdrawn and record the maximum force. If additional fibres from another tuft were gripped or if only part of the tuft was removed, ignore the result. In certain carpet constructions the selection of one tuft is impracticable; in these cases grip the minimum number of tufts that can be selected, and inspect the withdrawn unit carefully to ensure that the required number of tufts has been isolated.

**7.3 For loop pile carpets.** Select a suitable loop and engage the hook under the top of it. Clamp the carpet as described in clause **4**, and attach the hook to the upper jaw. Set the machine in motion, and stop it as soon as slippage occurs in the bonds holding one of the loop sides. Record the maximum force.

**7.4** Where both cut and loop pile are present, these should be tested separately, and care should be taken to ensure that where possible the tufts or loops tested are surrounded by those of the same type. Only completely cut tufts or completely uncut loops should be tested.

**7.5** Repeat the procedure for a minimum of 20 tufts or loops[1)], spread evenly through the available samples, taking account of the restriction of at least 25 mm between a previously withdrawn tuft or the edge of the specimens. If the pile yarn breaks without pulling out the tuft or loop, record this separately, marked "broken". Include this result in the number of valid tests and use it separately in calculations.

## 8 Calculation

Calculate the mean tuft withdrawal force in newtons and coefficient of variation for all the results, excluding any marked "broken". Calculate the mean of the "broken" results separately. If there is a marked difference between results from different areas, this should be reported.

## 9 Test report

The report shall include the following information:

a) that the tests were performed in accordance with this British Standard, i.e. BS 5229;

b) type of tensile testing machine used;

c) the number of tufts or loops tested;

d) mean tuft-withdrawal force and coefficient of variation and, if applicable, the mean force of the broken tufts and differences between different areas;

e) if applicable, a statement that a multiple number of tufts was withdrawn, and a careful description of the unit.

NOTE The coefficient of variation of tuft withdrawal force is usually fairly large and may be of the order of 20 % to 30 %. Assuming these values, if 20 tests are carried out, the 95 % confidence limits of the mean are about ± 9 % to ± 13 % of the mean value. Greater accuracy may be obtained by testing 50 tufts, in which case, the 95 % confidence limits would be ± 6 % to ± 9 % of the mean value.

It would be expected that the tuft withdrawal force for a loop pile carpet is between 1½ times and twice that of a cut pile of a similar type.

[1)] The original five specimens (see clause **6**) are cut large enough to allow 10 tufts or loops to be tested from each in case a total of 50 tests should be required (see also the note to clause **9**).

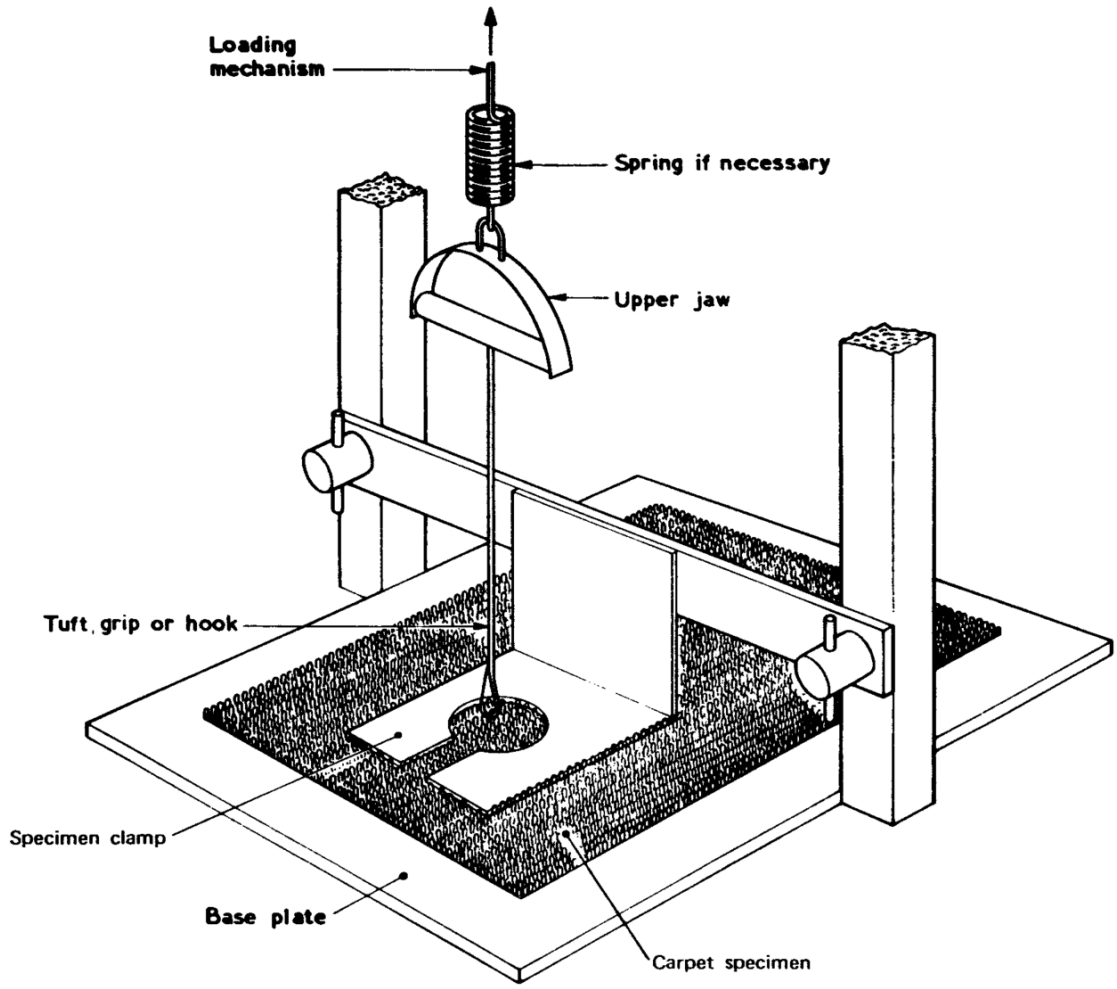


**Figure 1 — One possible form of flat horizontal mounting**

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# Publications referred to

This standard makes reference to the following British Standards:
BS 1051, *Glossary of terms relating to the conditioning and testing of textiles.*
BS 4664, *Methods of sampling and cutting specimens for physical tests on textile floor coverings.*

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