DUS 1891

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Standard specification for plastic films made from low-density Polyethylene and Linear Low-Density Polyethylene for general use and packaging applications

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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 co-ordinate the elaboration of standards and is

(a) a member of International Organisation for Standardisation (ISO) and

(b) a contact point for the WHO/FAO Codex Alimentarius Commission on Food Standards, and

(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 19, Packaging and Packaging products

Standard specification for plastic films made from low-density Polyethylene and Linear Low-Density Polyethylene for general use and packaging applications

1 Scope

1.1 This specification covers unpigmented, unsupported, low-density polyethylene and linear low-density polyethylene films (hereafter referred to as film or films) with densities ranging from 0.910 g/cm^3 - 0.925 g/cm^3.

Note 1 The density of a film will not necessarily be equal to the density of a moulded plaque from the same resin.

Note 2 Blends of ethylene/vinyl acetate (EVA) with low-density polyethylene may have densities up to 0.929 g/cm^3.

1.2 This specification is applicable to homopolymer polyethylene, but is not restricted to it. It is applicable to films made from polyethylene copolymers, and also applicable to films made from blends of homopolymers and copolymers, including ethylene/vinyl acetate copolymers.

1.3 The thickness of the films covered by this specification is from 30.0 µm to 101.6 µm, inclusive. The maximum width of the sheet or lay flat is 3.30 m.

1.4 This specification does not cover oriented heat-shrinkable films.

1.5 This specification allows for the use of recycled polyethylene film or resin as feedstock, in whole or in part, as long as all of the requirements of this specification are met and as long as any specific requirements as governed by the producer and end user are also met.

1.6 This specification defines the levels of the various physical properties from which specifications for specific films may be described.

1.7 This specification covers dimensional tolerances, classifications, intrinsic quality requirements, and test methods. The dimensional tolerances include thickness, width, and length or yield. Classification defines types, classes, surfaces, and finishes. The intrinsic quality requirements include density, workmanship, tensile strength, heat sealability, and odour, as well as the classification properties for impact strength, coefficient of friction, optical properties, and surface treatment. A sampling method is included.

1.8 This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

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.

ISO 4593, Plastics — Film and sheeting — Determination of thickness by mechanical scanning

ISO 472, Plastics — Vocabulary

ISO 13468-1, Plastics — Determination of the total luminous transmittance of transparent materials — Part 1: Single-beam instrument

ISO 1183-1, Plastics — Methods for determining the density of non-cellular plastics — Part 1: Immersion method, liquid pycnometer method and titration method

ISO 1183-2, Plastics — Methods for determining the density of non-cellular plastics — Part 2: Density gradient column method

ISO 7765-1, Plastics film and sheeting — Determination of impact resistance by the free-falling dart method — Part 1: Staircase methods

ISO 7765-2, Plastics film and sheeting — Determination of impact resistance by the free-falling dart method — Part 2: Instrumented puncture test

ISO 8295, Plastics — Film and sheeting — Determination of the coefficients of friction

ISO 6383-1, Plastics — Film and sheeting — Determination of tear resistance — Part 1: Trouser tear method

ISO 6383-2, Plastics — Film and sheeting — Determination of tear resistance — Part 2: Elmendorf method

DUS 1892, Test method for specular gloss of plastic films and solid plastics

ISO 8296, Plastics — Film and sheeting — Determination of wetting tension

ISO 4591, Plastics — Film and sheeting — Determination of average thickness of a sample, and average thickness and yield of a roll, by gravimetric techniques (gravimetric thickness)

ISO 527-3, Plastics — Determination of tensile properties — Part 3: Test conditions for films and sheets

ISO 293, Plastics — Compression moulding of test specimens of thermoplastic materials

DUS1893, Test method for odour and taste transfer from polymeric packaging film

DUS 1894, Test method for seal strength of flexible barrier materials

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 472 apply.

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

4 Classification

The low-density polyethylene film is, by this specification, classified by Types 1, 2, and 3; Surfaces 1, 2, and 3; Classes 1, 2, 3, and 4; and Finishes 1, 2, 3, and 4. These classifications are described in detail in 6.1.

5 Materials

5.1 The film shall be made from an ethylene homopolymer, ethylene copolymers, or blends of homopolymers or copolymers, or homopolymer and copolymer, so that it meets the density and other film requirements listed herein.

5.2 The film shall be made from resins having densities between 0.910 g/cm^3 and 0.925 g/cm^3 (910.0 kg/m^3 and 925.0 kg/m^3), inclusive. This is the range of standard densities in the definition of low-density polyethylene. Standard density refers to the density of the material moulded to a thickness of 1.9 mm using procedure in ISO 293.

5.3 The film shall be natural in colour (essentially colourless).

6 Physical requirements

6.1 Classification properties:

6.1.1 Type

The dart drop impact for all thickness of film shall be as specified in Table 1 for Types 1, 2, and 3.

Table 1 — Classification for type

Film Thickness µm	Drop Dart (g, min)[A]		
	Type 1	Type 2	Type 3
38	65	105	140
51	85	135	175
76.2	125	195	245
101.6	165	255	315
[A] Impact limits for thickness not covered in this table will be determined by linear interpolation between successive values in this table.			

6.1.2 Surface

The kinetic coefficient of friction shall be as specified in Table 2 for Surfaces 1, 2, and 3.

Table 2 — Classification for surface

Surface	Coefficient of friction
1	>0.5
2	>0.2 to 0.5
3	0.2 or less

6.1.3 Class

The optical properties shall be as specified in Table 3 for Classes 1, 2, and 3. The optical properties of gloss and haze do not always correlate. The particular property of most importance for the specific application shall be established, and the value for this property shall then govern in case of any inconsistency.

Table 3 — Optical properties for classes

Class	Gloss units	Haze, %
1	30 or less	>25

2	>30 to 50	>10 to 25
3	>50 to 70	>5 to 10
4	>70	0 to 5

6.1.4 Finish

The surface treatment level of the film shall be as specified in Table 4 for Finishes 1, 2, 3, and 4.

Table 4 — Classification for finish

Finish	Wetting tension, mN/m (dynes/cm)
1	32, 33, 34
2	35, 36, 37
3	38, 39, 40
4	41 and over

6.2 Other properties

6.2.1 Tensile properties

The tensile strength and elongation at break for all thicknesses shall be as specified in Table 5.

Table 5 — Tensile properties

Property	Units	Machine direction	Transverse direction
Tensile Strength, min.	MPa	11.7	8.3
Tensile Elongation, min.	%	225	350

6.2.2 Heat sealability

The minimum ratio of heat-seal strength to the film strength in the two principal directions shall be as specified in Table 6

Table 6 — Heat sealability [A]

Finish of contact surfaces [B]	Heat sealability, min
2 to 2	0.60
1 to 2	0.60
1 to 1	0.75

A Heat sealability is the ratio of the tensile strength of the heat-sealed specimen to the tensile strength of the original film specimen.

B Heat sealability is not applicable to films with finish greater than two; this does not infer that films with finishes greater than two cannot be sealed

6.2.3 Odour

The odour level of the film shall average no more than a 3.5 rating level.

7 Dimensions

7.1 Size

The nominal thickness, width, length per roll or roll diameter, yield of the film and dimension tolerances for "J-sheeting" lip and gusset depth shall be established by mutual agreement between the purchaser and the supplier.

7.2 Thickness tolerance

The thickness variation across the film shall be within the tolerances given in Table 7

Table 7 — Tolerance, percent from nominal thickness [A]

Film width mm	Across film [B] tolerance %
1270 or less	±5
>1270 to 3300	±10

[A] Use Table 9 as the controlling table for average gage in terms of yield. For minimum gage requirements, order film specifying nominal gage greater than the required minimum by at least the percent tolerance set above.

[B] No single measurement shall differ from the nominal gage by more than the tolerance listed in this table.

7.3 Width tolerance

The width shall be within the tolerances given in Table 8.

Table 8 — Width tolerances across sheet or layflat tubing

Film widths mm	Sheeting, mm	Layflat tubing mm
381 or less	–0, +4.76	–0, +4.76
>381 to 762	–0, +6.35	–0, +9.53
>762 to 1524	–0, +9.53	–0, +15.87
>1524 to 3300	–0, +12.7	–0, +25.4

7.4 Yield tolerance

The deviation of the actual yield from nominal yield shall be within the tolerances given in Table 9.

Table 9 — Deviation, actual yield from nominal yield

Quantity, kg	Tolerances, %
Any one roll	±10
500 or less	±10
500-1000	±5
Over 1000	±3 %

7.5 Flatness

The flatness of the film shall be within limits as mutually agreed upon between the buyer and the seller.

8 Workmanship, finish, and appearance

8.1 Film

The film shall have workmanship qualities conforming to good commercial practice. The quality of film with regard to gels, streaks, pinholes, particles of foreign matter, scratches, wrinkles, wind chatter, undispersed raw materials, holes, tears, and blisters shall be mutually established by the purchaser and the supplier.

8.2 Roll formation

8.2.1 The diameter of cores upon which film is wound shall be established by mutual agreement between the purchaser and the supplier.

8.2.2 Cores upon which film is wound must not be recessed at either edge of the roll, but shall be allowed to extend up to 6.35 mm beyond either edge of the roll or as established by mutual agreement between the purchaser and the supplier.

8.2.3 Rolls with cores that are crushed and are not able to be mounted on the purchaser's equipment are to be considered rejects.

8.2.4 Ridges and soft spots that result in bagginess and looseness of the unwound film are unacceptable and shall be rejected by the purchaser on a roll-to-roll basis if the conditions contribute to poor performance of the film in end-use application.

8.2.5 The edges of the roll must be free of nicks and cuts, and the general condition of roll edges must not interfere with the unwinding of the rolls.

8.2.6 The type and number of splices, flaggings of splices, or breaks (if unspliced) in rolls of more than one piece shall be established by mutual agreement between the supplier and the purchaser.

9 Sampling

9.1 Statistically based sampling plans which are appropriate for each particular product or quantity may be used to obtain samples for use in determining compliance with this specification.

9.2 For the purposes of developing supplier-purchaser specifications, a lot size generally refers to the number of rolls in a lot. Sampling units are those rolls selected by random numbers from the lot. A unit sample is the sample of film taken from the roll. Care must be exercised in taking unit samples. Unwind and then discard several turns from the roll and then take more than enough sample to run all specified tests. Keep the sample from becoming soiled. Ensure that the sample is not folded or creased excessively

10 Test methods

10.1 Conditioning

Condition the test specimens at 23 ± 2°C and 50 ± 10 % relative humidity for not less than 40 h prior to test in accordance with procedure A of practice DUS 1881 unless otherwise specified by agreement or the relevant material specification. In cases of disagreement, the tolerances shall be ±1°C and ±5 % relative humidity.

10.2 Test conditions

Conduct the tests at 23 ± 2°C and 50 ± 10 % relative humidity unless otherwise specified by agreement or the relevant material specification. In cases of disagreement, the tolerances shall be ±1°C and ±5 % relative humidity.

10.3 Width

Measure width with a metal rule capable of measuring to an accuracy of ±1.59 mm.

10.4 Thickness

Measure thickness in accordance with ISO 4593.

10.5 Yield

This shall be conducted in accordance with ISO 4591.

10.6 Flatness

Measure flatness using a method mutually agreed upon between the purchaser and the supplier.

10.7 Density

The density of resins from which the film is made shall be measured in accordance with ISO 1183-1 or test method ISO 1183-2.

10.8 Coefficient of friction

The static and kinetic coefficients of friction shall be measured in accordance with ISO 8295. The test shall be conducted film to film, in both the machine direction and transverse direction.

10.9 Optical properties

10.9.1 Clarity

Measure clarity of the film by visual or instrumented means, as agreed upon between the purchaser and the supplier.

10.9.2 Gloss

Measure gloss of the film in accordance with test method DUS 1892, using a 45° gloss head.

10.9.3 Haze

Measure haze in accordance with test method ISO 13468-1.

10.10 Wetting tension

Measure wetting tension in accordance with test method ISO 8296.

10.11 Impact resistance

Measure impact resistance in accordance with test methods ISO 7765-1 or ISO 7765-2.

10.12 Tensile properties

Measure tensile strength and elongation at break in accordance with test method ISO 527-3.

10.13 Heat sealability

Measure heat sealability in accordance with test methods DUS 1894, test method B, dynamic load test.

10.14 Odor

Measure odor level in accordance with test method DUS1893, low to moderate scale.

10.15 Tear resistance

Measure tear resistance in accordance with test method ISO 6383-1 or ISO 6383-2, as agreed upon between the purchaser and the supplier.

11 Inspection and certification

11.1 Inspection and certification of the material supplied under this specification shall be for conformance to the requirements specified herein.

11.2 Lot-acceptance inspection shall be the basis on which acceptance or rejection of the lot is made. The lot-acceptance inspection shall consist of those tests that ensure process control during manufacture as well as those necessary to ensure certification in accordance with 11.4.

11.3 Periodic check inspection shall consist of the tests specified for all requirements of the material under this specification. Inspection frequency shall be adequate to ensure that the material is certifiable in accordance with 11.4.

11.4 Certification shall be that the material was manufactured, sampled, tested, and inspected in accordance with this specification and that average values meet the requirements at a confidence level of 95 %.

11.5 A report of the test results shall be furnished when requested. The report shall consist of results of the lot-acceptance inspection for the shipment and results of the most recent periodic-check inspection.

12 Packaging and package marking

12.1 Packaging

The material shall be packaged in a manner that protects the integrity of the film or sheeting.

12.2 Labelling

The film shall be supplied with a label that bears the following information:

a) manufacturer's name and/ or registered trade mark and address,

b) type,

c) surface,

d) class,

e) finish (if treated, the treated side of the film shall be clearly identified), and

f) reference number of this Uganda standard.

Bibliography

ASTM D4635 – 16, Standard Specification for Plastic Films Made from Low-Density Polyethylene and Linear Low-Density Polyethylene for General Use and Packaging Applications

Certification marking

Products that conform to Uganda standards may be marked with Uganda National Bureau of Standards (UNBS) Certification Mark shown in the figure below.

The use of the UNBS Certification Mark is governed by the Standards Act, and the Regulations made thereunder. This mark can be used only by those licensed under the certification mark scheme operated by the Uganda National Bureau of Standards and in conjunction with the relevant Uganda Standard. The presence of this mark on a product or in relation to a product is an assurance that the goods comply with the requirements of that standard under a system of supervision, control and testing in accordance with the certification mark scheme of the Uganda National Bureau of Standards. UNBS marked products are continually checked by UNBS for conformity to that standard.

Further particulars of the terms and conditions of licensing may be obtained from the Director, Uganda National Bureau of Standards.

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