KENYA STANDARD **KS 2114:2007**

Spring Mattresses —Specification

 First Edition 2007

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Kenya Prisons Service
Department Of Defence
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KENYA STANDARD

KS 2114:2007

Spring Mattresses —Specification

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Contents

Foreword

This Kenya Standard was prepared by the Technical Committee on Mattresses under the guidance of the Chemical Industry Standard Committee.

During the preparation of this standard reference was made to the following documents:

SANS 1005: 1979, South African standard specification innerspring mattresses

SANS 1401-10:2004 South African standard specification for woven cotton and similar household fabrics and articles part 10: Cotton ticking

SANS 902:1971 South African Standard Specification for Hessian cloth

BS 1425: Part 1:19991 British standard –Cleanliness of fillings and stuffing, upholstery and other domestic articles part 1: Specification for fillings and stuffings other than feather and/or down.

SANS 79:2004 South African standard for test method for Textiles — Mass per unit area of conditioned fabrics

SANS 81:2004 South African standard test method for Width of a textile fabric sample

SANS 83:1972 South African standard test method for length of a textile fabric sample

Acknowledgement is made for the assistance obtained from these sources.

Spring Mattresses —Specification

1 Scope

This Kenya Standard specifies the requirements and test methods for spring mattresses intended for institutional and domestic use.

2 Normative References

The following Standards contains provisions which, through reference in this text, constitute provisions of this Kenya Standard. For undated references, the latest edition of the normative document referred to applies.

KS 08-119, Kenya standard Method for determination of breaking load and elongation (strip method) of woven fabrics

KS 08-123, Kenya standard Methods for determination of colour fastness of textile materials to washing

KS 08-359, Kenya standard Method for determination of colour fastness of textile materials to artificial light (Xenon Arc)

KS 08-631, Kenya standard Method for determination of bursting strength and bursting distension of fabrics

KS 376-0, Kenya standard Specification for flexible polyurethane (polyether) foams — Part 0: General requirements

KS 08-363, Kenya standard Methods for determination of dimensional change of woven fabrics on commercial laundering near the boiling point

KS 08-32, Kenya standard Conditions for the testing of textiles

KS 08-121, Kenya standard Methods for determination of threads per centimetre in woven fabrics

KS 08-120, Kenya standard Method for determination of mass per unit length and mass per unit area of woven or knitted fabrics

KS 08-208, Kenya standard Glossary of textile terms for natural fibres

ISO 10714, Steel and iron—Determination of phosphorus content—Phosphovanadomolybdate spectrophotometric method

ISO 15350, Steel and iron — Determination of total carbon and sulfur content — Infrared absorption method after combustion in an induction furnace (routine method)

ISO 6892, Metallic Materials— Tensile testing at ambient temperature

3 Definitions

For the purposes of this standard the following definitions and those given in KS 08-208 shall apply:

3.1
basic filling

the filling adjacent to the spring unit

3.2
breaking strength

The maximum load(or force) supported by a specimen in a tensile test carried to rupture.

3.2
bursting strength

the force required to rupture a fabric by distending it with pressure applied at right angles to the plane of the fabric.

3.3
coir

a retted fibre obtained from husks of the coconut

3.4
defective

an innerspring mattress that fails in one or more respects to comply with the appropriate requirements of the specification.

3.5
equivalent density of polyurethane foams

$\frac{10d}{3}$ where "*d*" is the actual density of the foams

3.6
lot

not less than 10 and not more than 500 innerspring mattresses of the same class, materials, dimensions, and construction, from one manufacturer, submitted at any one time for inspection and testing

3.7
surface filling

the filling between the basic filling and the cover of the mattress

3.8
warp

yarns / threads lying lengthways in a fabric as woven

3.9
weft

yarns / threads lying widthways in a fabric as woven(at right angles to the warp)

3.10
yarn

a generic term for a continuous strand of textile fibres or filaments without twisting, suitable for plying, knitting, braiding, weaving or otherwise intertwining to form a textile end product

4 Requirements

4.1 Classes

Mattresses shall be reversible, i.e. they shall have two bearing (sleeping) surfaces and shall be of one of the following classes, as specified by the purchaser:

a) **Class 1** – Mattresses intended for institutional use, and having a woven ticking cover.

b) **Class 2** – Mattresses intended for domestic use and having a cover of a woven, a non-woven, or a knitted ticking.

4.2 Construction

4.2.1 General

a) The bearing (sleeping) surfaces of the spring unit of mattresses shall be covered by an insulator unit (see 4.6.4) to which the basic filling (see 4.6.5.3) is securely stapled, or is so securely attached as to seal off the end openings of the spring.

b) All mattresses shall have a prebuilt border (see 4.6.5.5) that covers the sides and ends of the mattresses.

c) On all mattresses all edges of the surface filling(s) shall be covered by a flange that is sandwiched on the sides and ends of the mattress between the filling and prebuilt border, and on the sleeping surfaces between the fillings and the ticking. Flanges shall be of a suitable textile material of mass per unit area at least 122 g/m^2 and width at least 120 mm, and shall be securely stitched to the ticking and secured to the spring unit. Alternatively, the surface panel shall be fixed to the surface filling(s) by an acceptable method.

d) Each mattress shall be completely covered with ticking (see 4.4.2) that is either quilt-stitched to the basic filling (through the surface filling of sleeping surfaces) or micro-quilted to all or a portion of the surface filling. In the case of micro-quilting, the quilt-stitching shall be locked on to a layer of an acceptable material that forms a backing to the surface filling or to the lowest layer of the surface filling penetrated by the stitching.

e) When a mass equivalent to 190 kg/m^2 of bearing surface area is applied uniformly over a sleeping surface of a mattress, the mattress shall not be compressed to less than 40 % of its unloaded height.

f) When a mattress is subjected to endurance test in accordance with Annex F, there shall be no significant failure of any part (internal or external) of the mattress that could affect its fitness for use, and the loss in height at any of the points tested shall not exceed 5 %.

4.2.2 Handles

a) When so specified by the purchaser, each side of the mattress shall be provided with two acceptable handles. Each handle shall be fitted (longitudinally or transversely) at a distance, measured from the centre of the handle, of 450 ± 10 mm from the adjacent end of the mattress.

b) When tested in accordance with Annex A, the handles shall not break or become detached or otherwise unserviceable, and the ticking shall show no evidence of damage.

4.3 Workmanship

Each mattress shall be a rectangular unit of uniform thickness, length, and width, with straight borders and a neat finish. Unless made of an intrinsically corrosion-resistant metal, all metal parts of mattress shall have an acceptable corrosion-resistant finish. All sewing shall be securely and neatly finished off.

4.4 Materials

4.4.1 Fillings and stuffing

a) The fibres or synthetic materials used for fillings and stuffing of mattresses shall be new, clean, and free from defects that detract from the appearance or that may be detrimental to the performance of the mattresses, and shall comply with the relevant requirements in tables 1.

Table 1 – Fibres or synthetic materials used for fillings and stuffing of mattresses

Material	Property	Requirements	Test method
i) New vegetable fibre	a) Insoluble extract %, max.	2.8	Annex B
	b) Oil content %, max.	5.0	Annex C
ii) New synthetic material	a) Insoluble extract %, max.	2.8	Annex B

b) All steel components used in the mattresses shall have a tensile strength of at least 1 450 MPa when tested in accordance with ISO 6892.

4.4.2 Ticking

The ticking of Class 1and 2 mattresses shall comply with the requirements given in Tables 2 and 3 respectively.

Table 2 – Ticking of class 1 mattresses

1	2	3
Property	**Requirements**	**Test method**
Breaking strength (woven fabric ticking), N, min a) Warp b) Weft	 980 490	KS 08-119
Dimensional changes on laundering, % max. a) Warp b) Weft	 4 4	KS 08-363
Colour fastness to: washing, rating, min a) change in colour b) staining of transfer cloths	 4 3—4	KS 08-123
Colour fastness to light rating, min.	4	KS 08-359

Table 3 – Ticking of class 2 mattresses

1	2	3
Property	**Requirements**	**Test method**
Breaking strength (woven fabric ticking), N, min a) Warp b) Weft	 650 400	KS 08-119
Bursting strength (knitted or non-woven ticking), KPa, min.	700	KS 08-631
Colour fastness to light rating, Min.	4	KS 08-359

4.4.3 Edge frame

The material used for edge frames shall be high carbon steel strip of width at least 5 mm and thickness at least 1.60 mm or high carbon steel wire of diameter at least 3.75 mm.

4.4.4 Spring wire

a) The sulphur content of the wire of vertical springs and wire (helical and straight) used in assembling the spring unit shall not exceed 0.05 % (by mass) when tested in accordance with ISO 15350.

b) The phosphorus content of the wire of vertical springs and wire (helical and straight) used in assembling the spring unit shall not exceed 0.05 % (by mass) when tested in accordance with ISO 10714.

4.4.5 Insulator wire

The wire used in insulator units shall be oil-tempered spring steel wire of diameter at least 0.9 mm.

4.4.6 Lacing wire

a) The lacing wire shall be hard-drawn spring steel wire of diameter at least 1.28 mm

b) The lacing wire shall be hard-drawn spring steel wire so formed into coils, of diameter 10 ± 1.5 mm.

c) The lacing wire shall be hard-drawn spring steel wire so formed into coils that the coiled wire has at least 78 coils per meter.

4.4.7 Paper cords

Paper cords used in insulator units shall have a diameter of at least 4 mm.

4.4.8 Hessian

Hessian used as the backing of the basic filling and for prebuilt borders shall comply with the requirements in table 4.

Table 4— Hessian fabric requirements

SL No.	Property	Requirements	Test method
i)	Threads per 10 cm, min.:		
	a) Warp	27	KS 08-121
	b) Weft	21	
	Breaking strength N, min.:		
	a) Warp	310	KS 08-119
	b) Weft	220	
ii)	Mass per unit area, g/m^2, min.	155	Annex G

4.4.9 Polypropylene fabric

Polypropylene fabric used as the backing of the basic filling shall be of split film polypropylene yarns. The weave shall be plain and the fabric shall, comply with the requirements in table 5.

Table 5— polypropylene fabric requirements

SL No.	Property	Requirements	Test method
i)	Threads per 10 cm, min.:		
	a) Warp	40	KS 08-121
	b) Weft	24	
ii)	Mass per unit area, g/m^2, min.	80	Annex G

4.4.10 Sisal and coir

Sisal and coir used in the basic filling shall comply with quality requirements in 4.4.1.

4.4.11 Wadding

Wadding shall be in sheet form. At least 60 % of the composition of the wadding shall be of cotton fibres and the rest other fibres.

4.4.12 Polyurethane foam

The polyurethane foam used shall be of the polyether type and shall be in sheet form and, when used as the only filling material (see also 4.6.5), the thickness of the sheet shall be at least 25 mm. In addition foam in Class 1 mattresses, shall comply with the requirements for class 30, and grade 12 of KS 376-0 while foam in Class 2 mattresses, shall comply with the requirements for class 20, grade 12 of KS 376-0.

4.5 Sizes and dimensions

The overall dimensions of a mattress when measured in accordance with Annex D shall not differ from the nominal values given in table 6 by more than 12 mm.

Table 6 — Overall dimensions of mattresses

1	2	3	4		
Mattress size	**Class**	**Dimensions, mm**			
		Nominal length	**Nominal width**		
Adult	1	1 930	915		
		1 930	760		
	2	2 000	1 830	1 520	1 370
		2 000	1 070	915	760
		1 880	1 830	1 5 20	1 370
		1 880	1 070	915	760
Juvenile	1	1 625	760		
	2	1 625	760		
Cot	1	1 320	760		
	2	1 220	610		

4.6 Components

4.6.1 Springs

a) The springs that constitute the spring unit shall be acceptable double-cone coiled springs, or, in the case of adult size mattresses only, the unit shall consist of acceptable interlinked formed-wire springing. The free ends of the wire of double-cone springs shall be closely and firmly twisted and knotted for at least 1½ turns round the end coils, and the extremities shall not project beyond the periphery of the end coils. The free ends of formed-wire springing shall be so securely finished off as to prevent unwinding and to obviate all possible damage to the ticking and injury to the user of the mattresses.

b) The number and distribution of the springs in a mattress shall be at least equal to the appropriate minima given in Table 7 or Table 8, as relevant.

Table 7 – Number of double-cone springs

1	2	3	4
Mattress size	**Nominal length and width of mattress, mm**	**Number of transverse rows of springs, min.**	**Number of springs in each row, min.**
Adult	2 000 x 1 830	23	16
	2 000 x 1 520	23	13
	2 000 x 1 370	23	12
	2 000 x 1 070	23	9
	2 000 x 915	23	8
	2 000 x 760	23	6
	1 930 x 915	22	8
	1 930 x 760	22	6
	1 880 x 1 830	22	16
	1 880 x 1 520	22	13
	1 880 x 1 370	22	12
	1 880 x 1 070	22	9
	1 880 x 915	22	8
	1 880 x 760	22	6
Juvenile	1 625 x 760	19	6
Cot	1 320 x 760	15	6
	1 220 x 610	14	5

Table 8 – Number of Interlinked formed-wire springing

1	2	3	4
Mattress size	**Nominal length and width of mattress, mm**	**Number of transverse rows of springs, min.**	**Number of springs in each row, min.**
Adult	2 000 x 1 830	34	23
	2 000 x 1 520	34	19
	2 000 x 1 370	34	17
	2 000 x 1 070	34	13
	2 000 x 915	34	11
	2 000 x 760	34	9
	1 930 x 915	32	11
	1 930 x 760	32	9
	1 880 x 1 830	32	23
	1 880 x 1 520	32	19
	1 880 x 1 370	32	17
	1 880 x 1 070	32	13
	1 880 x 915	32	11
	1 880 x 760	32	9

4.6.2 Spring units

a) All springs and formed wire springing shall be securely laced together (by lacing wire, clips, or other acceptable means) at the ends adjoining the sleeping surface. Where lacing wire is used, the ends of the wire shall be so trimmed and securely finished off as to prevent unwinding of the wire and piercing of the mattress cover during use.

b) Spring units shall have an edge frame (see 4.6.3) securely attached to both edges (top and bottom) of the sides and ends, or shall have the top and bottom ends of the outer rows of springs securely moulded, or fixed by any other acceptable method, into the foam filling to a horizontal distance of at least 5 mm.

c) When a spring unit is tested in accordance with Annex E, no breakage or loosening of springs or connecting wires shall occur, and at the points of measurement any permanent loss in height of the springs or springing (as relevant) and any permanent stretch of the lacing wire shall not exceed 5 %.

4.6.3 Edge frame joints

Joints in an edge frame shall be situated in an end of the frame. Joints shall be made by mechanical means or shall be fusion welded or butt welded, and shall be such that, when a spring unit is tested in accordance with Annex E, no fracture or permanent deformation shall occur at the joints.

4.6.4 Insulator units

Each insulator unit shall consist of parallel steel wires (see 4.4.5) that are spaced at centres not exceeding 40 mm, that run in the direction of the length or of the width of the mattress, and that pierce parallel paper cords (spaced at centres not exceeding 230 mm) that run in the direction perpendicular to that of the wires.
The free ends of wires shall be so securely finished off as to obviate all danger of damage to the ticking or injury to a user of the mattress. The overall length and width of insulators shall each be not more than 80 mm less than the length and width respectively of the spring unit. Alternatively, the units may be of another design that incorporates the use of steel wire, and ensures equal or better performance of the filling.

4.6.5 Filling

4.6.5.1 General

The filling of each sleeping surface shall comprise a basic filling and a surface filling.

The masses per square meter of sleeping surface specified in this subsection apply, in the cases of polyurethane fillings and filling layers, to those based on the equivalent density of the foam determined in accordance with G.5.3.

4.6.5.2 Surface filling

The surface filling of a mattress shall consist of cotton felt (or other acceptable material) or of polyurethane foam or of layers of these and the mass per square meter of sleeping surface shall be determined in accordance with Annex G.

4.6.5.3 Basic filling

a) **Class 1**

The basic filling of Class 1 mattresses shall consist of needled coir or sisal secured to a backing of polypropylene fabric (or other acceptable material). It shall have a mass of at least 1 520 g/m^2 of sleeping surface when determined in accordance with Annex G.

b) **Class 2**

The basic filling of Class 2 mattresses shall be of the type specified in (a) above, or of polyurethane foam, or of layers of these. In the case of a mattress that incorporates an insulator unit, the basic filling shall have a mass of at least 1220 g/m^2 of sleeping surface, when determined in accordance with Annex G. In other cases its mass shall be at least 1520 g/m^2 g of sleeping surface, and, if the filling (or its bottom layer) is of polyurethane foam, the foam shall be separated from the spring unit by a sheet of an acceptable material.

4.6.5.4 Gross filling

The gross mass of filling (basic and surface) when determined in accordance with Annex G.5.5 shall be at least 3 040 g/m^2 of sleeping surface except that in a Class 2 mattress that incorporates an insulator unit (see 5.3.4) it shall be at least 2 430 g/m^2 of sleeping surface.

4.6.5.5 Prebuilt borders

Prebuilt borders shall be firm and shall consist of one or more layers of wadding, polypropylene fabric, or other acceptable material (of total thickness in all cases, at least 5 mm) stitched to a backing of Hessian (see 4.1.8) or other material of at least equal strength and of acceptable quality.

5 Packing and Marking

5.1 Packing.

The mattress shall be so packed that it is protected from dirt, gross distortion, and nicking during normal transport and storage.

5.2 Marking.

The following information shall appear in legible and durable marking on a strong durable label that is securely attached to the outside of the ticking (on an end or on a sleeping surface near an end) on each mattress: -

a) Name and address of manufacturer;

b) The words ‘’ spring mattress”;

c) Lot or batch number;

d) Dimensions;

e) Class of mattress;

f) Made in Kenya/country of origin;

g) Instructions for safe use and disposal marked on the label or enclosed in a pack.

6. Sampling, inspection and compliance with the standard

Sampling, inspection and the criteria for compliance with the standard shall be in accordance with the Annex H.

Annex A

Test for the performance of handles

A.1 Apparatus

An apparatus that is capable of repeatedly lifting, by the two handles of one side, a mattress (placed flat on a horizontal surface) from the horizontal through 45 ^{o} and lowering it again to the horizontal position at a rate of 15 ± 2 lifting cycles per minute. The attachments engaging the handles shall be such that at the start of a test and at the end of each cycle the handles are under slight tension. The apparatus shall be such that, with the mattress in the initial position, the forces applied to the handles are equal and that, throughout the test, each of the forces is applied from a point 2.5 ± 0.1 m above, and in the vertical plane containing the horizontal line through the midpoint of the appropriate handle when the mattress is in its initial position (see Fig. 1).

A.2 Procedure.

Sample the mattress in accordance with annex H. So attach a bar, having a mass of 30 ± 0,5 kg and a length approximately equal to the distance between the handles, to the upper surface of the mattress that the centre line of the bar is 50 ± 10 mm from the edge of the mattress nearest to the handles being tested (see Fig. 1). Subject the mattress to 200 lifting and lowering cycles and examine for compliance with the relevant requirements of 4.2.2.

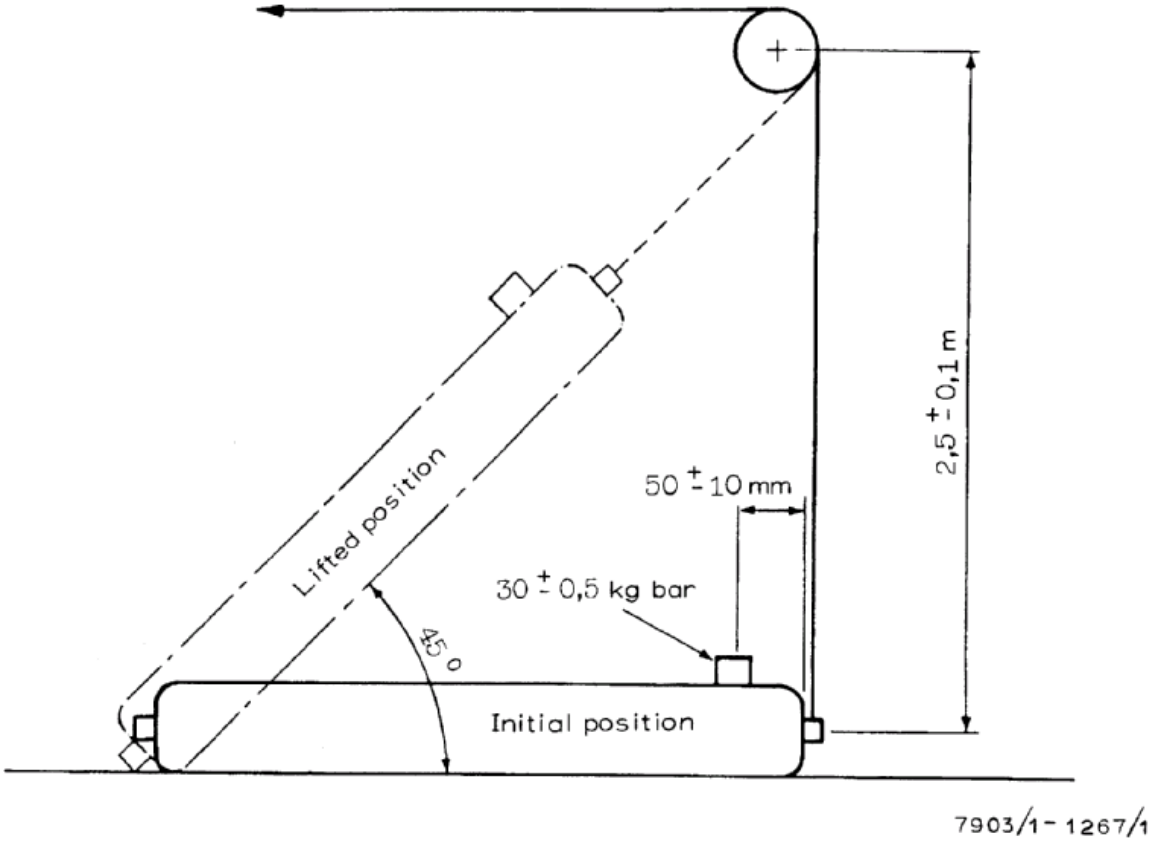


Fig. 1 – Test for mattress handles

Annex B

Test Method for insoluble extract

B.1 Principle

A test specimen is shaken in a closed glass jar under controlled conditions. The resultant liquid is poured through a test sieve and measured portions of the fluid are evaporated before or after filtration to determine total extracted matter, soluble extracted matter and (by subtraction) insoluble extracted matter.

B.2 Apparatus

B.2.1 Chemical balance

B.2.2 Drying-oven – ventilated.

B.2.3 Water bath or sand bath – etc. for evaporation of filtrate.

B.2.4 Glass jars – with liquid tight glass closures, and of capacity approximately 1500 mL.

B2.5 Shaking machine – suitable for rotating one or more glass jars in a vertical plane about their centre, at a constant speed of 60 ± 1 r/min.

B.2.6 Spiral wire plunger – as shown in figure 2, made from steel wire 5 mm in diameter and consisting of a flat spiral to the centre of which is connected a rod or a continuation of the steel wire, loaded so that the total mass of the plunger is 0.45 ± 0.01 kg. The spiral consists of three loops the outer loop being approximately 60 mm in diameter.

B.2.7 Test sieve – of 150 µm aperture, in stainless steel, and of 200 mm diameter, complying with BS 410.

B.2.8 Large glass funnel – into which the test sieve can be fitted.

B.2.9 Glass filter funnels – 150 mm diameter

B.2.10 Conical flasks – 1 L capacity to receive strained liquid and conical flasks 500mL capacity for boiling down.

B.2.11 Dishes – stainless steel, nickel, porcelain or heat-resistant glass, for evaporation.

B.2.12 Filter papers – 120 mm diameter, double-acid-washed, low ash, retentive for disintegration in extract and 20 mm diameter for filtration.

B.2.13 Graduated measuring cylinders or volumetric flasks – Capable of measuring 500 mL, 200 mL and 100 mL.

B.3 Reagents

B.3.1 Methanol

Warning – Methanol is a very flammable liquid and the vapour can form explosive mixtures with air and oxygen, the vapour being slightly heavier than air. Methanol is toxic and the effects of absorption of even small

amounts may be cumulative over relatively long periods. Methanol may enter the body as vapour (by being inhaled), through the mouth, and through the skin, particularly by way of cuts and abrasions.
Precautions should be taken against these hazards. Adequate ventilation is essential and boiling down and evaporation of solutions containing methanol should not be permitted in the open laboratory

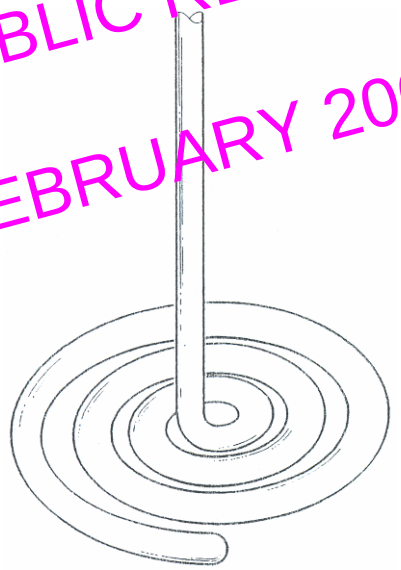


Figure 2 – Spiral wire plunger

B.3.2 Washing solution – consisting of the following ingredients.

	Parts by volume
Ammonia solution approximately 35% (m/m), approximately 0.88 g/mL	12
Distilled water	415
Methanol (AR)	75
Acetone (AR)	100

Mix the distilled water with the ammonia solution, add the methanol and mix. Add the acetone and mix.

NOTE: There is a slight contraction in volume on mixing these ingredients. The solution should be freshly prepare, and cooled to 20 ± 2 ^{o}C before use.

In the case of rubberized hair and rubberized fibre, replace the washing solution with water.

B.4 Preparation of test specimens

B.4.1 A gross sample of not less than 0.5 kg shall be taken in accordance with annex H.

B.4.2 Test samples shall be taken from the gross sample in such a manners as to ensure that each test specimen is representative of the sample, as follows.

B.4.3 Carefully open the parcel containing the sample and after removing from layered materials any backing or inter-leaving material, arrange the whole of the sample on a table.

B.4.4 Divide the gross sample, whether it is loose or layered material into 20 piles or heaps approximately equal in bulk.

B.4.5 Take small quantities from each of the 20 piles or heaps. In the case of a material from which short fibres or dust fall readily, include a proportional amount by mass of any short fibres and dust in each test specimen.

B.5 Procedure

B.5.1 Extraction

From the gross sample, take a test specimen in accordance with B.4, of approximately 12.5 g weighed to an accuracy of ± 0.05 g in the case of fibre and hair/fibre mixtures, and for all other materials, approximately 25 g, weighed to an accuracy of ± 0.05 g.

Place the test specimen in a clean jar and add 500 mL of washing solution (or water in the case of rubberized hair and fibre) at 20 ± 2 ^{o}C. Agitate the specimen with the plunger to remove air bubbles, ensuring that no liquid, fibres, etc. adhere to the plunger when it is removed. Close the jar, secure it in the shaking machine and rotate it continuously for 20 ± 1 min at a constant speed of 60 ± 1 r/min. Take the jar out of the machine, remove the cover and insert the plunger. As soon as the plunger comes to rest, pour the liquid though the test sieve placed in a large funnel, collecting the strained liquid in a clean conical flask. Use the plunger to retain the specimen in the jar, but do not squeeze the specimen with the plunger.

NOTE: If more than one jar has been shaken at the same time, before removing the cover and inserting the plunger, hold the jar in a horizontal position and shake it vigorously by moving it horizontally twice to the left and twice to the right, to avoid any settlement of suspended particles. Take care to avoid allowing any jar to remain standing for more than 1 min to 2 min before the shaking machine is started or before pouring off the liquid.

B.5.2 Determination of soluble extract

Transfer 200 mL of the liquid to a 500 mL conical flask and heat (e.g. over a Bunsen burner, but not in the open laboratory; see warning note in B.3.1 regarding methanol) until the volume is reduced to approximately 100 mL. Cool, make up to 200 mL in a graduated cylinder or volumetric flask, and transfer to a 500 mL conical flask.

NOTE 1: The flask in which the liquid was reduced may be used again.

Add a 120 mm diameter, double-acid-washed, retentive, low ash filter paper, torn into small pieces, and shake the flask briskly until the paper has disintegrated.

Filter the mixture through a 240 mm diameter dry qualitative filter paper without suction, refiltering the first runnings. The filtrate should be clear or have only a faint opalescence.

NOTE 2: Losses by evaporation should be avoided. For example, if the liquid is poured into the filter funnel and left there so that filtration can be completed overnight, lower the funnel into the flask which is receiving the filtrate, and cover the filter paper by placing a clock glass or similar object on top of the funnel.

Evaporate 100 mL of the filtrate in a suitable tared dish over steam to dryness. Dry to constant mass at 105 ^{o}C to 110 ^{o}C by transferring the dish and contents to a well-ventilated drying-oven. Weigh the dish and contents after cooling in a desiccator for approximately 30 min.

B.5.3 Determination of total extract

Transfer, portion by portion, 100 mL of the liquid to a suitable tared dish and evaporate the liquid over steam to apparent dryness. Dry to constant mass at 105 ^{o}C to 110 ^{o}C by transferring the dish and contents to a well-ventilated drying-oven. Weigh the dish and contents after cooling in a desiccator for approximately 30 min.

B.5.4 Determination of dry matter

B.5.4.1 Weigh a 5 ± 0.05 g test specimen of the material in a tared weighing bottle fitted with a lid.

B.5.4.2 Remove the lid and dry to constant mass at 105 °C to 110 °C in a well-ventilated drying-oven until the mass of two consecutive readings do not differ by more than 0.005 g.

B.5.4.3 Replace the lid before re-weigh the bottle and its contents after cooling in a desiccator for approximately 30 min.

B.5.4.3 Express the oven-dry mass *D* as a percentage, to the nearest whole number, of the original mass of the test specimen.

B.5.5 Calculation and expression of results

Calculate the insoluble extracted matter *i* as a percentage of the dry mass of the test specimen, using one of the following equations:

a) For a 25 g test specimen,

$$i = \frac{2000}{D}\ (W_2 - W_1);$$

Or

b) For a 12.5 g test specimen,

$$i = \frac{4000}{D}\ (W_2 - W_1).$$

Where

D is the oven-dry mass of the test specimen, determined in accordance with B.5.4, expressed as a percentage of the original mass;

W_1 is the oven-dry mass of the soluble extract (in g);
W_2 is the mass of the oven-dry total extract (in g).

Express the results to one decimal place.

Annex C

Test Method for oil content

C.1 Principle

A test specimen is extracted with petroleum spirit in a Soxhlet apparatus and the solvent evaporated to determine the percentage oil.

C.2 Apparatus

C.2.1 Soxhlet extraction apparatus –of 100 mL capacity, type 2, i.e. with concentric type siphon tube and ground glass joints at the top of the Soxhlet extractor (socket joint) of size 40/38, to accommodate the paper or glass thimble for the specimen.

NOTE: The cone joint size at the bottom of the extractor, fitting into the flask, may be 29/32 or 24/29.

C.2.2 Extractor flasks – of 250 mL capacity with ground glass neck size 29/32 or 24/29, to fit the extractor.

C.2.3 Paper thimbles – 30 mm x 100 mm or sintered base glass thimbles, 34 mm x 100 mm.

C.2.4 Glass filter funnel

C.2.5 Filter papers, - 120 mm diameter.

C.2.6 Dishes (stainless steel, nickel, porcelain or heat-resistant glass for evaporation).

C.2.7 Controllable heating arrangements – for Soxhlet extraction.

C.3 Reagents

C.3.1 Petroleum spirit – boiling range 40 ^{o}C to 60 ^{o}C.

C.4 Procedure

From the gross sample sampled in accordance with annex H, take a test specimen in accordance with B.4, of approximately 5 g weighed to an accuracy of ± 0.05 g. Place the specimen in a paper or glass thimble, ensuring that the whole of the test specimen will be covered by the extracting fluid during each cycle of siphoning.

Extract the specimen in the Soxhlet apparatus with petroleum spirit for not less than 10 siphonings at a rate of approximately 10 siphonings per hour. Filter the extract into a tared dish, remove the solvent, dry to constant mass by heating in a well ventilated oven at 105 ^{o}C to 110 ^{o}C for hot less than 2 h and until two successive weighings do not differ by more than 5 % and weigh the oil.

NOTE: It is common practice to control the number of siphonings by timing. This can be satisfactory, but it is reliable only if the rate of refluxing is adequate and maintained (not interrupted by, for example, a power cut). It is recommended that the rate of siphoning is checked from time to time.

C.5 Expression of results

Calculate and report the amount of oil *o* as a percentage of dry mass of the test specimen, determined in accordance with B.5.4, using the following equation:

$$o = \frac{p}{D} \times 100$$

Where

p is the dry mass of petroleum spirit extract (in g);

D is the oven-dry mass of the test specimen, determined in accordance with B.4, expressed as a percentage of the original mass.

Annex D

Test method for Dimensions

D.1 Apparatus

D.1.1 Metre **rule**- a steel rule graduated in millimetres that is of a length and width exceeding the width and length of the mattress to be measured and accurate to 1 mm (or better).

D.2 Procedure

D.2.1 Sample the mattress in accordance with Annex H.

D.2.2 Place the mattress on a plane horizontal surface, stretch it (both laterally and longitudinally), and then allow it to relax for 10 min before taking any measurements.

D.2.3 Measure from seam to seam the length and the width, measuring each in at least three positions that are approximately equally spaced along the length and the width respectively.

D.2.4 Calculate the arithmetic mean of the three measurements of the width and record it as the width of the sample and check its dimensions for compliance with the relevant requirements of clause 4.

D.2.5 Calculate the arithmetic mean of the three measurements of the length and record it as the length of the sample and check its dimensions for compliance with the relevant requirements of clause 4.

Annex E

Test method for Performance of spring units

E.1 Apparatus

A compression apparatus capable of cyclically compressing a section of the spring unit between parallel horizontal platens at a rate of 60 ± 5 cycles/minute (see Fig. 3). The stroke of the moving (compressing) platen shall be adjustable between 75 mm and 150 mm, and the distance between the platens shall be capable of being varied to accommodate different thicknesses of spring unit and, where relevant, to provide for initial compression of the unit. The size of the stationary fixed platen shall be approximately 500 mm x 500 mm, and the size of the moving (compressing) platen shall be 230 mm x 150 ± 5 mm. The edges of the compressing platen shall be rounded to a radius of approximately 6 mm. The apparatus shall be equipped with a counter that records the number of compression cycles completed during a test.

E.2 Preparation of Test Specimens

a) Double-cone spring units

1) From the spring unit in each test sample taken in accordance with annex H, cut a section containing 16 springs, i.e. four rows each containing four rows springs (see Fig. 4). So mark or tag the four centre springs of the specimen that each can be identified. Then mark the upper centre lacing wire of the specimen at two points "B" (see Fig. 4) that are, in each case, equidistant from the outer and inner springs, and mark the four centre springs at the points corresponding to those marked "A" in Fig. 4.

2) With the specimen on a plane horizontal surface and taking all measurements to the nearest 2 mm, measure the initial height of the springs at each point marked "A" and record the average height, and measure the initial length of the central lacing wire between the points marked "B".

b) Interlinked formed-wire springing

From the spring unit in each test sample cut a section of size approximately 430 mm x 330 mm. So mark or tag four points on the springing in the centre part of the specimen that form a square of size approximately 100 mm x 100 mm, that each can be readily identified. Then mark the upper centre lacing wire of the specimen at two points (equivalent to points "B" in Fig. 4) that are equidistant from the centre of the square (i.e. the intersection of the diagonals of the tagged points) and a distance apart that is equal to the overall length of the compressing platen. With the specimen on a plane horizontal surface take the measurements described in (a) (2) above.

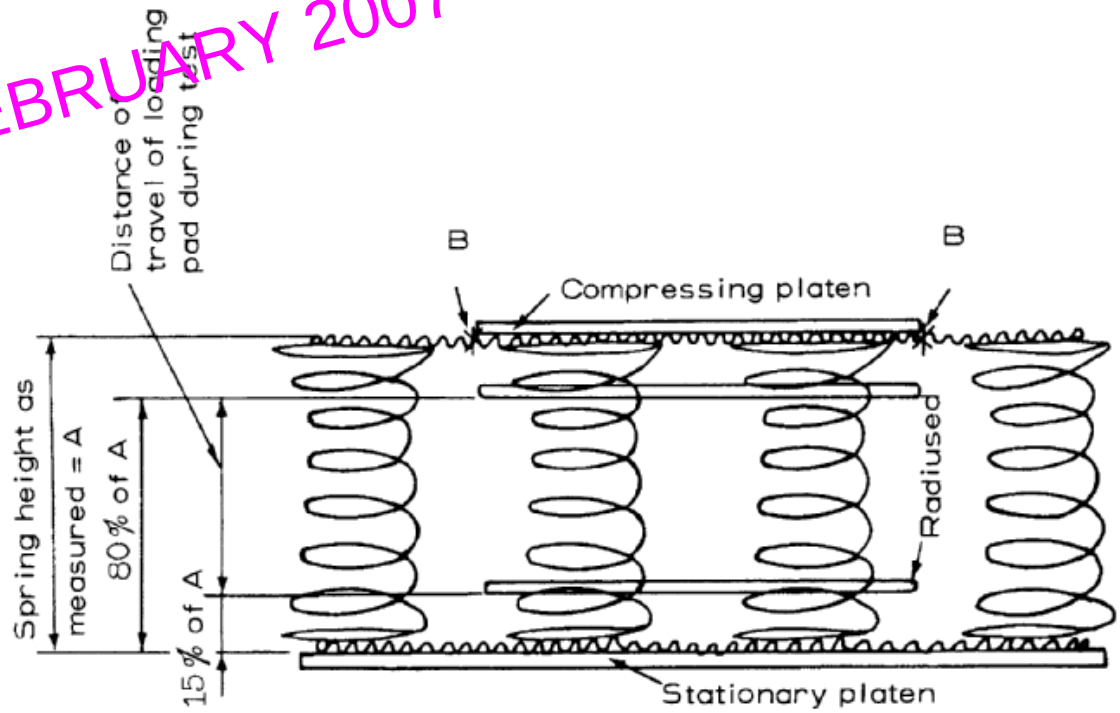
NOTE: The overall dimensions of test specimens and the measuring points of both types of spring unit shall, where practicable, be the same.

E.3 Procedure

a) Place the test specimen on the stationary platen of the apparatus and position it centrally below the compressing platen (see Fig. 3). With the compressing mechanism adjusted to give a stroke of 65% of the free height of the specimen, and positioned at top dead centre, so adjust the distance between the platens as to cause an initial compression of the specimen of 20%. Operate the apparatus (compressing the specimen to 15% of its free height) for 5 000 cycles and check that there is no breakage or loosening of springs or connecting wires (see 5.3.2(b)).

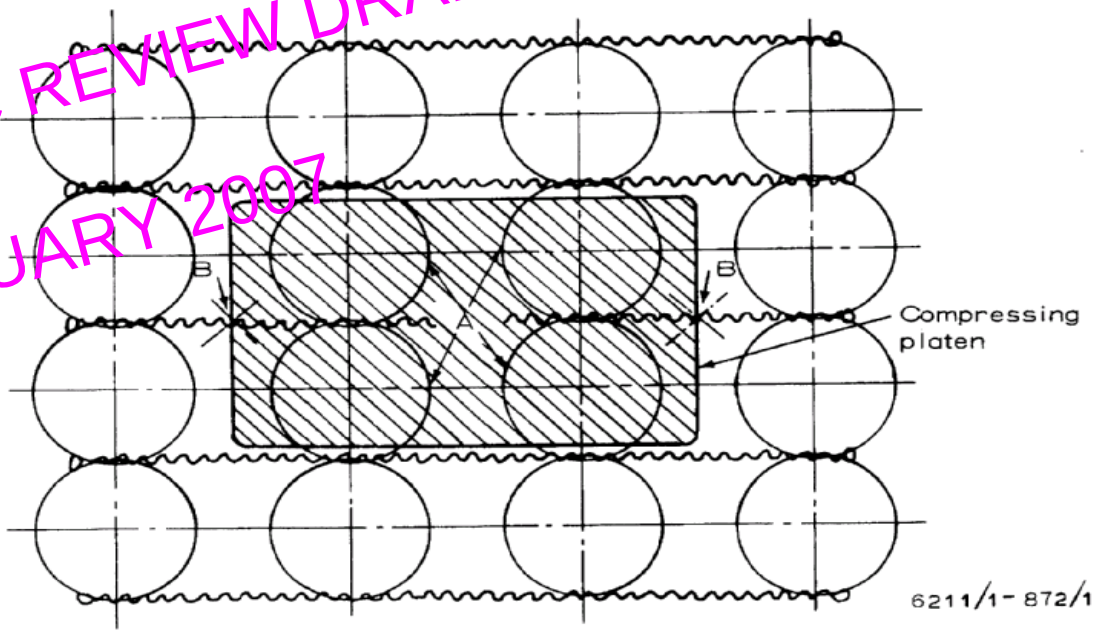
b) Release the compression load by lowering the bottom platen and, in the case of double-cone spring units, again measure the height (to the nearest 2 mm) at each of the points marked "A" and record the average, and

measure the distance between the points marked "B". In the case of interlinked formed-wire springing take the same measurements at the corresponding points. Determine and record the permanent loss in height in each case (expressed as a percentage of the initial average height) and the permanent stretch of the central lacing wire (expressed as a percentage of its initial length). Examine the specimen for compliance with the other requirements of 5.3.2(b).



Side view showing distance traversed by compressing platen, i.e. from 80% to 15% and back to 80% of initial height A (one cycle)

Fig. 3 – Section of Spring Unit and Stationary and Compressing Platens (Side View)



The shaded area represents the approximate shape and position of the compressing platen applying the test load.

Fig. 4 – Section of Spring Unit for Testing (Plan View)

Annex F

Test method for endurance

F.1 Apparatus

A compression apparatus capable of cyclically compressing (between parallel platens) the central part of the complete mattress to 67% of its free height and then releasing it, at a rate of 60 ± 5 cycles/minute. The apparatus shall have a lower platen large enough to support the whole mattress, and an upper compressing platen with a corrugated contact surface of the size and shape shown in Fig. 5. The specified compression shall be measured at the positions of maximum compression caused by the corrugated platen

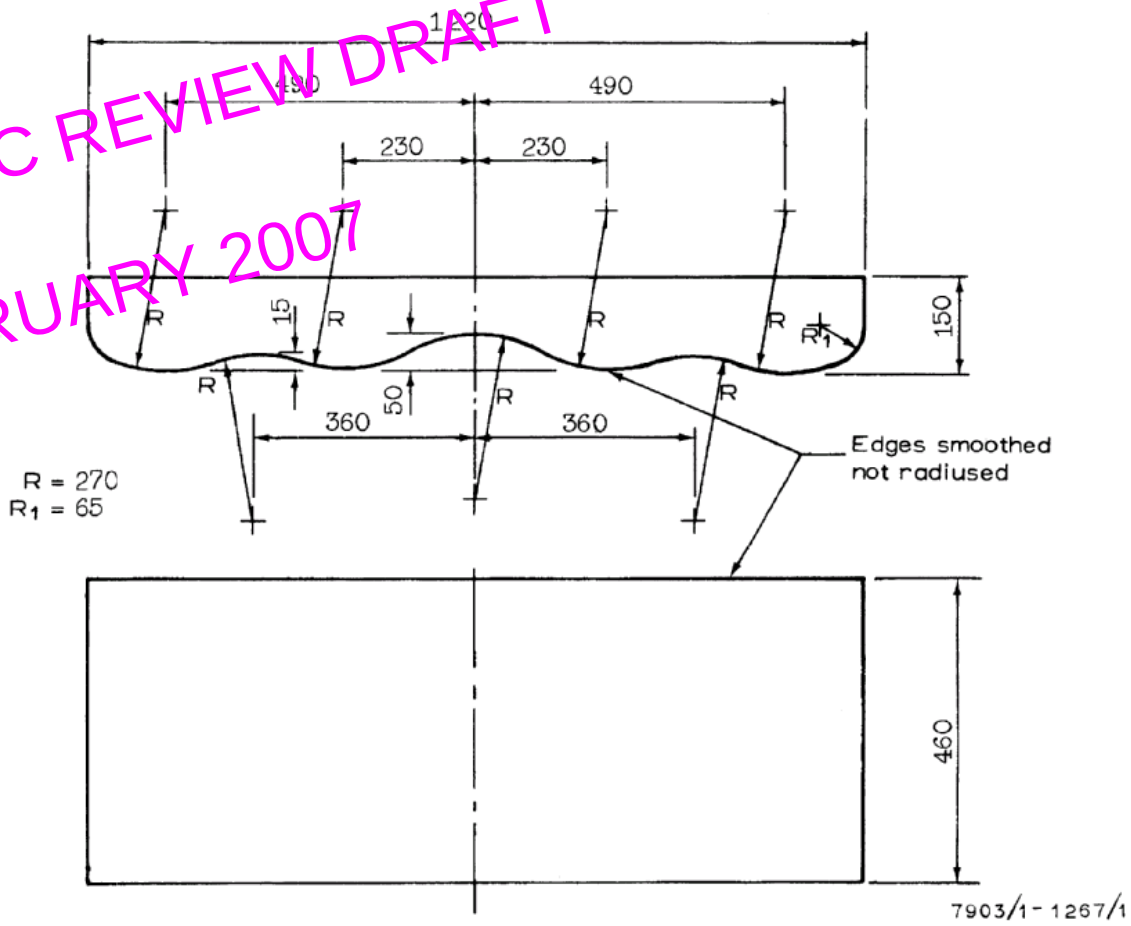
F.2 Preparation of Test Specimens

a) Place the mattress to be tested and taken in accordance with annex H, on a solid plane horizontal base for a period of at least 12 h.

b) Place a flat steel pressure plate (of diameter 300 ± 2 mm and mass 2 ± 0.2 kg) on each of the six measurement positions (in turn) shown in Fig. 6, and measure (to an accuracy of ± 2 mm) the height of the mattress at each of these positions. Ensure that the pressure plate is lowered slowly and without shock on to each of the measurement positions, and that each measurement is taken at least 10 s after application of the pressure plate.

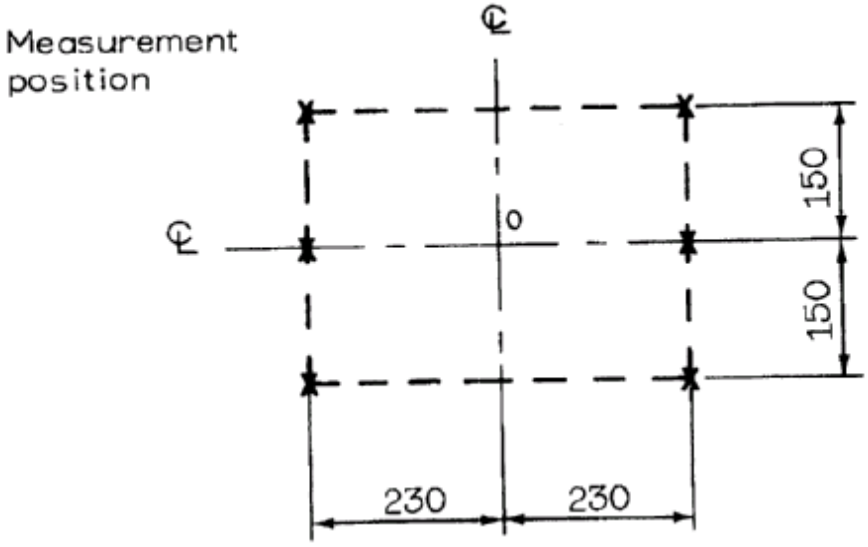
F.3 Procedure

Position the upper platen of the apparatus with its longitudinal axis along the longitudinal axis of the mattress and its centre vertically above the midpoint, 0, of the measurement positions (see Fig. 6), secure the mattress against horizontal movement, and operate the apparatus for 60 000 compression cycles. Allow the mattress to recover for at least 12 h, again measure the height as described in F.2(b), and calculate (for each of the six points) the loss in height as a percentage of the original height. Cut the mattress open and examine for compliance with 4.2.1(f).



Dimensions in millimetres

Fig. 5 – Compressing Platen for Endurance Test



Dimensions in millimetres

Fig. 6 – Measurement Positions for Endurance Test

Annex G

Test method for Mass per unit area

G.1 Three alternative procedures for determining the mass per unit area of woven fabrics (including those of the stretch type), knitted fabrics, non-woven fabrics, composite fabrics and narrow fabrics, that have been conditioned in the standard atmosphere for testing are specified. The samples for testing shall taken in accordance with annex H.

G.2 Three procedures are described which apply to:

1) full-width fabrics that are of such a length that they can be conditioned and measured satisfactorily;

2) representative large cuttings that can be measured satisfactorily; or

3) a number of representative specimens cut to a constant area of 0.01 m^2. Smaller areas are not considered suitable for testing.

G.1.1 Procedure 3 is not applicable to knitted fabrics and woven stretch-type fabrics.

G.2 Principle

The mass and the dimensions of a textile fabric specimen, that is without tension and has been conditioned in the standard test atmosphere, is determined and the mass per unit area is calculated.

G.3 Apparatus

G.3.1 Table that has a smooth flat surface and is of a size that exceeds that of the fabric to be measured.

G.3.2 Pair of scissors or suitable cutter that is capable of cutting a square or circular specimen of area 0.01 m^2 to an accuracy of 1 % or better.

G.3.3 Metal plate that is 5 mm smaller than the cutter (see G.3.2) and that has a thickness of 10 mm.

G.3.4 Balance, that is capable of determining the mass of the specimen to an accuracy of 0.2 % or, in the case of 0.01 m^2 specimens, to an accuracy of 0.001 g.

G.3.5 Steel scale that is of a length and width exceeding the width and length of the fabric to be measured, and is graduated in centimetres and millimetres.

G.4 Procedure

NOTES
1 Any of the procedures can be used to determine the mass per unit area of a fabric; however, for the purpose of greater accuracy, the procedure that gives the largest test specimen(s) is preferable.

2 In the case of narrow fabrics, a complete roll should be used, but, if this is not possible, the length of the specimen should be at least 5 m.

G.4.1 General

Condition the sample in accordance with KS 08-32 and carry out the test in the same standard atmosphere.

G.4.2 Procedure 1: full-width specimen

G.4.2.1 Ensure that the fabric, which should preferably be selected from the middle of a piece, is not less than 0.5 m and not more than 4 m long, and lay it flat, and without tension, on the table. Cut at both ends, across the full width of the sample, along parallel lines at right angles to the selvedge. If the mass per unit area of a selvedge on a full-width piece appears to deviate appreciably from the mass per unit area of the body of the fabric, or if so agreed upon between the parties concerned, trim off the selvedge along the outermost threads of the body of the fabric and use only the body of the fabric for the determination of the mass per unit area.

G.4.2.2 The width and length of a textile fabric sample laid on a flat surface is measured with a steel scale.

G.4.2.3 Lay the test sample flat and full width (without subjecting it to tension) on a plane surface and condition it in that state for at least 24 h in accordance with KS 08-32.

G.4.2.4 Take, to the nearest 1 mm, five measurements across the overall width or between the innermost selvedge threads (as relevant) of the conditioned test sample at approximately equal intervals throughout its length.

G.4.2.5 Take, to the nearest 1 mm, five measurements of the length of the conditioned test sample at approximately equal intervals throughout its width.

G.4.2.6 Calculate the arithmetic mean of the five measurements of the width and record it as the width of the sample.

G.4.2.7 Calculate the arithmetic mean of the five measurements of the length and record it as the length of the sample.

G.4.2.7 Use the balance to determine the mass of the specimen.

G.4.3 Procedure 2: for representative large cuttings

G.4.3.1 Ensure that the available cutting is representative of the sample. Trim the cutting into a square or rectangular specimen by cutting along parallel lines at right angles to the warp (length) direction and at right angles to the weft (width) direction.

G.4.3.2 Measure the width and length of the specimen, as specified in G.4.2.

G.4.3.3 Use the balance to determine the mass of the specimen.

G.4.4 Procedure 3: for several small (0.01 m^2) specimens

NOTE On fabrics with large in-woven designs, which involve local areas of appreciably different mass per unit area, the use of procedure 1 or procedure 2 is preferable. If the sample size necessitates the use of procedure 3, select specimens that contain an integral number of pattern repeats or that are representative of the pattern.

G.4.4.1 Application

This Procedure is not applicable to knitted fabrics and woven stretch-type fabrics.

G.4.4.2 Cut at least three square pieces, of side length of approximately 150 mm, from areas of the fabric selected to represent the sample as fully as possible but not within 50 mm of the selvedge.

G.4.4.3 Lay each piece flat, and without tension, on a suitable cutting surface. Place the metal plate and the cutter on each piece in turn and cut out a 0.01 m^2 specimen from each piece, ensuring that no loss of threads occurs.

G.4.4.4 Use the balance to determine the mass of the 0.01 m^2 specimens, and calculate the mean mass.

G.5 Calculation

G.5.1 In the case of procedure 1 and procedure 2, calculate the mass per unit area *M* in grams per square meter, using the following formula:

$$M = \frac{m \times 1000\,000}{L \times w}$$

Where

m is the mass of the specimen, in grams;

L is the length of the specimen, in millimetres; and

w is the width of the specimen, in millimetres.

G.5.2 In the case of procedure 3, calculate the mass per unit area *(M* in grams per square meter) by multiplying the mean mass (in grams) by 100.

G.5.3 For polyurethane fillings and filling layers, the mass per square meter of sleeping surface is calculated based on the equivalent density as:

$\frac{10d}{3}$ where "*d*" is the actual density(mass per unit area *M*) of the foams calculated as in G.5.

G.5.4 For non polyurethane fillings and filling layers, the mass per square meter of sleeping surface is calculated based on the actual density(mass per unit area *M*) as in G.5.

G.5.5 Determine the gross mass of fillings by adding the mass per square meter of sleeping surface for basic fillings and that of surface fillings.

Annex H

Sampling, Inspection and Compliance with the specification

H.1 Sampling

The following sampling procedure shall be applied in determining whether a lot complies with the relevant requirements of the specification. The samples so taken shall be deemed to represent the lot for the respective properties

H.1.1 Sample for Inspection

From the lot take (when relevant, at random) the number of mattresses shown in Column 2 of Table 5 relative to the appropriate lot size shown in Column 1. Visually examine each mattress for all the relevant requirements of clause 4, compliance of which is not assessed by the tests given in annexes A to G.

H.1.2 Sample for Testing

After visual inspection of the sample taken in accordance with H.1, take from it at random the number of mattresses shown in Column 3 of Table 5 relative to the appropriate lot size shown in Column 1.

Table 5 – Sample sizes

1	2	3
Lot size, mattresses	Sample for inspection, mattresses	Sample for testing mattresses
10-15	All	2
16-100	15	2
101-300	20	4
301-500	30	6

H.2 Compliance with the standard

The lot shall be deemed to comply with the standard if after Inspection and testing of the samples taken in accordance with H.1 no defective is found.

