

# DRAFT UGANDA STANDARD

Second Edition  
2021

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## Footwear materials — Determination of collapsing load of domed shapes



Reference number  
DUS 583: 2021

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The Executive Director  
Uganda National Bureau of Standards  
P.O. Box 6329  
Kampala  
Uganda  
Tel: +256 417 333 250/1/2  
Fax: +256 414 286 123  
E-mail: [unbs@infocom.co.ug](mailto:unbs@infocom.co.ug)  
Web: [www.unbs.go.ug](http://www.unbs.go.ug)

## Foreword

Uganda National Bureau of Standards (UNBS) is a parastatal under the Ministry of Trade, Industry and Cooperatives established under Cap 327, of the Laws of Uganda, as amended. UNBS is mandated to coordinate the elaboration of standards and is

- (a) a member of International Organisation for Standardisation (ISO) and
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- (c) the National Enquiry Point on TBT Agreement of the World Trade Organisation (WTO).

The work of preparing Uganda Standards is carried out through Technical Committees. A Technical Committee is established to deliberate on standards in a given field or area and consists of key stakeholders including government, academia, consumer groups, private sector and other interested parties.

Draft Uganda Standards adopted by the Technical Committee are widely circulated to stakeholders and the general public for comments. The committee reviews the comments before recommending the draft standards for approval and declaration as Uganda Standards by the National Standards Council.

The committee responsible for this document is Technical Committee UNBS/TC 7, Textiles, Leather, Paper and related products, Subcommittee SC 2, Leather and related products.

This second edition cancels and replaces the first edition (US 583:2007), which has been revised:

The document has been put in the new template for standard development as per the ISO/IEC Directives, Part 2:2019



# Footwear materials — Determination of collapsing load of domed shapes

## 1 Scope

1.1 Part A of this draft Uganda Standard specifies a method for the preparation of dome-shaped test specimens formed from thermoplastic or solvent-activated toe-puff, stiffener or similar footwear materials.

1.2 Part B of this draft Uganda Standard specifies a method for the measurement of the collapsing load of these dome-shaped test specimens.

## 2 Normative references

The following referenced documents referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

DUS ISO 17709, *Footwear — Sampling location, preparation and duration of conditioning of samples and test pieces*

## 3 Terms and definitions

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at <http://www.iso.org/obp>

No terms and definitions are listed in this document.

## 4 Principle

### 4.1 Part A

Test specimens of thermoplastic or solvent-activated materials are formed into dome shapes, using dome formers.

### 4.2 Part B

The collapsing load of the dome-shaped test specimen is determined by means of a compression cage and a tensile testing machine.

## 5 Reagents and apparatus

### 5.1 Reagents (Part A)

5.1.1 **Methylene chloride**, or a mixture of equal parts of methyl ethyl ketone and acetone

5.1.2 **Silicone-based release agent**

### 5.2 Apparatus (Part A)

5.2.1 **Dome formers** (see Figure 1)

5.2.2 **Toggle type clamp**

5.2.3 **Fan-assisted oven**, set at  $95\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$

### 5.3 Apparatus (Part B)

5.3.1 **Tensile testing machine** that has the following characteristics:

- a rate of traverse of 50 mm/min; and
- load ranges from 50 N to 500 N, with one or more ranges in between, for example, 100 N to 200 N.

5.3.2 **Compression type cage**

5.3.3 **Repeated collapsing device**, manually operated

## 6 Preparation of test specimens

6.1 From each test sample of footwear material, cut six circular test specimens of diameter  $57\text{ mm} \pm 1\text{ mm}$ .

6.2 From thin polyethylene, cut six rings of outside diameter 57 mm and inside diameter 38 mm (for material coated with adhesive on one side only).

6.3 Also from polyethylene, cut six circular discs of diameter 57 mm (for material coated with adhesive on both sides).

## 7 Procedure (Part A)

### 7.1 Forming domes of thermoplastic footwear materials

7.1.1 Release the two spring-loaded toggle clips C and remove ring R (see Figure 1).

7.1.2 Remove any contamination from the spherical surface of plunger P, the inner surface of ring R and the end of cylinder Y with solvent or by gentle scraping.

7.1.3 Loosen screw S and slide plunger P down in cylinder Y. Retighten screw S.

7.1.4 Proceed as follows:

- a) in the case of materials not coated with adhesive, place a test specimen on top of cylinder Y. Place clamping ring R over cylinder Y and attach toggle clips C to lugs L and close;

- b) in the case of materials coated with adhesive on one side only, place a test specimen on top of cylinder Y, with the adhesive coating uppermost. Place a polyethylene ring (see 6.2) on the test specimen before closing clamping ring R as in (a) above; and
- c) in the case of materials coated with adhesive on both sides, first place a polyethylene disc (see 6.3) on top of cylinder Y, then place the test specimen on top of the disc and finally place the polyethylene ring (see 6.2) on top of the test specimen. Close clamping ring R as in (a) above.

**7.1.5** Set the oven (see 5.2.3) and, after its temperature has stabilized, place all six prepared dome formers in it. If the oven is not fan-assisted, so adjust the temperature setting that the test specimen reaches a temperature of 80 °C within a period of 8 min to 9 min.

**7.1.6** After 8 min, remove one former from the oven (using heat-resistant gloves) and fit the bottom of the former's plunger onto the shaped base of the toggle type clamp.

**7.1.7** Loosen screw S. Immediately close the toggle handle so that cylinder Y is pushed into contact with the base of the clamp. Hold the cylinder in this position and retighten screw S.

**7.1.8** Mould the test specimens in the remaining five formers without delay in the same way, removing them from the oven one at a time, so that all six are moulded within one minute.

**7.1.9** After dome forming, leave the formers for at least 2 h in a conditioned atmosphere as specified in ISO 17709, before removing the test specimens from them. Leave the test specimens in this conditioned atmosphere for a further 0.5 h before testing.

## **7.2 Forming domes of solvent activated footwear materials**

**7.2.1** Repeat the steps given in 7.1.1 and 7.1.2.

**7.2.2** Loosen screw S and slide plunger P down in cylinder Y. Retighten screw S.

**7.2.3** Spray plunger P's dome, the top and inside surfaces of cylinder Y and the inside surfaces of clamping ring R with the silicone-based release agent (see 5.1.2).

**7.2.4** Pour solvent (see 5.1.1, or use solvent recommended by the manufacturer of the material) into a dish or beaker.

**7.2.5** Using a pair of tongs, dip a test specimen into the solvent and remove after 1 s.

**7.2.6** Place the test specimen on a wire mesh and allow to stand for 2 min, unless otherwise specified by the manufacturer of the material.

**7.2.7** Place a polythene disc (see 6.3) centrally on the top edge of cylinder Y, followed by the solvent-activated test specimen and a polythene ring (see 6.2). Thereafter, place clamping ring R over cylinder Y and attach toggle clips C to lugs L and close.

**7.2.8** Fit the bottom of plunger P into the shaped base of the toggle type clamp.

**7.2.9** Loosen screw S. Immediately close the toggle handle so that cylinder Y is pushed into contact with the base of the clamp. Hold the cylinder in this position and retighten screw S.

**7.2.10** Mould the five remaining test specimens in formers in the same way.

**7.2.11** After dome forming, leave the formers for 24 h in a conditioned atmosphere as specified in ISO 17709, before removing the test specimens from them. Leave the test specimens in this conditioned atmosphere for a further 24 h before testing.

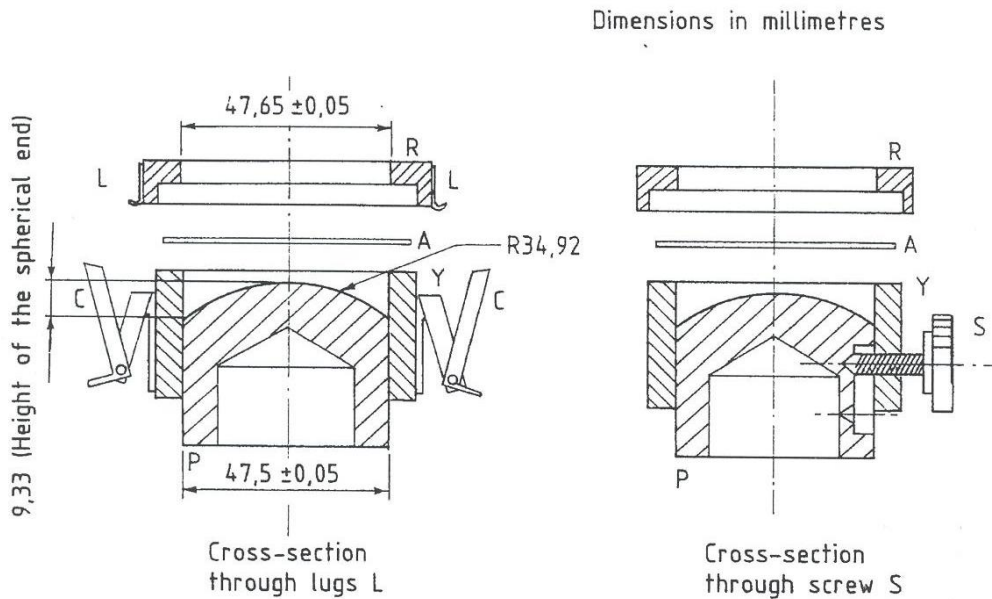


Figure 1 — Exploded cross-sectional view of dome former

## 8 Procedure (Part B)

### 8.1 General

Submit three test specimens to the dry collapsing load test and three to the wet collapsing load test.

### 8.2 Dry collapsing load

**8.2.1** Fit the compression cage (see 5.3.2) into the tensile testing machine (see 5.3.1). Set the machine to a suitable load range.

**8.2.2** Place a dry test specimen in the compression cage such that the test specimen is centrally under the compression plunger. and start the machine. (The compression will need to be stopped once it is clear that the peak load has been reached and passed.) Record the peak load as the "first dry collapsing load"  $L$  for that test specimen, and then remove the test specimen.

**8.2.3** Reset the cross-head of the tensile machine, and test the two remaining test specimens as in 8.2.2. Calculate and report the average of these three results as the "average first dry collapsing load"  $L_1$  of the material.

**8.2.4** Using a test specimen from 8.2.3, remove any deformation with the fingers. Now collapse the test specimen, using the manually operated repeated collapsing device (see 5.3.3) eight times, ensuring that the centre of the dome touches the baseplate every time. Remove any deformation with the fingers. Collapse the remaining two test specimens in the same way.

**8.2.5** Re-measure the collapsing loads of all three test specimens, using the procedure described in 8.2.2 and 8.2.3; calculate the average of the results and report this as the "average tenth dry collapsing load"



### 8.3 Wet collapsing load

**8.3.1** Soak the three test specimens for the wet tests in deionized or distilled water at  $20\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$  for 1 h.

**8.3.2** Measure the collapsing loads of each wet test specimen in the same way as for the dry test specimens. Calculate and report the "average first wet collapsing load"  $L_1$  and the "average tenth wet collapsing load"  $L_{10}$

## 9 Calculation of results for wet and dry test specimens

Calculate the resilience  $R$  in the following way:

$$R = \frac{L_{10}}{L_1} \times 100$$

where

$R$  is the resilience, as a percentage, of the material.

$L_{10}$  is the average tenth, in Newtons, of wet or dry collapsing load. and

$L_1$  is the average first wet or dry collapsing load, in Newtons.

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## Bibliography

US 583:2007, *Footwear materials — Determination of collapsing load of domed shapes*

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