BRITISH STANDARD

BS 5131-5.13: 1980

Methods of test for

Footwear and footwear materials —

Part 5: Testing of complete footwear —

Section 5.13 Measurement of the strength of stitched seams in upper and lining materials

NOTE It is recommended that this Section should be read in conjunction with the information in the General Introduction to BS 5131, published separately.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 5 and a back cover.

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

This British Standard, having been prepared under the direction of the Clothing Standards Committee, was published under the authority of the Executive Board and comes into effect on
30 April 1980

The following BSI references relate to the work on this standard:
Committee reference CLT/7
Draft for comment 77/35456 DC

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Amendments issued since publication

Amd. No.	Date of issue	Comments

Contents

1 Scope

This Section describes a method of measuring the breaking strength of stitched seams in shoe upper and lining materials. The test is intended to be used to evaluate seams either cut from shoes or made up to simulate actual or proposed constructions for shoes. The construction of the seam is not, therefore, specified precisely but it should be stated when reporting the test result.

2 References

This Section refers to the following standards publication:

BS 1903, *Glossary of terms used by the light clothing industry.*

3 Definitions

For the purposes of this Section of BS 5131, the following definitions apply.

3.1
lapped seam

a seam in which the edge of one section overlaps the edge of the other by a small amount (the underlay allowance) with the reverse side of the top section in contact with the face of the lower section and the stitching through the underlay allowance (see Figure 5.13/1)

NOTE This seam differs somewhat from a lapped seam as used in the garment industry and as described in BS 1903.

3.2
closed seam

a seam made by placing the face sides of the two sections in contact, with the edges aligned, see Figure 5.13/2(a), stitching through them close to the aligned edges and then folding the two sections back so that their faces are in the same plane [see Figure 5.13/2(b)]

3.3
seam allowance

the distance from the edge of the section to the first functional row of stitching. In a closed seam, the seam allowance for the two sections is the same, but in a lapped seam they may differ

3.4
underlay allowance

the amount by which the lower section of a lapped seam is overlapped by the top section

4 Principle

Test pieces containing a stitched seam are prepared with the ends of the seam so constructed as to prevent fraying out during the test. The breaking force is then measured with the direction of pull perpendicular to the seam and expressed as force per unit length of seam. The type of breakdown that occurs is also recorded.

5 Test piece preparation

5.1 Specially prepared test pieces. From the upper or lining material (or both) cut sufficient squares with 50 mm sides to produce three seamed test pieces for each direction of test. Mark the direction of the backbone, warp threads or machine run clearly on each square.

NOTE The number of squares per test piece and their type varies according to the upper construction at the seam. For example, the test piece may consist of two pieces of the same upper material stitched together, or two pieces of different upper materials, or it may include one or more lining materials and perhaps also reinforcing tapes.
The number of directions of test also varies according to the upper construction. Separate tests in the "along" and "across" directions may be sufficient, but for some purposes test pieces may need to be prepared with "along" and "across" squares combined, or with squares cut on the bias.

Stitch the squares together to produce three test seams for each direction of test. The types of seam construction and the choice of thread, needle size and type and stitch density are normally selected to simulate the shoemaking process under examination. The following examples are a guide to the selection of these features when a specific process is not being simulated.

Uppers 1.2 mm *to* 1.8 mm *thick (with or without a lining)*

Size 14 needle with a continuous filament polyamide or polyester thread or a polyester core spun thread having a metric ticket number of 50 or 60; a round point or narrow wedge needle for leathers, round point, round triangular tipped or extra narrow wedge for coated and uncoated fabrics and a round point needle on meshes; 6 stitches per centimetre; either a lapped or closed seam; seam allowance 2 mm for leather, 2 mm for polyvinylchloride coated fabric, 3 mm for most polyurethane coated fabrics (although 2 mm may be sufficient for some stronger polyurethane coated materials); underlay allowance 9 mm.

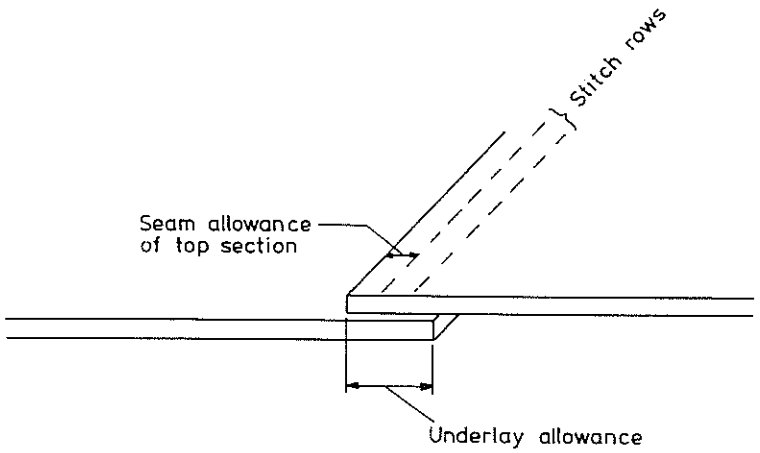


Figure 5.13/1 — Lapped seam

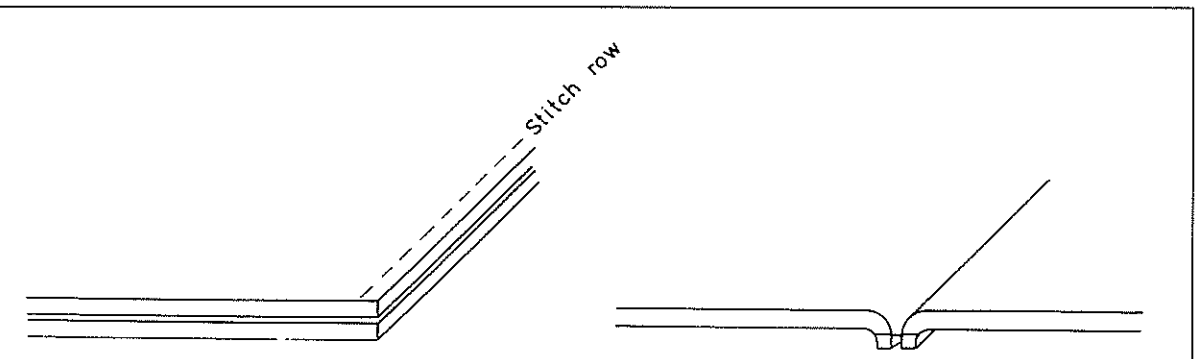


Figure 5.13/2 — Closed seam

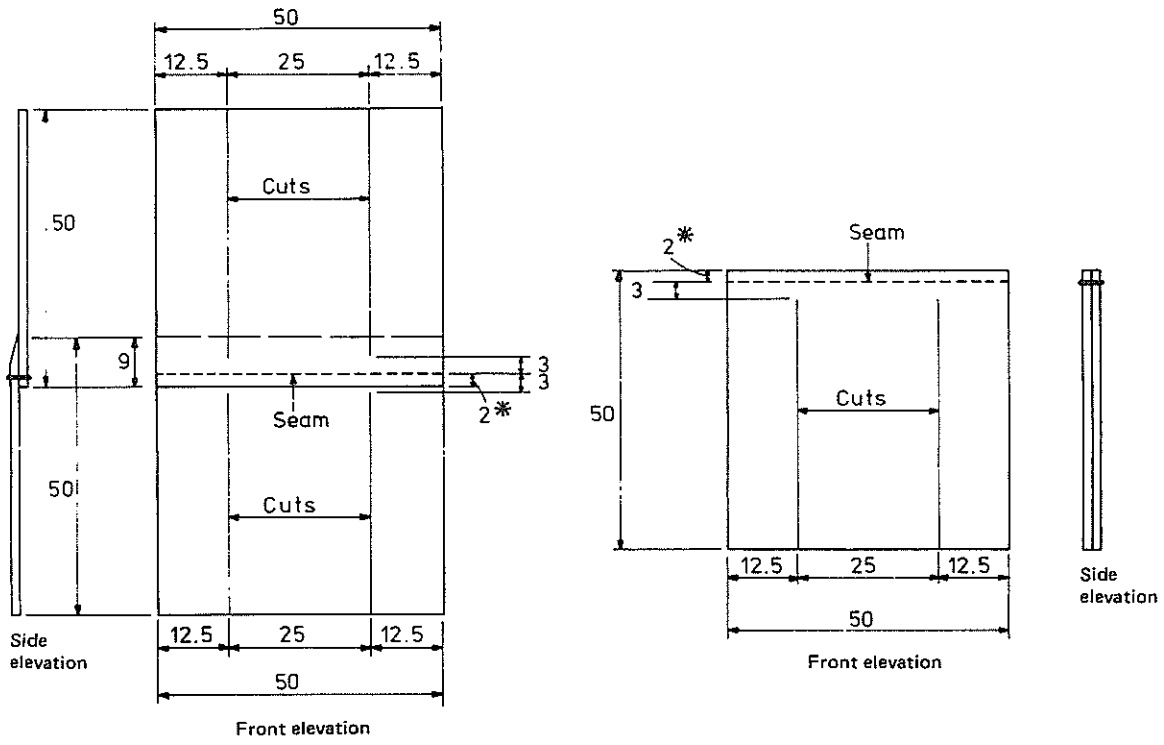
Linings 0.7 mm *to* 1.2 mm *thick*

Size 12 or size 14 needle with a continuous filament polyamide or polyester thread or a polyester core spun thread having a metric ticket number of 60 or 75; needle point as for uppers; 6 to 7 stitches per centimetre; seam allowance as for uppers.

When the seam has been made, trim it to provide a 25 mm test width with two 12.5 mm edge pieces by cutting down to within 3 mm of the stitch line (see Figure 5.13/3). Considerable care is required when cutting near to the seam, and a small sharp hand knife is probably the best tool to use.

5.2 Test pieces cut from shoes. Where possible, cut two rectangular test pieces of the dimensions shown in Figure 5.13/4, preferably from different shoes. The central part of the seam (i.e. excluding the parts in the two edge pieces) shall be approximately mid-way between the two ends of the test piece and, if curved, approximately parallel to these ends, as judged by eye.

If the shoe upper is too small for this size of test piece, the width of the central portion between the cuts may be reduced, but not to below 10 mm. The edge pieces shall not be reduced in width.



(a) Lapped seam

(b) Closed seam

*2, but 3 for most polyurethane coated fabrics

All dimensions are in millimetres.

Figure 5.13/3 — Dimensions of made-up test seams

6 Apparatus

6.1 *Conditioning cabinet or room* capable of maintaining an atmosphere of 20 ± 2 °C and 65 ± 2 % relative humidity.

6.2 *Tensile testing machine* with a range of 0 to 2 000 N and a rate of traverse of 100 ± 20 mm/min. The jaws shall be at least 30 mm wide.

6.3 If seams are to be prepared specially (see **5.1**) a suitable *sewing machine and accessories* such as needles will be required.

7 Conditioning

Condition the prepared test pieces for at least 48 h in an atmosphere at 20 ± 2 °C and 65 ± 2 % relative humidity and carry out the tests in this standard atmosphere.

8 Procedure

Measure the width of the centre part of each test piece, if this is not 25 mm.

Set the jaws of the tensile machine to 30 mm apart and clamp the 25 mm wide central test strip between them so that the seam is 15 mm from each jaw and is parallel to the jaw edges. The 12 mm wide edge strips are not clamped but are allowed to hang free (see Figure 5.13/5). Clamp test pieces cut from shoes in the same way with the same jaw separation, even if they are smaller than the preferred size.

Operate the machine and record

a) the force in newtons, at which failure occurs (breaking force);

b) the type, or types, of failure.

Test the duplicate test pieces in the same way; also the test pieces corresponding to the other directions of test.

9 Calculation and expression of results

For each test piece calculate its seam strength by dividing the breaking force by the test piece width (normally 25 mm) and express the result as newtons per millimetre (N/mm). Calculate the arithmetic average of the seam strengths for all test pieces (usually three) corresponding to one direction of test.

10 Test report

Include the following items in the test report:

a) the average seam strength for each direction of test expressed in accordance with clause **9**;

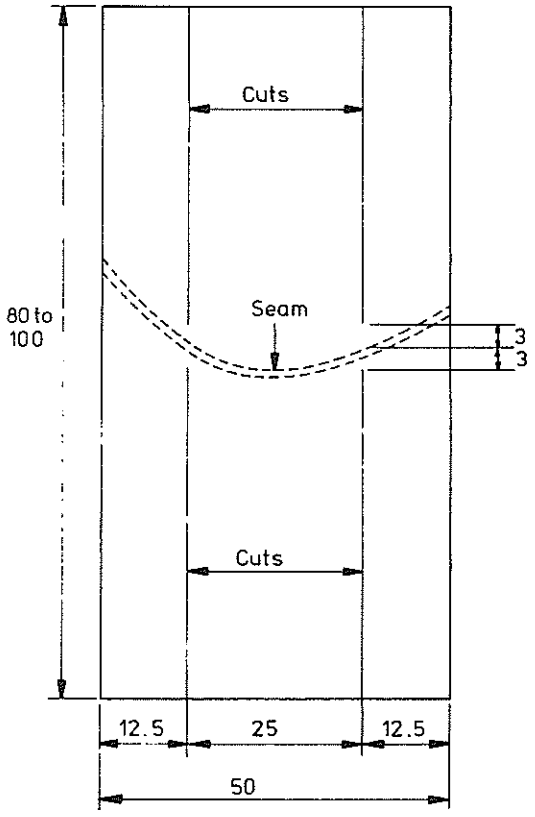
b) the type or types of failure;

c) full details of the seam construction including seam type, material type and thickness used, thread type and size, needle type and size, stitches per centimetre, seam allowance and underlay allowance;

d) the width of the centre part of the test pieces, if it is not 25 mm;

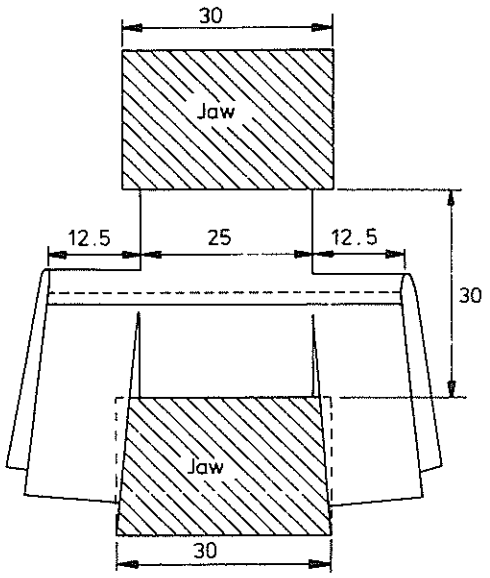
e) reference to the method of test, i.e. BS 5131-5.13;

f) the date of testing.



All dimensions are in millimetres

Figure 5.13/4 — Desirable dimensions of seam test piece cut from a shoe



All dimensions are in millimetres.

Figure 5.13/5 — Test piece clamped in the tensile test machine

BS 5131-5.13: 1980

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