BRITISH STANDARD

BS 5131 :
Part 0 : 1990

Methods of test for

Footwear and footwear materials

Part 0. General introduction

NOTE. It is recommended that this Part should be read in conjunction with the individual Sections of BS 5131.

STANDARDS

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Textiles and Clothing Standards Policy Committee (TCM/-) to Technical Committee TCM/39, upon which the following bodies were represented:

British Footwear Manufacturers' Federation
British Leather Confederation
British Rubber Manufacturers' Association
British Steel plc
Consumer Standards Advisory Committee of BSI
Cork Industry Federation
Footwear Components Federation
Footwear Distributors' Federation
Institute of Trading Standards Administration
Iron and Steel Trades Confederation
Lancashire Footwear Manufacturers' Association
Mail Order Traders' Association of Great Britain
Ministry of Defence
National Union of Footwear, Leather and Allied Trades
Office of Fair Trading
SATRA Footwear Technology Centre

The following bodies were also represented in the drafting of the standard, through subcommittees and panels:

British Adhesives and Sealants Association
British Paper and Board Industry Federation
British Plastics Federation
Multiple Shoe Retailers' Association
RAPRA Technology Ltd.

This British Standard, having been prepared under the direction of the Textiles and Clothing Standards Policy Committee, was published under the authority of the Board of BSI and comes into effect on 31 January 1991

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The following BSI references relate to the work on this standard:
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Contents

Foreword

This series of British Standard test methods for footwear and footwear materials, published as BS 5131, has been prepared under the direction of the Textile and Clothing Standards Policy Committee at the request of SATRA Footwear Technology Centre. The methods are largely based on those already well established in the UK footwear industry and which have been published by SATRA to whom due acknowledgement is made. This Part of BS 5131 supersedes BS 5131 : Introduction : 1975, which is withdrawn.

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

General introduction

1 Scope

This Part of BS 5131 lists each test method published as a Section of this standard. The Sections are available separately. This Part also lists other British Standard methods of test applicable to footwear and footwear materials so as to function as a general index of all British Standard test methods applicable in the footwear industry.

Table 1 lists the Sections of BS 5131 by title and indicates the SATRA test methods on which they are based (where relevant).

Table 2 lists methods of test which deal with the testing of individual materials relevant to the footwear industry.

Table 3 lists the applicability of the methods of test according to the property tested and the material under test.

The methods of test are intended to permit valid comparisons to be made between various materials intended to fulfil the same structural and design function. As a consequence, the methods of test may be used to predict performance in manufacturing or in use. Experience in the industry indicates that in most cases the methods are accurate in this sense. In cases where the methods are inaccurate (for example, when used in conjunction with particular materials), this is stated in the scope clause of the particular test method concerned.

Attention is drawn to the fact that it is necessary to refer to the particular standard as given in tables 2 and 3 when carrying out the test, and not to this Part of BS 5131. In particular, for water vapour permeability, two alternative methods are given (method 24 of BS 3144 or BS 3177). Since these give different results, reference to the method of test is obviously needed. Similar remarks apply to flexing properties and to cracking and bursting strength and stretch.

The test methods include tolerances for all critical parameters in order to provide the maximum reproducibility of test results. Where the test methods involve a small element of subjectivity and require lower levels of skill and judgement in operation, the tests give results with a high degree of reproducibility. Where the test methods involve a greater element of subjectivity, or require higher levels of skill and judgement in operation, the test results are less reproducible. This has been clearly established where the test methods require several test specimens to be tested. However, in the absence of suitable interlaboratory test data, the expected precision and confidence limits of the results for any of the methods cannot be quoted. Nevertheless, the methods are widely used in the industry and function satisfactorily in product development, product specification and in troubleshooting.

Throughout this British Standard, SI units have been used. However, the test equipment currently used to carry out some of the tests is calibrated in other units, and in such cases the appropriate value is first given in SI units and then given in brackets in the other units.

Table 1. Sections of BS 5131

Title		SATRA method on which the procedure is based
Part 1. Adhesives		
Section		
1.1	Resistance of adhesive joints to heat (creep test)	AM 3
1.2	Resistance of adhesive joints to peeling	AM 1
1.3	Preparation of test assemblies using adhesives (other than hot melt adhesives) for heat resistance (creep) and peel tests	AM 2
1.4	Heat activation life of adhesives	
1.6	Recommended environmental storage conditions for adhesive joints prior to heat resistance or peeling tests	
1.7	Preparation of test assemblies using hot melt adhesives for heat resistance (creep) and peel tests	
1.8	Rate of bond strength development in shear of hot melt adhesives for lasting	
1.9	Measurement of green strength of adhesive joints	
Part 2. Solings		
Section		
2.1	Ross flexing method for cut growth resistance of soling materials	PM 60
2.6	Split tear strength of cellular solings	PM 65
2.7	The preparation of test pieces from soling materials for physical testing	
2.10	Heat shrinkage of cellular solings	PM 70
2.11	Resistance of solings to short-term contact with a hot surface	
Part 3. Uppers, textiles and threads		
Section		
3.1	Strength of upper and lining materials at right angles to stitch perforations	PM 33
3.4	Edgewise compressibility, upper materials	PM 44
3.5	The break/pipiness test	PM 36
3.6	Abrasion resistance of shoe laces	PM 93
3.7	Breaking strength of shoe laces	PM 94
Part 4. Other components		
Section		
4.1	Resistance to peeling of insole board	PM 101
4.2	Flexing index of fibreboard	PM 3
4.3	Resistance of fibreboard to stitch-tear	PM 5
4.4	Heel pin holding strength of fibreboard	PM 11
4.5	Tensile strength of fibreboard	PM 2
4.6	Shear strength of ribs stuck to insoles	AM 5
4.7	Resistance to peeling of ribs stuck to insoles	AM 13
4.8	Resistance of heels of ladies' shoes to lateral impact	PM 20
4.9	Fatigue resistance of heels of ladies' shoes	PM 21
4.12	Fastness of fibreboard finishes to rubbing in the presence of water and perspiration	PM 8
4.13	Transverse tensile strength of fibreboard	
4.18	Longitudinal stiffness of steel shanks	PM 58
4.20	Force required to pull heel pins out of shoe heels	PM 96

Table 1. Sections of BS 5131 (*concluded*)

Title		SATRA method on which the procedure is based
Part 5. Testing of complete footwear		
Section		
5.1	Adhesion of stuck-on and moulded-on soles	AM 4
5.2	Degree of vulcanization of moulded-on rubber soles	PM 40
5.3	Resistance of complete footwear to heat	
5.4	Sole bond peeling strength	
5.5	Resistance of finished footwear to water penetration (trough test)	PM 81
5.6	Impact test for rigid units and shoe bottoms	PM 86
5.7	Fatigue test for rigid units and shoe bottoms	PM 87
5.8	Durability in flexing, shoe bottoms	PM 92
5.9	Strength of top piece attachment to shoe heels	
5.11	Determination of the strength of buckle fastening assemblies	
5.13	Measurement of the strength of stitched seams in upper and lining materials	
Part 6. Codes of practice		
6.1	Code of practice for the comparative evaluation by wear trial of materials, components or constructions	
6.2	Code of practice for the identification in footwear wear trials of major weaknesses in design or construction and the assessment of fitness-for-purpose	

Table 2. Test methods for specific materials used by the footwear industry		
Material	**Test method**	
Adhesives	BS 5350	Methods of test for adhesives
Board	BS 3430	Method for sampling to determine the average quality of paper and board
	BS 3432	Method for determination of grammage of paper and board
	BS 3748	Method for the determination of stiffness of board
Coated fabrics	BS 3424	Methods of test for coated fabrics
Leather	BS 1309	Methods of sampling and chemical testing of leather
	BS 3144	Methods of sampling and physical testing of leather
	BS 1006	Methods of test for colour fastness of textiles and leather
Plastics	BS 2782	Methods of testing plastics
Rubber	BS 903	Methods of testing vulcanized rubber
	BS 1673	Methods of test for raw rubber and unvulcanized compounded rubber
	BS 4443	Methods of test for flexible cellular materials
	BS 4470	Method for evaluation of vulcanization characteristics of isobutene-isoprene rubber (IIR)
Textiles	BS 1006	Methods of test for colour fastness of textiles and leather
	BS 1932	Testing the strength of yarns and threads from packages Part 1 Methods for determination of breaking strength and breaking extension
	BS 2471	Methods of test for textiles — woven fabrics — determination of mass per unit length and mass per unit area
	BS 2576	Method for determination of breaking strength and elongation (strip method) of woven fabrics
	BS 4736	Method for determination of dimensional changes of fabrics induced by cold-water immersion

Table 3. Test methods for properties of materials used by the footwear industry		
Property	**Material**	**Recommended test method**
Thickness	Leather	Method 3 of BS 3144
	Fibreboards	BS 5131 : Section 4.3, 4.4 or 4.5
	Non-leather upper and lining materials	Method 26 of BS 3424 : Part 23, at a pressure of 2 kPa
	Rubber and PVC	BS 903 : Part A38
	Fabric	Method 26 of BS 3424 : Part 23, at a pressure of 2 kPa
Density	Leather	Method 4 of BS 3144
Mass per unit area	Upper material	Method 3 of BS 2471
Hardness	Rubber and PVC	BS 903 : Part A26 (see note 1)
Breaking strength and extension at break	Synthetic upper materials	Method 6 of BS 3424 : Part 4
	Threads	BS 1932 : Part 1
	Fabric	BS 2576
Cracking and bursting strength and stretch	Upper leather	Method 8 of BS 3144
	Synthetic upper materials	Method 8 of BS 3144, or method 8A or method 8B of BS 3424 : Part 6
Flexing properties	Upper leather and synthetic upper materials	Method 13 of BS 3144 and/or Method 11C of BS 3424 : Part 9 (see note 2)
	Fabric	Method 11C of BS 3424 : Part 9
Moist heat setting (dome plasticity)	All upper materials	Method 10 of BS 3144 but with the setting conditions modified to conform with the requirements of SATRA Method PM 18
Water vapour permeability	All materials	Method 24 of BS 3144 or BS 3177 (see note 3)
Coating adhesion	Synthetic upper materials	Method 9 of BS 3424 : Part 7
Adhesion of finish	Upper leather	Method SLF 11 of the Society of Leather Technologists and Chemists
Fastness of finish to rubbing	Upper material	BS 1006 UK-LC and BS 1006 UK-LG
Colour fastness to light	Upper material	BS 1006 : B02
Shrinkage on wetting	Fabric	BS 4736

Table 3. Test methods for properties of materials used by the footwear industry (*concluded*)

Property	Material	Recommended test method
Plasticizer volatility	PVC soling compounds	Prepare the sample according to BS 5131 : Section 2.7. Carry out the test as described in BS 2782 : Method 465B but using disk test specimens 2.0 ± 0.1 mm in thickness
Heat stability	PVC soling compounds	Method 130A of BS 2782 : Part 1 (see note 4)

NOTE 1. Whenever possible prepare the sheet for test by the appropriate procedures given in BS 5131 : Section 2.7. In the case of thermoplastic rubber, whenever possible determine the hardness of a sample which has not been reduced in thickness by preparation.

NOTE 2. These methods are regarded as complementary rather than as alternatives.

NOTE 3. Although results from method 24 of BS 3144 are considered to be more accurate for higher permeabilities, in some situations it has been found that the procedure is less convenient to carry out than that described in BS 3177, which gives quicker results. As a consequence, it has not been found possible to recommend a single method for all applications in the footwear industry. It is, however, recommended that method 24 of BS 3144 is used in cases where it yields results greater than 3.5 $mg \cdot cm^{-2} \cdot h^{-1}$, the result obtained when testing the same material in accordance with BS 3177 being 2 $mg \cdot cm^{-2} \cdot h^{-1}$.

NOTE 4. This is a useful and relatively cheap test to carry out. It is, however, a static test and in cases of dispute (involving degradation in processing, for example), a dynamic test (using a torque rheometer, for example) is to be preferred.

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BSI
2 Park Street
London
W1A 2BS

BSI
Linford Wood
Milton Keynes
MK14 6LE