

**ICS 87.040**

**DMS 393:2018**

Third edition

**DRAFT PROPOSAL**

## **Undercoats for paints – Specification**

**NOTE: This is a draft proposal. It shall neither be used nor regarded as a Malawi Standard**

# **Undercoats for paints – Specification**

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## TABLE OF CONTENTS

Content	Page
Foreword.....	i
Technical committee.....	i
Notice.....	i
Scope.....	1
Normative references .....	1
Definitions .....	2
Requirements .....	2
Packing and marking .....	5
Sampling and compliance.....	5
Methods of test .....	6
Annex A (Normative): Notes to purchasers .....	9
Annex B (Informative): Components of colour difference.....	10
Annex C (Informative): Quality verification of undercoats for paints .....	11

## FOREWORD

This draft Malawi standard was prepared by the Technical Committee MBS/TC 12, *Paints and varnishes*. During the preparation of this standard reference was made to the following South African National Standard:

SANS 681:2014 Edition 3.3, *Undercoats for paints – Specification*.

Acknowledgement is hereby made for use of the standard.

Annex A forms an integral part of this standard. Annexes B and C are for information only. This edition of the standard cancels and replaces the second edition (MS 393:2013). Technical modification to this document has been done through inclusion of **7.3.4** under sub clause **7.3**, application properties for dilution stability of paints for brush application.

## TECHNICAL COMMITTEE

This draft Malawi standard was prepared by the MBS/TC 12, Technical Committee on *Paints and varnishes* and the following companies, organizations and institutions were represented:

- Malawi Polytechnic
- Blantyre City Council
- Chancellor college
- Monolux paints Limited
- Rainbow Paints Limited
- Kansai Plascon Limited
- National Construction Industry Council (NCIC)
- Malawi Building and Civil-Engineering Allied Traders Association ( MABCATA)
- Malawi Bureau of Standards
- Malawi Housing Corporation
- Royale Chemicals Limited
- Valmore Paints Limited

## NOTICE

*This standard shall be reviewed every five years or earlier, whenever necessary, in order to keep abreast of progress. Comments are welcome and shall be considered when the standard is being reviewed.*

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**DRAFT PROPOSAL**

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**Undercoats for paints – Specification**

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**1 SCOPE**

This draft standard specifies requirements for two grades of undercoat, Grade 1 and Grade 2, for use under air-drying paints and for application over primed steel and wood and on sealed and primed masonry, hardboard, compressed fibreboard and similar materials used in the construction and furnishing of buildings.

**2 NORMATIVE REFERENCES**

The following standards contain provisions, which, through reference in this text, constitute provisions of this draft standard. All standards are subject to revision and, since any reference to a standard is deemed to be a reference to the latest edition of that standard, parties to agreements based on this draft standard are encouraged to take steps to ensure the use of the most recent editions of the standards listed below. Information on currently valid national and international standards can be obtained from the Malawi Bureau of Standards.

MS 275, *Paints and varnishes – Comparison of contrast ratio (hiding power) of paints of the same type and colour;*

MS 274, *Paints and varnishes – Standard panels for testing;*

MS 276, *Paints and varnishes – Measurement of specular gloss of non-metallic paint films at 20°, 60° and 85°;*

MS 283, *Standard test method for low concentration of lead, cadmium, and cobalt in paint by Atomic Absorption Spectroscopy;*

MS 722, *Labelling, Presentation and advertising of prepacked goods for the ultimate consumer;*

MS 282, *Decorative high gloss enamel paints;*

MS 892, *Paints and varnishes – Examination and preparation of samples for testing;*

MS 1007, *Paints and varnishes – Determination of brush and roller properties;*

MS 1009, *Paints, varnishes and printing inks – Determination of fineness of grind;*

MS 1010-1, *Paints and varnishes – Determination of hiding power - Part 1: Kubelka-Munk method for white and light-coloured paints;*

MS 1014-1, *Paints and varnishes – Colorimetry – Part 1: Principles;*

MS 1014-2, *Paints and varnishes – Colorimetry – Part 2: Colour measurement;*

MS 1014-3, *Paints and varnishes – Colorimetry – Part 3: Calculation of colour differences;*

MS 1016-1, *Paints and varnishes – Drying tests – Part 1: Determination of through-dry state and through-dry time;*

MS 1016-3, *Paints and varnishes – Drying tests – Part 3: Surface-drying test using ballotini;*

MS 1017, *Method for calculation of small colour differences;*

MS 1018, *Paints and varnishes – Determination of viscosity by means of an efflux cup;*

MS 1019, *Paints and varnishes – Cross-cut test;*

MS 1020, *Paints and varnishes – Sanding properties of paint film;*

MS 1027, *Paints and varnishes – Determination of viscosity by means of a Stormer viscometer; and*

MS-ISO 9001, *Quality management systems – requirements.*

### 3 TERMS AND DEFINITIONS

For the purposes of this draft standard, the following terms and definitions apply.

#### 3.1

##### **defective**

test sample or a container of the undercoat that fails in one or more respects to comply with the relevant requirements of this draft standard

#### 3.2

##### **lot**

the quantity of undercoat of the same grade and colour, in containers bearing the same batch identification, produced by one manufacturer, and submitted at any time for inspection and testing

#### 3.3

##### **reflectivity**

reflectance of a paint film of such thickness that a further increase in thickness gives no further change in reflectance

#### 3.4

##### **standard atmosphere**

an enclosed atmosphere of  $23\text{ °C} \pm 2\text{ °C}$  temperature and  $(50 \pm 5)\%$  relative humidity

#### 3.5

##### **Grade 1 undercoat**

is a high hiding power undercoat that will allow a reduction in the number of coats in the paint system necessary to obtain complete obliteration of the substrate

#### 3.6

##### **Grade 2 undercoat (utility grade)**

is a low hiding power undercoat.

### 4 REQUIREMENTS

#### 4.1 Grades

An undercoat for paint shall be of one of the following grades, as required (see annex A):

- a) **Grade 1:** High hiding; or
- b) **Grade 2:** Utility grade.

#### 4.2 Condition in the container

When undercoat from a newly opened container is examined in accordance with MS 892, it shall be free from lumps, skin, extraneous matter, colour separation and hard settlement. If settlement is observed, the undercoat shall be capable of being readily redispersed to a smooth, homogeneous state by using a palette knife.

#### 4.3 Storage stability

If stored in accordance with 7.2 and then examined in accordance with MS 892, the undercoat shall show no livering, and no hard or dry settlement. The undercoat shall be capable of easy and rapid redispersion to a smooth, homogeneous state. The undercoat shall not contain any skin.

#### **4.4 Application properties**

##### **4.4.1 Brush application**

When applied to a vertical steel panel (see 7.1.1.1), of size at least 100 mm × 200 mm, and then tested in accordance with MS 1007, the unthinned undercoat shall brush without excessive drag, and shall join without lap marks after drying for 5 min.

The dry film shall have an even, level surface, free from flotation and from sag or ciss marks.

##### **4.4.2 Roller application**

When applied to a vertical steel panel (see 7.1.1.1) of size at least 300 mm × 300 mm and then tested in accordance with MS 1007, the unthinned undercoat shall roll without perceptible drag. The undercoat shall flow well, spread without foaming or ribbing, and join without lap marks after drying for 5 min.

The dry film shall have an even, level surface free from flotation or pinholes and from sag or ciss marks.

##### **4.4.3 Reducibility with mineral turpentine**

When tested in accordance with 7.3.1, the undercoat shall mix readily with the mineral turpentine to a smooth, homogenous state and shall show no incompatibility after the standing period of 1 h.

##### **4.4.4 Spray application**

When tested in accordance with 7.3.2, the undercoat shall spray without spattering, and shall show no tendency to sag or run. The dry film shall be even, level, free from sag or ciss marks, "orange peel" or flotation.

##### **4.4.5 Recoating properties**

When the undercoat is overcoated with a gloss enamel in accordance with 7.3.3, there shall be no ciss marks or lifting of the gloss enamel film in the wet or dry state.

The loss of gloss of the gloss enamel applied over the undercoat shall not exceed 10 % of the gloss of the enamel applied direct to the second panel.

The cross-cut classification shall not exceed 1, either between the paint and the panel or between the undercoat and the enamel.

#### **4.5 Fineness of grind**

When determined in accordance with MS 1009, the fineness of grind of the undercoat shall not exceed 40 µm.

#### **4.6 Drying time**

##### **4.6.1 Surface-dry time**

When the undercoat is applied (see 7.1.2) with an adjustable applicator blade to a glass panel (see 7.1.1.3) and is then tested in accordance with MS 1016-3, the surface-dry time shall not exceed 4 h.

##### **4.6.2 Hard-dry time**

When the undercoat is applied (see 7.1.2) with an adjustable applicator blade to a glass panel (see 7.1.1.3) and is then tested in accordance with MS 1016-1, using a plunger mass of 6.75 kg, the hard-dry time shall not exceed 16 h.

#### 4.7 Hiding power

When the hiding power of the undercoat, applied at the relevant wet film thickness given in table 1, is determined in accordance with MS 275, using a reflectometer with a C illuminant on black and white cards, the contrast ratio (calculated as a percentage) shall be at least 98.5 %.

**Table 1 – Wet film thicknesses of undercoat to be used in contrast ratio determination**

1	2	3
Reflectivity %	Wet film thickness $\mu\text{m}$	
	Grade 1	Grade 2
Over 60	100	200
40 - 60	80	150
25 – 39.9	70	120
Below 25	60	100

#### 4.8 Colour

**4.8.1** When the colour of the undercoat is compared visually in accordance with 7.4.2, with a standard colour agreed upon by the interested parties (see Annex A), the colour difference rating shall not exceed 3.

**4.8.2** When the colour of the undercoat is compared instrumentally in accordance with 7.4.3, with a standard colour agreed upon by the interested parties (see Annex A), the total colour difference  $DE_{CMC}$  (see note), determined in accordance with MS 1017, shall be small enough that the alb plot falls within the ellipsoid for the standard colour that is defined by the semi-axis  $S_L$ ,  $S_C$  and  $S_H$  and has a unit volume tolerance of 2.

**NOTE** – The notation  $DE_{CMC}$  as used here and in commercially available software corresponds with the  $DE$  defined in MS 1017, with  $l = c = 1$  as chosen values.

#### 4.9 Reflectivity of white undercoats

When a white undercoat is drawn down onto a glass panel (see 7.1.1.3) with an applicator blade with a gap clearance of 250  $\mu\text{m}$  and is allowed to dry for at least 16 h, the reflectivity  $R_\infty$  of the paint, determined in accordance with MS 1010-1 and using a reflectometer with a C illuminant, shall be at least 80.

#### 4.10 60° Specular gloss

When the undercoat is applied (see 7.1.2) to a glass panel (see 7.1.1.3) with an adjustable applicator blade and is then tested in accordance with MS 276, the 60° specular gloss of the dry undercoat shall not exceed 30.

#### 4.11 Sanding properties

When the undercoat is tested in accordance with 7.5, there shall be no clogging of the sandpaper, and the film shall feel smooth and shall not have been totally removed by the sanding.

#### 4.12 Flexibility

When the undercoat is tested in accordance with 7.6, using a 7 mm mandrel for Grade 1 undercoats and a 9 mm mandrel for Grade 2 undercoats, the film shall not crack or flake or show loss of adhesion.

#### **4.13 Consistency**

##### **4.13.1 Brushing consistency**

When tested in accordance with MS 1027, the consistency of the undercoat shall be 72 – 95 KU.

##### **4.13.2 Spraying consistency**

When tested in accordance with MS 1018, after thinning with not more than 15 % (v/v) of the thinner recommended by the manufacturer the undercoat shall have a consistency of 15 – 30 s.

#### **4.14 Lead content**

When tested in accordance with MS 283, the undercoat shall not contain lead.

### **5 PACKING AND MARKING**

#### **5.1 Packing**

The undercoat shall be packed in clean, dry containers. The containers shall be strong enough to withstand normal usage, and shall be adequately sealed to prevent leakage and contamination of the contents during normal transportation, handling and storage.

#### **5.2 Marking**

Labeling and marking shall comply with MS 722 with each container, or a label securely fixed to the container, shall be clearly, legibly and indelibly marked with at least the following information:

- a) The manufacturer's name, or the brand name of the product, or both;
- b) The word "undercoat";
- c) The grade (see 4.1);
- d) A description, in words, of the grade (see 4.1);
- e) The colour of the undercoat;
- f) The batch identification;
- g) Date of manufacture;
- h) The directions for use; and
- i) The shelf life.

### **6 SAMPLING AND COMPLIANCE**

#### **6.1 Sampling**

The following sampling procedure shall be applied in determining whether a lot complies with the relevant requirements of this draft standard. The samples so drawn shall be deemed to represent the lot.

##### **6.1.1 Samples for storage stability test**

From the lot draw at random three containers, each of capacity at least 1 ℓ. If the containers in the lot have a capacity of less than 1 ℓ, draw at random three containers of the greatest capacity. Use these samples for the storage stability tests and the test for condition in the container.

## 6.1.2 Sample for inspection and remaining tests

From the lot draw at random one container. Remove any surface skin that may be present, thoroughly stir or mix the contents of the container(s) so drawn until a completely homogeneous product is obtained and take from the container(s) a test sample of volume at least 1 l. If the containers in the lot have a capacity of less than 1 l, take at random enough containers to provide a 1 l test sample. Use this sample for the remainder of the tests.

## 6.2 Compliance

The lot shall be deemed to comply with the requirements of this standard if, upon inspection of the containers in the lot and upon testing the samples drawn in accordance with 6.1, no defective is found.

**NOTE** – Refer to annex C regarding quality verification.

## 7 METHODS OF TEST

### 7.1 Preparation

#### 7.1.1 Test panels

**7.1.1.1 Steel panels**, of size 70 mm x 150 mm (unless otherwise specified) and of thickness 0.60 mm to 0.90 mm, and that have been solvent-cleaned in accordance with MS 274.

**7.1.1.2 Steel panels** (for flexibility test only), of size 70 mm x 150 mm and of thickness 0.50 mm, and that have been solvent-cleaned in accordance with MS 274.

**7.1.1.3 Glass panels**, of size 70 mm x 150 mm (unless otherwise specified), and that have been solvent-cleaned in accordance with MS 274.

#### 7.1.2 Wet film thickness

Apply the undercoat at a wet film thickness of 60 µm to 65 µm per coat, unless otherwise specified.

### 7.2 Storage stability

Store a full, closed 500 ml container of the undercoat, undisturbed, in an upright position, at a temperature of  $23 \pm 2$  °C. Examine after a period of 30 days and again after a period of 12 months.

Use a palette knife to examine the undercoat for compliance with 4.3 after the relevant storage periods.

### 7.3 Application properties

#### 7.3.1 Reducibility with mineral turpentine

**7.3.1.1** As a thinner, use mineral turpentine that contains between 12 % and 18 % (by volume) of aromatic solvent and that has a boiling range of 130 to 200 °C.

**7.3.1.2** Dilute eight volumes of undercoat (at a temperature in the range 21 to 32 °C) with one volume of mineral turpentine at the same temperature. In accordance with 7.3.4, leave the reduced undercoat to stand at  $23 \pm 2$  °C for 1 h.

Examine the condition of the undercoat in the container for compliance with 4.4.

#### 7.3.2 Spray application

Thin the reduced undercoat further to spraying viscosity (15 s to 30 s, when determined with a Ford No.4 viscosity cup, in accordance with MS 1018). Apply the paint to a vertical glass panel (see 7.1.1.3), of size 100 mm x 300 mm, using a conventional spray gun with an external mix nozzle and air cap, and an atomizing pressure of 350 kPa. Maintain a distance of 250 mm between the nozzle tip and the panel and a

fan setting of approximately 45°. Regulate the traverse speed of the spray gun to obtain a wet film thickness of  $75 \pm 5 \mu\text{m}$  after two complete passes.

During spraying, examine the spray pattern for freedom from spattering. Leave to dry in a vertical position. Examine the wet film and the dry film for freedom from sag marks and ciss marks.

### **7.3.3 Recoating properties**

Apply a film of the undercoat (see **7.1.2**), by brush, to a steel panel (see **7.1.1.1**) burnished in accordance with MS 274. Allow to dry in a standard atmosphere for 16 h. Apply, by brush, to a wet film of thickness  $60 \mu\text{m}$  to  $65 \mu\text{m}$ , a coat of gloss enamel that complies with MS 282 and is supplied by the same manufacturer as the undercoat. Examine the wet film for film defects.

At the same time, apply, by brush, an equally thick layer of the gloss enamel direct to a second steel panel. Allow both panels to dry for 24 h and determine the  $60^\circ$  gloss of each in accordance with MS 276.

Determine the cross-cut classification on the first panel (with both undercoat and gloss enamel) in accordance with MS 1019, using 2 mm spacings between cuts. Examine the cuts for loss of intercoat adhesion.

### **7.3.4 Dilution stability of paints for brush application**

#### **7.3.4.1 Apparatus**

**7.3.4.1.1 Container**, any suitable well-stoppered container of convenient size.

**7.3.4.1.2 Panel**, a window glass panel of size approximately 150 mm x 70 mm.

#### **7.3.4.2 Diluent**

The specified paint thinner or solvent.

#### **7.3.4.3 Procedure**

**7.3.4.3.1** Dilute the well-mixed paint with the specified volume of the diluent or according to the manufacturer's printed instructions. Observe whether the paint mixes readily and easily with the diluent. Almost fill the container with the diluted paint, stopper it well, and leave for the specified period at  $25 \pm 2^\circ\text{C}$ .

**7.3.4.3.2** At the end of this period examine the diluted paint for signs of incompatibility, gelling, precipitation, and other specified undesirable characteristics. Flow the paint out on the glass panel, dry it, and inspect for defects in the dried film.

## **7.4 Colour**

### **7.4.1 Panel preparation**

Draw down a single film of undercoat with an adjustable applicator blade onto a glass panel (see **7.1.1.3**) at the appropriate wet film thickness specified in Table 1. Leave to dry for 16 h in a standard atmosphere.

### **7.4.2 Visual comparison**

Compare the colour of the undercoat with that of the standard colour, and express the colour difference in terms of the ratings given in Table 2.

**Table 2 – Colour rating**

1	2
Rating	Intensity of difference
0	No perceptible difference
1	Very slight, i.e. just perceptible
2	Slight, i.e. clearly perceptible
3	Moderate, i.e. very clearly perceptible
4	Considerable, i.e. pronounced
5	Severe, i.e. very pronounced
<b>NOTE</b> – The components of colour differences are given in annex C	

### 7.4.3 Instrumental comparison

Determine the colour co-ordinate values  $CIE L$ ,  $a$  and  $b$  of the test undercoat and of the standard colour in accordance with MS 1014-1 and MS 1014-2.

Plot the ellipsoid of the standard colour, describing  $\Delta E_{CMC}$  of volume tolerance of 2 in accordance with MS 1017. Plot the values of  $a$  and  $b$  in the same plane.

### 7.5 Sanding properties

Draw the undercoat down (see 7.1.2) onto a steel panel (see 7.1.1.1) of size 450 mm x 150 mm. Allow the panel to dry in a standard atmosphere for 16 h and determine the sanding properties of the undercoat in accordance with MS 1020, subjecting the panel to 15 oscillations of the abrasive boat.

Examine the film for compliance with 4.11.

### 7.6 Flexibility

#### 7.6.1 Apparatus

**7.6.1.1 Cylindrical mandrel**, as specified in MS 1021, with mandrels of diameter 7 mm or 9 mm, as required (see 4.12).

**7.6.1.2 Oven**, maintained at a temperature of  $70 \pm 2$  °C.

**7.6.1.3 Magnifying means**, capable of 10x magnification.

#### 7.6.2 Procedure

Draw the undercoat down onto a steel panel (see 7.1.1.2). Allow the panel to dry for 24 h in a standard atmosphere and then store it at  $70 \text{ °C} \pm 2 \text{ °C}$  for 24 h. Condition the panel at  $23 \pm 2$  °C before testing it in accordance with MS 1021, using the appropriate mandrel.

Examine the undercoat film at the bend, using 10x magnification.

**ANNEX A**  
(Normative)

**NOTES TO PURCHASERS**

**A.1** The following requirement shall be specified in tender invitations and in each order or contract:

The grade of the undercoat (see **4.1**).

**A.2** The following requirements shall be agreed upon between the manufacturer and the purchaser:

- a) The colour (see **4.8**); and
- b) The sampling procedure, if other than as specified (see annex B).

**NOTE 1** – Colour differences may be specified in one or more of the following formats:

- a) As agreed upon between interested parties, prior to delivery;
- b) In the categories outlined in Table 2; or
- c) As measurable colour differences in accordance with MS 1014-1, MS 1014-2 and MS 1014-3.

**NOTE 2** – Apart from the colour, it is recommended that tender invitations and orders include reference to acceptable colour differences. Acceptable colour differences will vary with the colour (see **4.8**) and the gloss value (see **4.10**).

**ANNEX B**  
(Informative)

**COMPONENTS OF COLOUR DIFFERENCE**

It is recommended that the following method be used for expressing colour differences:

**C.1 DIFFERENCE IN HUE**

Designation: DH

Rating: 0 to 5

Symbols: ye (more yellow); gr (more green); re (more red); bl (more blue)

Example: DH/5ye means that the test specimen is 5 more yellow than the standard colour.

**C.2 DIFFERENCE IN CHROMA**

Designation: DC

Rating: 0 to 5 and + or -

Example: DC/-2.5 means that the test specimen is 2.5 less in chroma than the standard colour.

**C.3 DIFFERENCE IN LIGHTNESS**

Designation: DL

Rating: 0 to 5; "+" means lighter than and "-" means darker than the standard colour.

Example: DL/-2 means that the test specimen is 2 darker than the standard colour.

**ANNEX C**  
(Informative)

**QUALITY VERIFICATION OF UNDERCOATS FOR PAINTS**

In cases where a purchaser requires ongoing quality verification of the quality of undercoats for paints produced to this standard, it is suggested that, instead of concentrating solely on evaluation of the final product, he also directs his attention to the manufacturer's quality system. In this connection, it should be noted that MS-ISO 9001 covers the provisions of an integrated quality system

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**THE MALAWI BUREAU OF STANDARDS**

The Malawi Bureau of Standards (MBS) is the standardizing body in Malawi under the aegis of the Ministry of Industry and Trade. Set up in 1972 by the Malawi Bureau of Standards Act (Cap: 51:02), the MBS is a parastatal body whose activities aim at formulating and promoting the general adoption of standards relating to structures, commodities, materials, practices, operations and from time to time revise, alter and amend the same to incorporate advanced technology.

**CERTIFICATION MARK SCHEME**

To bring the advantages of standardization within the reach of the common consumer, the MBS operates a Certification Mark Scheme. Under this scheme, manufacturers who produce goods that conform to national standards are granted permits to use the MBS' "Mark of Quality" depicted below on their products. This Mark gives confidence to the consumer of the commodity's reliability.



