

Procedure for

Inspection and testing of textiles for aerospace purposes

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Committees responsible for this British Standard

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- British Narrow Fabrics Association
- British Rubber Manufacturers' Association Ltd.
- Civil Aviation Authority (Airworthiness Division)
- Cordage Manufacturers' Institute
- Linen Sewing Thread Manufacturers' Association
- Ministry of Defence
- Society of British Aerospace Companies Limited
- Textile Finishers' Association

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Foreword

This British Standard has been prepared under the direction of Technical Committee ACE/39 and supersedes BS 5F 100:1991, which is withdrawn. It covers the inspection and testing requirements and certain basic quality requirements for textiles for aerospace purposes including aircrew clothing. The requirements specified in this British Standard are for use in conjunction with the relevant specifications in the BS F Aerospace Series and are also applicable to other specifications for textiles for aerospace purposes, where appropriate.

The start and finish of text introduced or altered by Corrigendum No. 1 is indicated in the text by tags **[C1]** **[C1]**.

The principal changes in this revision include the addition of a new test apparatus for air permeability measurement, redefined requirements for measurement of bow in narrow fabrics, and clarification of the requirements for warp and skew. The introduction of the new test for measurement of bow has resulted in re-numbering of subsequent clauses.

The requirement for 1.2 to become “References” has resulted in “Information to be supplied by the purchaser” being moved to a normative annex. The opportunity has also been taken to revise the standard, where appropriate, to incorporate the changes resulting from the revision of other British Standards.

WARNING NOTE 1. This British Standard calls for the use of substances and/or procedures that may be injurious to health if adequate precautions are not taken. It refers only to the technical suitability and in no way absolves either the supplier or the user from statutory obligations relating to health and safety at any stage of manufacture or use.

WARNING NOTE 2. Manufacturers are advised that textiles for aerospace purposes, whether defined in the British Standard F series or other publications, the inspection, testing and quality requirements of which are specified by this standard, are utilized in safety or other critical use applications.

Failure of an item of equipment in service due to non-conformity of a textile material could therefore result in liability for the equipment failure being assigned to the textile manufacturer if it is determined that the equipment failure was due to non-conformity of a textile material, as supplied.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its 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 iii, a blank page, pages 1 to 68, an inside back cover and a back cover.

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Section 1. General

1.1 Scope

This British Standard specifies procedures for the inspection and testing of materials covered by specifications for textiles for aerospace purposes.

NOTE 1 The information to be supplied by the purchaser in the contract or order is listed in Annex A.

NOTE 2 This British Standard does not purport to cover all quality requirements for subsequent processing or the end use of any textile.

NOTE 3 Details of the classification, methods of marking and acceptance limits for the more common faults in certain broad groups of textiles are given in Annex B. Permitted tolerances are stated where applicable.

NOTE 4 The latest revision of an Aerospace Series standard is indicated by a prefix number.

1.2 References

1.2.1 Normative references

This standard incorporates, by dated or undated reference, provisions from other publications. These normative references are made at the appropriate places in the text and the cited publications are listed on page 69. For dated references, only the edition cited applies; any subsequent amendments to or revisions of the cited publication apply to this standard only when incorporated in the reference by amendment or revision. For undated references, the latest edition of the cited publication applies, together with any amendments.

1.2.2 Informative references

This standard refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on page 70, but reference should be made to the latest editions.

1.3 Definitions

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

1.3.1

textile

any fabric (however constructed), sewing thread or cordage made from natural or man-made fibres and/or yarns or blends of these

1.3.2

fabric

a manufactured assembly of fibres and/or yarns that has substantial surface area in relation to its thickness and sufficient mechanical strength to give the assembly inherent cohesion

1.3.3

wide fabric

a fabric constructed at more than 450 mm width between selvages

1.3.4

narrow fabric

a fabric constructed at 450 mm width or less between selvages and not obtained by slitting wide fabric

1.3.5

coated fabric

a fabric coated by spreading, calendering, hot melt, laminating or transfer techniques

1.3.6

plain (bobbin) netting

a hexagonal mesh fabric in which the bobbin threads twist round the warp threads and traverse diagonally across the netting

1.3.7

sewing thread

the result of twisting together, in one or more operations, two or more single, folded or cabled yarns intended principally for sewing purposes

1.3.8

braided cordage

cordage of braided or plaited construction independent of size

1.3.9

laid cordage

cordage constructed by twisting three or more strands around each other to form a helix round a central axis

1.3.10

rope

cordage of 4 mm diameter or more

1.3.11

cord or line

cordage of less than 4 mm diameter

1.3.12

water repellency

the resistance of textile fabrics to absorption of showered water.

NOTE The criterion is the amount of water absorbed following the effects of a defined simulated rain shower for a specific duration. In addition, the amount of water penetrating the textile fabrics and the water run off can be used for the assessment.

1.3.13

standard atmosphere

standard temperate atmosphere for testing, (65 ± 2) % relative humidity at a temperature of (20 ± 2) °C

1.3.14

manufacturer

the company making the material into the form (yarn, loomstate fabric, finished fabric, etc.) in which it is consigned to the purchaser

1.3.15

supplier

the company consigning the material to the purchaser.

1.3.16

quality assurance authority

the body, e.g. the purchaser, responsible for authorizing the manufacturer or supplier to issue certification, when to certify means to attest as meeting a standard

1.4 Certification

1.4.1 With each delivery of material, the manufacturer shall supply consignment documentation (e.g. a certificate of conformity, declaration) containing the following minimum information:

- a) consignee's name and address;
- b) consignor's name and address;
- c) reference number and date of document;
- d) contract and/or order number;
- e) description of supplies and quantity;
- f) the numbers of the relevant British Standards and of other relevant specifications;
- g) identification marks (e.g. batch number, piece numbers);
- h) reference to a test report giving the date of testing;
- i) non-conformity (e.g. concessions or production permits);
- j) a certificate signed by a duly authorized employee of the company, in the following form unless otherwise required by the quality assurance authority.

“Certified that the whole of the supplies detailed herein have been inspected, tested and, unless otherwise stated above, conform in all respects with the requirements of the contract or order”.

1.4.2 For material consigned by a supplier other than the manufacturer, all the information required in **1.4.1**, as provided by the manufacturer, shall form part of the supplier's consignment documentation.

1.4.3 If a batch of material consigned by the manufacturer is subdivided by a stockist or other non-manufacturer before reconsignment, he shall carry out any consequent additional dimensional inspection and identification marking, and shall certify accordingly.

1.5 Sampling and testing

1.5.1 General

Except where otherwise specified in the individual textile specification, testing to the requirements specified for the textile in the condition as sampled shall be carried out in accordance with this standard on properly identified samples taken as described in **1.5.2**, **1.5.3** and **1.5.4**, as appropriate.

1.5.2 Initial sampling

For new production, i.e. where a manufacturer is working for the first time on a particular type of textile, sampling shall be increased above the sampling plan given in Table 1 until such time as the quality assurance authority is satisfied with the degree of uniformity within batches.

1.5.3 Sampling plan

1.5.3.1 For production by a manufacturer with working experience of a particular type of textile, sampling procedures shall be in accordance with **1.5.3.2** and Table 1.

1.5.3.2 For coated fabrics, samples shall not include the coating imperfections which occur at the extreme ends. For other textiles, samples shall not be taken from the first few metres manufactured. All fabric samples shall be full width.

1.5.4 Special arrangements for type testing

Where a specification requires special tests (type tests) to be carried out at the outset of new production and requires repeats of those tests on an infrequent, as distinct from a batch basis, the particular textile specification shall define the frequency of sampling to be applied.

1.5.5 Testing

1.5.5.1 Except where otherwise required as part of the procedure of an individual test given in this standard, all test samples or specimens cut from the test samples shall be conditioned in accordance with **1.6**.

Table 1 — Sampling plan

Textile	Sampling plan
Woven fabrics including narrow fabrics: loomstate ^a	For fabrics manufactured from beams take one sample from one piece per beam. For fabrics manufactured from creels take one sample from one piece from each continuously manufactured length not exceeding 5 000 m. If several narrow fabrics are manufactured simultaneously on the same loom, take one sample from each continuously manufactured length not exceeding 5 000 m.
Knitted fabrics: loomstate ^b	For warp knitted fabrics, take one sample from one piece per set of beams (i.e. each time a beam in a set is changed, take a further sample). For weft knitted fabrics, take one sample from one piece from each continuously knitted length not exceeding 500 m.
Woven or knitted fabrics including narrow fabrics: piece treated ^{a,b}	For fabrics already proved by test in the loomstate, take one sample from one piece per finisher's batch per fabric type and manufacturer. For fabrics not subject to test in the loomstate, take one sample from one piece per beam or set of beams, or per continuously manufactured length not exceeding 5 000 m, in each finisher's batch. If a finisher's batch consists only of further pieces from beams or continuously manufactured lengths previously proved by test in the finished condition, take one sample from one piece from the finisher's batch.
Plain (bobbin) netting	Take one sample from each piece from each continuously manufactured netting.
Coated fabrics ^a (including narrow fabrics) Single ply fabrics	Take one sample from each piece from each continuously coated or plied length not exceeding 1 000 m.
Coated fabrics ^a (including narrow fabrics) Laminated or multi-ply fabrics	Take one sample from one piece from each continuously laminated or plied length not exceeding 1 000 m.
Ropes	Take samples from each machine according to the following sampling formula: $S = 0.4 \sqrt{N}$ where S is the number of samples (to the nearest integer); N is the number of 220 m lengths from a machine. Take a minimum of one sample from each machine.
Cords and lines	Take samples from each machine according to the following sampling formula: $S = 0.25 \sqrt{N}$ S is the number of samples (to the nearest integer); N is the number of 250 m lengths from a machine. Take a minimum of one sample from each machine.
Sewing threads	Take one sample from each thread batch or from each 25 kg whichever gives the greater number of samples.
^a The quantity of fabric produced from one weaver's beam or from a creel containing the same warp yarns throughout and woven on one particular loom. As such it constitutes a unique batch or unit of production provided that weft of substantially consistent quality has been used. If a fresh delivery of weft yarn of unproved quality is introduced during weaving the warp, a fresh batch has been created and further samples for complete fabric tests become necessary. Manufacturers should maintain continuous quality control of properties of weft yarn, e.g. type of fibre, yarn count, strength. ^b If a fresh delivery of yarn of unproved quality is introduced during weft knitting, a fresh batch has been created and further samples for complete fabric tests become necessary. Manufacturers should maintain continuous quality control of the relevant properties of yarn, e.g. type of fibre, yarn count, strength.	

1.5.5.2 For fabrics having a mass per unit area less than 240 g/m^2 manufactured wholly or partly from natural fibre and for all sewing threads, testing shall be completed without removal from the atmosphere specified in **1.6**.

1.5.5.3 For all other textiles, if the test samples or specimens are removed from the conditioning atmosphere for test purposes, testing shall be completed within 15 min of removal and the temperature shall be maintained in a draught-free environment.

1.5.5.4 In cases of dispute, and where conditioning is specified, all tests shall be conducted in the standard atmosphere (see **1.3.13**).

1.6 Conditioning

Unless otherwise specified in the individual test procedure in this standard, all test samples or specimens cut from the test samples shall be freely exposed in the standard atmosphere, $(65 \pm 2) \%$ relative humidity at a temperature of $(20 \pm 2) ^\circ\text{C}$ for the following periods:

uncoated fabrics having a mass per unit area less than 240 g/m^2 : } $6 \geq h$;
sewing threads:

other textiles: } $\geq 16 \text{ h}$.

The test report shall state the conditions used.

NOTE Standard temperate atmosphere for testing is in accordance with BS EN ISO 139.

1.7 Maintenance of identity

1.7.1 The identity of all textiles shall be carefully maintained during manufacture to enable final marking to be made in accordance with **1.8**.

1.7.2 The relationship between test samples and the textiles they represent shall remain identifiable during manufacture.

1.8 Final marking

1.8.1 All textiles approved by the inspector shall bear the mark of the inspector, together with markings as given in Table 2 to be identified and any additional markings specified in the individual textile specification.

NOTE In addition to the markings specified in **1.8.1** textiles may also bear markings as specified in the contract or order.

1.8.2 For woven or knitted fabrics and plain (bobbin) netting, the piece number shall also identify the weaver's or knitter's beam or warp or continuously manufactured 5 000 m length, as appropriate, together with the position on the beam or warp or in the continuously manufactured length. For multi-width weaving the transverse position as well as the normal longitudinal position shall be identified.

1.8.3 For coated fabrics the constituent textile pieces shall be identifiable from the piece number.

1.8.4 For wide fabrics, the markings shall be on each piece, near to the outermost end.

1.8.5 For narrow fabrics, the markings shall be on either the fabric or a durable label which shall be securely attached to each separate roll.

1.8.6 For sewing threads supplied in packages of 300 g and above, the markings shall be on each individual package. Packages less than 300 g shall be boxed and the markings shall be on the outside of the box.

1.8.7 For all other textiles, the markings shall be on a durable label which shall be securely attached to each separate length or package.

1.8.8 Marking media used for the final identification or other marking of textiles shall conform to Annex C.

1.8.9 All markings shall be legible and permanent.

Table 2 — Marking

	Loomstate fabrics	Finished fabrics	Coated fabrics	Braided cordage	Laid cordage	Sewing threads
Textile specification	X	X	X	X	X	X
Type or designation ^a	X	X	X	X	X	X
Company/ies involved in manufacture	X	X	X	X	X	X
Piece number (see 1.8.1)	X	X	X			
Number of metres defective ^b	X	X				
Finisher's batch number		X		X ^a		
Number of faults marked in accordance with Annex B			X			
Identification of cordage machine				X	X	
Batch or serial number				X	X	X
Number of portions (if more than one)	X	X	X			
Date (month and year) of coating			X			
^a If applicable.. ^b Applicable to parachute fabrics only. See B.1.						

Section 2. Quality requirements

2.1 Manufacture

2.1.1 Wide fabrics and netting

2.1.1.1 The fabric shall be uniformly manufactured.

2.1.1.2 The edges shall be straight and even and shall not be substantially thicker than the body of the fabric.

NOTE Certain weaving processes generate selvages that may be slightly thicker than the body of the fabric. Any difference in thickness should be kept to a minimum so that accurate cutting of panels from multiple layers of fabric is not hindered.

2.1.1.3 The fabric shall lie flat on a table.

2.1.1.4 Fabric supplied for subsequent coating shall continue to lie flat on a table when subjected to lengthways tension. Weft skew and bow shall conform to the individual textile specification.

2.1.2 Narrow fabrics

2.1.2.1 The fabric shall be uniformly manufactured.

2.1.2.2 The edges shall be straight and even.

2.1.2.3 If the edge structure is not specified in the individual textile specification the edges shall not be substantially thicker than the body of the fabric.

NOTE Certain weaving processes generate selvages that may be slightly thicker than the body of the fabric. Any difference in thickness should be kept to a minimum so that the subsequent manufacturing process is not hindered.

2.1.2.4 In fabric of multi-ply construction containing binder warp threads, the binders shall be uniformly spaced over the width of the fabric.

2.1.3 Cordage

2.1.3.1 The strands of laid cordage shall be well formed and free from grooves and sunken yarns.

2.1.3.2 Each strand of laid cordage shall contain the same number of yarns.

2.1.3.3 Unless otherwise specified in the individual textile specification, laid cordage shall have Z lay.

2.1.3.4 Braided cordage shall be uniform in construction.

2.1.4 Sewing threads

2.1.4.1 Threads shall have uniformity of thickness, construction and component ply tension so that there are no visually irregular twist faults.

2.1.4.2 Threads of length per unit mass less than 9 000 m/kg shall not contain thread knots.

2.1.4.3 Threads of length per unit mass greater than 9 000 m/kg shall not contain more than two thread knots per package.

2.2 Dyed textiles

2.2.1 Coloured textiles shall be dyed in accordance with the individual textile specification.

2.2.2 Sulfur dyes shall not be used.

2.2.3 Dyes known to accelerate actinic damage shall not be used.

NOTE 1 The following are the colour index (C.I.) numbers of some of the dyestuffs that are known to accelerate actinic damage:

a) to cellulose:

vat yellows: 2, 3, 4, 9, 11, 14, 18, 21, 26 and 28

vat oranges: 1, 2, 5 and 8;

vat reds: 1, 2, 42, 47 and 48;

vat brown: 5;

vat violet: 2;

b) to nylon 6,6:

mordant blue: 49;

disperse black: 1

NOTE 2 The following are the colour index (C.I.) numbers of dyestuffs that, either alone or mixed together, are known to have a protective effect on nylon 6,6:

acid black 132;

acid green: 43;

disperse yellow: 3;

disperse orange: 3;

mordant yellow: 34.

2.2.4 Unless otherwise specified in the individual textile specification, the minimum colour fastness ratings detailed in Table 3 shall apply.

2.2.5 The test for fastness of the colour to light shall be as given in Table 3 and is designated as a “type test”.

2.2.6 The tests for fastness of the colour to water or washings shall be as given in Table 3 and are designated as “type tests”.

2.2.7 After satisfactory initial type tests, no changes to the materials, dyeing formulation or processing conditions used shall be made without the type tests being repeated.

NOTE. The determination of the fastness of the colour to light, water or washing may be made on one sample taken from the first batch of a contract. Provided that this sample conforms with Table 3 and subject to this subclause, no further testing of fastness to light, water or washing should be necessary.

2.2.8 The manufacturer’s records of the type tests shall be made available to the quality assurance authority on request.

Table 3 — Dye fastness

Application	Textile	Property												
		Fastness to light ^a		Fastness to washing ^a			Fastness to water ^a				Fastness to rubbing ^{a,b}			Fastness to vulcanization in open steam ^c
All materials used for manufacture of clothing	Method	Minimum rating	Method	Minimum rating		Method	Minimum rating		Method	Minimum rating		Method	Minimum rating	
				Change of colour	Staining adjacent fabric		Change of colour	Staining adjacent fabric		Dry staining	Wet staining			
	Cellulosic; Wool	BS EN 20105-B02 ^d	6	BS EN 2015-C02	4	4			BS EN ISO 105-X12	4	3	BS EN ISO 105-S03, method A	5	
		Wholly or partly synthetic		4		4				4	3		5	
All materials used for non-clothing	Method	Minimum rating	Method	Minimum rating		Method	Minimum rating		Method	Minimum rating		Method	Minimum rating	
				Change of colour	Staining adjacent fabric		Change of colour	Staining adjacent fabric		Dry staining	Wet staining			
All materials used for non-clothing	Cellulosic; Wool	BS EN 20105-B02 ^d	5	BS EN ISO 105-E01	3	3			BS EN ISO 105-S03, method A			BS EN ISO 105-S03, method A	5	
		Wholly or partly synthetic		4			4	4					5	

^a Where the individual textile specification requires colour shades which are obtainable only by the use of fluorescent acid dyestuffs, the minimum ratings given in the table may not be achievable. The textile specification should define the required colour fastness ratings. Alternatively, they may be specified by the purchaser.

^b Not applicable to sewing threads.

^c Only applicable to fabrics intended for coating.

^d BS EN 20105-B02, method 1 to be used in cases of dispute.

NOTE A blank denotes that the test is not required.

^a Where the individual textile specification requires colour shades which are obtainable only by the use of fluorescent acid dyestuffs, the minimum ratings given in the table may not be achievable. The textile specification should define the required colour fastness ratings. Alternatively, they may be specified by the purchaser.

^b Not applicable to sewing threads.

^c Only applicable to fabrics intended for coating.

^d BS EN 20105-B02, method 1 to be used in cases of dispute.

NOTE A blank denotes that the test is not required.

2.3 Flamability, smoke density, toxic gas emission and heat release¹⁾

2.3.1 General

Unless otherwise specified in the individual textile specification tests for flammability, smoke density, toxic gas emission and heat release shall conform to **2.3.2.1**, **2.3.2.2**, **2.3.2.3**, **2.3.2.4** and **2.3.2.5** as appropriate.

NOTE 1 The Civil Aviation Authority requires textiles for use in aircraft to be tested according to their category of application in aircraft (see notes 2 and 3).

NOTE 2 The following textiles should be tested in accordance with **2.3.2.1**:

- floor coverings;
- textiles (including draperies and upholstery);
- decorative and non-decorative coated fabrics;
- textile thermal and acoustic insulation coverings;
- textile cargo covers.

NOTE 3 The following textiles should be tested in accordance with **2.3.2.2**:

- seat belts;
- shoulder harnesses;
- baggage tie-down equipment.

2.3.2 Tests

2.3.2.1 Vertical test for flamability of textiles greater than 70 mm in width²⁾

When tested in accordance with **3.16.1** the textile shall conform to **2.3.3.1**.

2.3.2.2 Horizontal strip test for flammability of textiles less than 70 mm in width³⁾

When tested in accordance with **3.16.2** the textile shall conform to **2.3.3.2**.

2.3.2.3 Smoke density test

When tested in accordance with BS 6401 the textile shall conform to **2.3.3.3**.

2.3.2.4 Heat release test

When tested in accordance with JAR 25.853 (a-1) the textile shall conform to **2.3.3.4**.

2.3.2.5 Toxic gas emission

If testing is required pending issue of a standard (and if not specified in the individual textile specification), details of any test requirements shall be fully documented in the appropriate contract or order (see Annex A).

NOTE There are currently no national or international standards giving test methods or acceptance criteria for the measurement of toxic gas emissions from the combustion of textiles for use in aircraft.

2.3.3 Performance

2.3.3.1 Vertical strip test

2.3.3.1.1 The mean burn length for the vertical strip test shall not exceed 200 mm.

2.3.3.1.2 The mean of the sum of the after-flame and after-glow times shall not exceed 15 s.

2.3.3.1.3 The mean flaming time of droplets from the specimen shall not exceed 5 s.

2.3.3.1.4 Except for the flaming time of droplets no individual test result shall exceed the mean specified in the individual textile specification by more than 25 %.

¹⁾ The performance requirements specified in this clause relate to the behaviour of specimens under the particular conditions of test and do not take into consideration the effects of ageing, washing, soiling, etc. that may be encountered during the life of the product. It has to be recognized that they do not give a full assessment of fire properties in all situations.

²⁾ This method is in accordance with that required by the Civil Aviation Authority, Specification No. 8: Issue 2, and JAR 25.853(b).

³⁾ This method is in accordance with that required by the Civil Aviation Authority, Specification No. 8: Issue 2, and JAR 25.853(b-2).

2.3.3.1.5 Unless otherwise specified in the individual textile specification, a textile that has been subjected to a flame retardant treatment shall continue to conform to **2.3.3.1.1**, **2.3.3.1.2**, **2.3.3.1.3** and **2.3.3.1.4** after being subjected to domestic wash procedure 50 of BS 5651.

2.3.3.1.6 Unless otherwise specified in the individual textile specification, a textile that has been subjected to a flame retardant treatment shall continue to conform to **2.3.3.1.1**, **2.3.3.1.2**, **2.3.3.1.3** and **2.3.3.1.4** after being subjected to the dry cleaning procedure described in BS 5651.

2.3.3.2 Horizontal strip test

2.3.3.2.1 The mean burn rate shall not exceed 63 mm/min.

2.3.3.2.2 Unless otherwise specified in the individual textile specification, a textile that has been subjected to a flame retardant treatment shall continue to conform to **2.3.3.2.1** after being subjected to domestic wash procedure 50 of BS 5651.

2.3.3.2.3 Unless otherwise specified in the individual textile specification, a textile that has been subjected to a flame retardant treatment shall continue to conform to **2.3.3.2.1** after being subjected to the dry cleaning procedure described in BS 5651.

2.3.3.3 Smoke density test

2.3.3.3.1 During the first 90 s the maximum smoke specific optical density, (D_s) shall not exceed 100 in both the radiant and flaming modes.

2.3.3.3.2 During the first 4 min the maximum smoke specific optical density, (D_s) shall not exceed 200 in both the radiant and flaming modes.

2.3.3.4 Heat release test

2.3.3.4.1 The mean total heat release shall not exceed 65 kW/(min·m²).

2.3.3.4.2 The mean peak release rate shall not exceed 65 kW/(min·m²).

2.4 Dimensions and tolerances

2.4.1

Unless otherwise specified in the individual textile specification, the material shall conform to **2.4.2**, **2.4.3** or **2.4.4**, as appropriate.

2.4.2 Wide fabrics

NOTE If loomstate wide fabric and netting is subsequently to be processed, e.g. scoured, dyed or coated, allowance should be made for the consequent shrinkage.

2.4.2.1 Overall width

When measured in accordance with BS 1930 the width of the fabric shall be not less than that specified in the individual textile specification. The variation in width shall not exceed 15 mm.

2.4.2.2 Length

When measured in accordance with BS EN 1773 the length of the fabric shall conform to the following.

- a) Fabric for coating shall consist of continuous lengths without gross defects and with not more than one butt seam per 200 m length. No part shall be less than 40 m long.
- b) For plain (bobbin) netting, the minimum length of the loomstate piece shall be 50 m.
- c) For other fabrics the minimum length of the loomstate piece shall be 100 m for those having a mass per unit area of 450 g/m² or less, and 50 m for those having a mass per unit area of more than 450 g/m². Not more than 5 % of the pieces shall be in three parts. Not more than 25 % of the remainder shall be in two parts and no part shall be less than 15 m long.

2.4.2.3 Lengthway distortion

When measured in accordance with the lengthway distortion test of BS 2819, the distortion shall not exceed 2.5 % for fabrics of 100 g/m² or less and shall not exceed 5 % for fabrics of more than 100 g/m².

2.4.2.4 Warp bow

When measured in accordance with BS 2819 the warp bow shall not exceed 0.2 %.

2.4.3 Narrow fabrics

NOTE If a loomstate narrow fabric is subsequently to be processed, e.g. scoured, dyed or coated, allowance should be made for consequent shrinkage.

2.4.3.1 Width

When smoothed over by hand and measured using a steel rule graduated in mm, the width of any part shall be as specified in the individual textile specification, with the tolerances given in Table 4.

Table 4 — Width tolerances of narrow fabrics

Nominal width mm	Tolerance
Less than 12	± 1.0 mm
12 to less than 55	± 1.5 mm
55 and over	± 4 % ^a
^a Rounded up to the nearest 1.0 mm.	

2.4.3.2 Length

The length of each roll shall be:

- a) not less than 100 m for fabric weighing 50 g/m or less;
- b) not less than 50 m for fabric weighing more than 50 g/m.

NOTE Length measurement by means of a roller yardage counter has been found suitable.

In each roll there shall be not more than four cuts per 100 m. Cuts shall not be joined by pins, metal fasteners or other means. No individual part shall be less than 10 m long. The total number of cuts in a consignment shall not exceed four times the number of rolls for fabrics of 50 g/m or less, or twice the number of rolls for fabrics exceeding 50 g/m.

2.4.3.3 Warp bow

Following conditioning in accordance with 1.6, the warp bow shall be measured in accordance with 3.26. The warp bow shall not exceed 10 mm/m length.

2.4.4 Length of cordage

2.4.4.1 Braided cordage

Braided cordage shall be supplied in continuous lengths and shall be free from faults (see 2.7 and B.3). Braided cordage shall be made up with minimum tension, so that when it is drawn from the package, the twist in the cordage does not exceed one-third of a turn per metre.

2.4.4.2 Laid cordage

Laid ropes shall be supplied in continuous minimum lengths of 220 m neatly coiled and tied with four or more clean lashings. Laid cords shall be supplied made up in wound packages.

2.5 Freedom from corrosive impurities

2.5.1 When tested in accordance with 4.2 the conductivity of the aqueous extract shall not exceed 15 mS/m except as permitted in 2.5.2.

2.5.2 If this value is exceeded, e.g. owing to the presence of adventitious conducting but not specially corrosive material the following shall apply:

- a) the pH value of the aqueous extract shall be not less than 5.0 nor more than 8.0 (see 4.3); and
- b) water soluble chloride expressed as sodium chloride, shall not exceed 0.10 % (see 4.5); and
- c) water soluble sulfate expressed as anhydrous sodium sulfate shall not exceed 0.25 % (see 4.6).

2.6 Freedom from microbiological growth

Where a material specification has a requirement that the fibre, finish or any required agents shall not contain substances that promote microbiological growth, a sample shall be type tested by the method detailed in BS 2011: Part 2.1J, using variant 1 and a severity of 28 days. The pass limit for the extent of growth shall be scale 1.

2.7 Freedom from faults

2.7.1 Faults

All textiles shall be examined for the presence of faults. Classification of the more common faults for certain broad groups of textiles shall be as given in Annex B as follows:

- B.1** wide fabrics (other than coated fabrics);
- B.2** coated fabrics;
- B.3** cordage;
- B.4** woven narrow fabrics.

The method of marking and acceptance limits for each of these groups of textiles shall be in accordance with the appropriate clause of Annex B, unless otherwise agreed by the quality assurance authority.

2.7.2 Examination

With uncoated translucent fabric, one examination by transmitted light shall be sufficient. Coated fabric required to be opaque shall be examined by transmitted light.

2.8 Freedom from corrosive action

Where the individual textile specification contains a requirement for freedom from corrosive action, it shall be tested in accordance with 4.13. The mean loss in mass of the metal panels tested in the solution in which the textile has been soaked (W_f) shall not exceed the mean mass loss of the metal panels tested in distilled water (W_d) by more than 3 mg, so that $W_f - W_d < 3$ mg.

Section 3. Physical tests

3.1 Determination of the number of threads, wales or courses per unit length in fabrics, and total hole count for plain (bobbin) netting

3.1.1 Woven fabrics

3.1.1.1 Procedure

Determine the number of warp and weft threads using an appropriate method described in BS EN 1049-2.

3.1.1.2 Report

Calculate and report the results in accordance with BS EN 1049-2 and the individual textile specification.

3.1.2 Knitted fabrics

3.1.2.1 Procedure

Determine the number of visible wales and courses using an appropriate method described in BS 5441.

3.1.2.2 Report

Calculate and report the results in accordance with BS 5441 and the individual textile specification.

3.1.3 Plain (bobbin) netting

3.1.3.1 Principle

The finished quality of plain netting is expressed as the sum of the hole count warp way and bobbin way within a 25.0 mm square.

3.1.3.2 Apparatus

3.1.3.2.1 *Measuring gauge*, having an aperture 25.0 mm × 25.0 mm square.

3.1.3.3 Procedure

3.1.3.3.1 Condition in accordance with 1.6 for at least 16 h.

3.1.3.3.2 Lay the netting flat on a horizontal surface and place the measuring gauge on the netting so that one of the edges of its aperture is tangential to a row of holes in the warp direction and so that the selected row commences with a complete hole (see Figure 1).

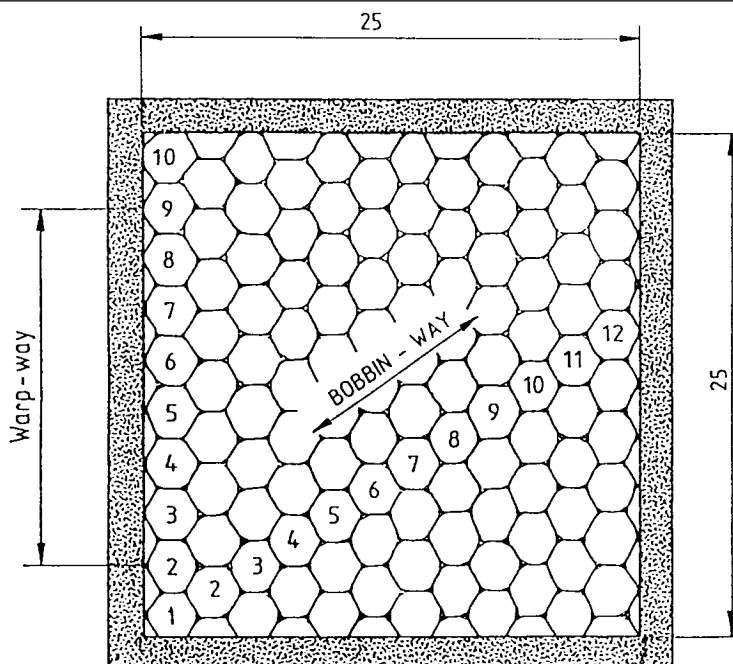
3.1.3.3.3 Count the number of holes in the warp way and the number of holes in the bobbin way. Determine the total hole count by adding the warp way and bobbin way hole counts together.

3.1.3.3.4 Incomplete holes are to be included in the count by attributing to them a fractional part of a complete hole i.e. either $\frac{1}{4}$, $\frac{1}{2}$ or $\frac{3}{4}$.

3.1.3.3.5 Repeat the procedure at not less than five different positions to obtain a representative value.

3.1.3.4 Report

Report the total hole count of each individual point selected and the mean of these values.



NOTE 1 All dimensions are in millimetres.

NOTE 2 The example shows a 22 hole net, i.e. 10 holes warp way and 12 holes bobbin way.

Figure 1 — Determination of total hole count

3.2 Mass and mass variation across the width

3.2.1 Wide fabrics and plain (bobbin) netting

3.2.1.1 Procedure

With the sample laid flat and free from applied tension, either cut one specimen not less than 500 mm in length from the full width of the fabric, or cut four specimens, each 200 mm square, spaced roughly equally across the width, but with no specimen nearer than 50 mm to a selvedge. Use the latter method if the mass variation across the width is required. Avoid creased areas. For each specimen, measure the dimensions, and determine the mass to an accuracy of 0.5 %. Calculate the mass per unit area in grams per square metre, taking the mean of four specimens. If required, calculate the mass variation across the width as the difference, in grams per square metre, between the specimens with the lowest and the highest mass per unit area.

3.2.1.2 Report

Report in accordance with the individual textile specification.

3.2.2 Narrow fabrics

3.2.2.1 Procedure

3.2.2.1.1 Smooth a suitable length of the fabric by hand on a flat surface.

3.2.2.1.2 Mark and accurately measure a specimen at least 1 m in length.

3.2.2.1.3 Cut out the specimen and weigh it.

3.2.2.2 Report

Report in accordance with the individual textile specification.

3.2.3 Cord, line and flat braided construction

3.2.3.1 Procedure

3.2.3.1.1 Subject a suitable length of the sample to a tension equivalent to 1% of the minimum breaking strength specified in the individual textile specification.

3.2.3.1.2 After (60 ± 5) s, mark and accurately measure along the length in tension, a specimen at least 1 m in length.

3.2.3.1.3 Release the tension, cut out the specimen and weigh it.

3.2.3.2 Report

Report in accordance with the individual textile specification.

3.2.4 Rope

3.2.4.1 Procedure

3.2.4.1.1 Subject a suitable length of the sample to a tension, t , equivalent to that exerted by a gravitational load in kilograms calculated from the following equations:

a) for three strand rope or circular cross-section braided rope:

$$t = d^2/8$$

where

d is the nominal diameter;

b) for eight strand plaited ropes:

$$t = 8n^2$$

where

n is the size number.

3.2.4.1.2 Repeat **3.2.3.1.2** and **3.2.3.1.3**.

3.2.4.2 Report

Report as required in accordance with the individual textile specification.

3.3 Breaking strength and extension under force

3.3.1 General

3.3.1.1 All testing machines shall be of a suitable capacity and shall conform to BS EN 10002-2 for machines with an accuracy grading of 1.0 or better.

NOTE 1 Testing machines having a constant rate of crosshead movement, constant rate of load or constant rate of traverse of the straining mechanism are acceptable.

NOTE 2 Any method of test agreed with the quality assurance authority may be used.

3.3.1.2 In cases of dispute the appropriate methods detailed in **3.3.2**, **3.3.3**, **3.3.4** and **3.3.5**, shall be used.

3.3.2 Apparatus

3.3.2.1 Tensile testing machine, conforming to BS EN 10002-2 for machines with an accuracy grading of 1.0 or better, and with the following.

- a) The machine shall have a constant rate of crosshead movement.
- b) The rate shall be adjustable to ensure that the required specified breaking force can be applied in (60 ± 10) s.
- c) The breaking force shall fall within that part of the range that is verified correct within 1 % of that force.
- d) For all fabrics, cords, lines, sewing threads and ropes, the grips shall be wider than the specimen.
- e) For wide fabrics, the grips shall have edges parallel to each other and at right angles to the direction of pull, and shall be split matching halves, with a serrated or wave profile, capable of receiving soft packing sheets to assist in gripping the specimen without causing damage, or shall be rubber faced.
- f) For narrow fabrics, cords, lines and sewing threads the grips may be self-tightening bollards, or wedge grips with a flat or wave profile, with provision for soft packings.
- g) For ropes, the grips are normally grooved bollards of a diameter appropriate to the specimen, or self-tightening wedges in split halves with inserts of a diameter appropriate to the specimen and provision for soft packings.

NOTE For synthetic ropes, sheet lead packings are recommended.

- h) The grips shall be adjustable in position to give initial test lengths as detailed in 3.3.4.

3.3.3 Preparation of specimens

3.3.3.1 Wide fabrics

3.3.3.1.1 Select the specimens from positions across the full width and length of the test sample in accordance with the principle illustrated in Figure 2.

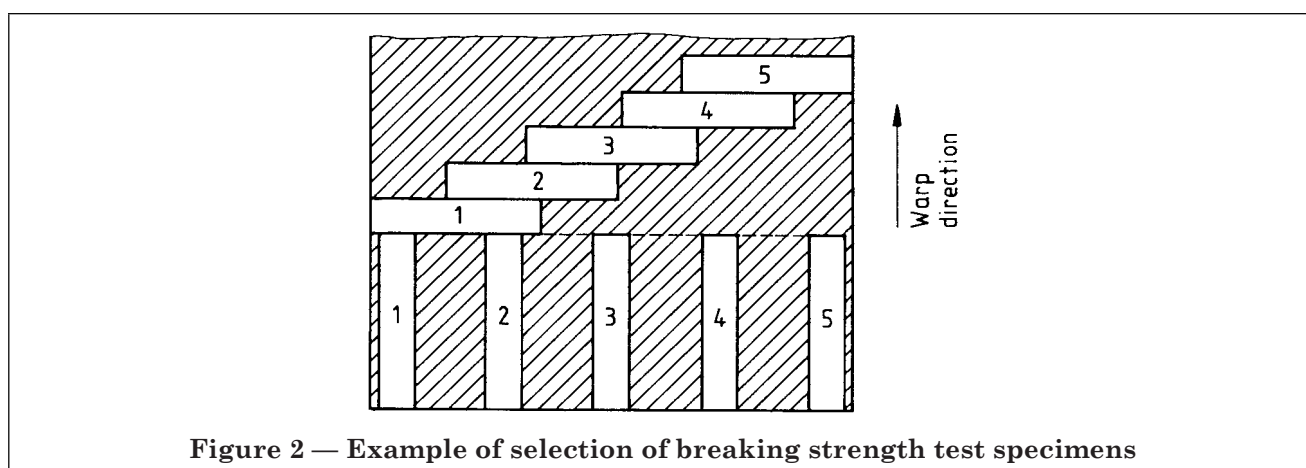


Figure 2 — Example of selection of breaking strength test specimens

3.3.3.1.2 For uncoated fabrics, cut 10 rectangular specimens 55 mm wide and between 300 mm to 400 mm in length from the test sample, five having the longer side closely parallel to the warp and five to the weft thread directions. Remove lengthways threads equally from each side of each specimen until the width is reduced to 50 mm, leaving the cross threads undisturbed.

3.3.3.1.3 If the number of widthway threads is fewer than 48 threads per centimetre, cut specimens 65 mm or wider in steps of 5 mm so that the specimen width is 50 mm plus at least 2×15 thread spaces or 25 mm, whichever is the less.

3.3.3.1.4 For coated fabrics obtain 10 rectangular specimens 50 mm wide and between 300 mm to 400 mm long from the test sample, five having the longer side closely parallel to the warp and five to the weft thread directions.