

Draft Approved from Technical Sub-committee

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नेपाल गुणस्तर  
NEPAL STANDARD

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**Enamel, Interior — (Undercoating and Finishing-Specification) PART 2**

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*Ministry of Industry, Commerce and Supplies*  
*Nepal Bureau of Standards and Metrology (NBSM)*  
*Kathmandu, Nepal*

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## **1 SCOPE**

This standard prescribes requirements and methods of sampling and test for enamel, interior, undercoating and finishing, colour as required.

## **2 REFERENCES**

The standards listed in Annex A contains provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of these standards.

## **3 TERMINOLOGY**

3.1 For the purpose of this standard, the definitions given in **NS\*\*\*** and that given below shall apply.

3.1.1 *Registered Sample* — Sample supplied in advance by a prospective supplier and registered by the approved testing authorities after testing it to all the requirements of this standard. A complete record of its performance shall be kept in respect of all tests.

## **4 TYPES**

The material shall be supplied in brushing consistency but shall be suitable for application by brushing without appreciable drag recommended consistency is 50 to 60 and air spraying recommended consistency is 35 to 40 after thinning with a suitable thinner as agreed to between the purchaser and the supplier.

## **5 REQUIREMENTS**

### **5.1 Composition**

The material shall be of such a composition as to satisfy the requirements of this standard.

### **5.2 Total Non-volatile Content**

The total non-volatile matter, which includes pigment, extenders and vehicle solids, shall not deviate by more than  $\pm 5$  percent by mass from the recorded data of registered sample when estimated by the method prescribed in NS 177. This applies to both undercoating and finishing enamels.

### **5.3 Condition in Container**

#### *5.3.1 At Delivery*

At the time of delivery, the paint shall be in such a condition that manual stirring readily produces a uniform product.

#### *5.3.2 During Storage*

During the 12 months storage period, the rating for degree of settling shall not drop to 0 (zero), when tested as per **NS \*\*\***.

#### **5.4 Freedom from Coarse Particles**

The paint shall be free from coarse aggregates, suspended particles of gel and foreign matter, when tested as per **NS\*\*\***.

#### **5.5 Skin Formation**

The undercoat or finishing paint shall show no skin formation, when examined visually at the time of delivery.

#### **5.6 Thinning Properties**

The undercoat/finishing paint shall be capable of being readily mixed with the thinner (*see NS\*\*\**) or suitable thinner to a maximum of 20 percent by volume to achieve the recommended viscosity range.

#### **5.7 Freedom from Yellowing**

Enamel, interior, finishing, white, shall not show a greater degree of yellowing than the approved sample when tested as prescribed in Annex B.

#### **5.8 Lead Restriction**

The material shall not contain lead or compounds of lead or mixtures of both, when tested in accordance with NS 177. When thus tested the material shall not contain lead or compounds of lead or mixtures of both, calculated as metallic lead, exceeding 90 ppm for both undercoating and finishing.

**5.9** The material shall also comply with the requirements given in Table 1.

**5.10** The manufacturer(s) may be permitted to mark their product 'synthetic' according to this specification, it contains minimum 10 percent by mass of phthalic anhydride content on non-volatile vehicle when tested as prescribed in **NS\*\*\*Methods of Sampling and Test for Paints, Varnishes and Related Products, Tests for Pigments and Other Solids:Phthalic Anhydride.**

#### **5.11 Optional Requirements**

Material may be tested for optional requirements given in Table 2 whenever required by purchaser.

### **6 PACKING AND MARKING**

#### **6.1 Packing**

Unless otherwise agreed to between the purchaser and the supplier, the enamel shall be packed in metal containers (*see NS\*\*\**). The packing is subject to the provisions of the law in force in the country at that time.

#### **6.2 Marking**

6.2.1 Each container shall be marked with the following:

- a) Name of the material and indication whether undercoating or finishing;
- b) Indication of the source of manufacture;

c) A statement “Synthetic”, if the material contains phthalic anhydride as prescribed under **5.10**;

d) Lead content (*Max*);

e) Volume of the material;

f) Batch number or lot number in code or otherwise;

g) Month and year of manufacture;

h) Colour/shade of the material; and

j) A cautionary note as below:

1) Keep out of reach of children;

2) Dried film of this paint may be harmful if eaten or chewed; and

3) This product may be harmful if swallowed or inhaled.

**Table 1 Requirement for Enamel, Interior: (A) Undercoating (B) Finishing**

*(Clause 5.9 and 8.1)*

S.N.	Characteristics	Requirement		Method of Test, Ref to	
		Undercoating	Finishing	NS 177	Annex
<b>i)</b>	Drying time, h, <i>Max</i>				—
	a) Surface dry	4	4		
	b) Hard dry	12	12		
	c) Tack free	24	24		
<b>ii)</b>	Mass, kg/10 l, <i>Min</i>	12	8.5	1(19)	—
<b>iii)</b>	a) Consistency	Smooth, uniform and suitable for brushing without appreciable drag on the brush		-	C
	b) Viscosity, s in No. 4 ford cup at 27 °C ± 2 °C	← 80 to 120 →		NS***	—
<b>iv)</b>	a) Finish	Smooth and matt to egg shell gloss	Smooth and glossy	1(3)	—
	b) Gloss, 60°	0 to 20	Above 70	1(5)	—
<b>v)</b>	Fineness of grind, microns, <i>Max</i>	50	15	NS****	—
<b>vi)</b>	Colour	Off white to light grey or to any other colour	Close match to the specified NS colours or to an agreed colour	1(9)	—
<b>vii)</b>	Wet opacity (see Note)	Between – 10 percent and + 20 percent of the approved sample		1(8)	—
<b>viii)</b>	Fastness to light (for finishing only) with panel exposed for 100 h	—	passes the test, if there shall be no appreciable colour change observed when compared to the unexposed panels	1(10)	—
<b>ix)</b>	Resistance to water	—	Shall pass the test	-	<b>E</b>

<b>x)</b>	Flexibility and adhesion				
	a) Scratch hardness (Load 1 000 g),	← No such scratch → as to show the bare metal		1(14)	—
	b) Bend test with 6.25 mm (diameter mandrel)	← No visible damage or detachment of film		1(14)	—
<b>xi)</b>	Flash point	Not below 30 °C		1(18)	—
<b>xii)</b>	Volume solids percent, <i>Min</i>	35	30	NS ***	—
<b>xiii)</b>	Accelerated storage stability test	← Shall pass the test →		—	F
<b>xiv)</b>	Keeping properties	Not less than one year from the date of manufacturing		NS 177	—

**Table 2 Optional Requirements for Enamel, Interior: (A) Undercoating (B) Finishing**  
(Clause 5.11)

S.N.	Characteristics	Requirement		Method of Test, Ref to <b>NS 177</b>
		Undercoating	Finishing	
<b>i)</b>	Hard dry, h, <i>Max</i>	—	8	
<b>ii)</b>	Non- volatile vehicle, percent, <i>Min</i>	<b>60</b>	<b>50</b>	
<b>iii)</b>	Phthalic Anhydride, percent by mass on non-volatile vehicle, <i>Min</i>	<b>15</b>	<b>15</b>	NS ***
<b>iv)</b>	Wet opacity, m <sup>2</sup> /10 l, <i>Min</i> (by Pfund cryptometer method)	As per Table 3		

**Table 3 Requirements for Wet Opacity**

[Table 2 (iv)]

S.N.	Colour Category No. to Table 1 of <b>NS***</b>	Wet Opacity Requirement, m <sup>2</sup> /10 l, <i>Min</i> (by Pfund Cryptometer Method)
<b>i)</b>	<b>3, 24</b>	<b>100</b>
<b>ii)</b>	<b>7, 15, 16</b>	<b>120</b>
<b>iii)</b>	<b>1, 17, 18, 21, 25, 26, 27</b>	<b>150</b>
<b>iv)</b>	<b>9, 10, 11, 12, 19, 23</b>	<b>180</b>
<b>v)</b>	<b>4, 5, 6, 8, 13, 14, 20, 22, 28</b>	<b>220</b>
<b>vi)</b>	<b>2, 29</b>	<b>280</b>

### **6.2.2 NS Certification Marking**

The use of the Standard Mark is governed by the provisions of the Nepal Standards Act, 2037 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the NBSM.

**6.3** Other details of packing and marking shall be in accordance with the instructions given by the purchaser.

**6.4** The material, when intended for defence purposes, shall be packed and marked in accordance with **NS\*\*\***.

## **7 SAMPLING**

### **7.1 Preparation of Test Samples**

#### *7.1.1 For Registration*

The sample shall be submitted in three different containers each containing not less than 500 ml of the material.

#### *7.1.2 Bulk Supply Sample*

Representative samples of the materials shall be drawn and treated as prescribed in **NS\*\*\***.

#### *7.1.3 For Drying Time Test*

Prepare mild steel panel of sizes 150 mm × 100 mm × 1.25 mm as prescribed in **NS 177**. Apply the paint on each side of the panel by brushing to give a dry film mass commensurate with the mass per 10 litre as specified in **NS 177**. Prepared test panel then subjected to the test as specified in **NS 177** as soon as possible.

#### *7.1.4 For Flexibility and Adhesion Test*

For both bend test and scratch hardness test prepare separate burnished tin plate panels, rectangular, of sizes 100 mm × 50 mm × 0.3 mm. Apply one coat of material by brushing on the panels as to give a dry film mass commensurate with the mass per 10 litre as specified in **NS 177**. The coated test panels shall be dried for 48 h and then shall be conditioned at a temperature of 27 °C ± 2 °C and relative humidity of 65 percent ± 5 percent for a minimum time of 16 h. Prepared test panels the subjected to the test as prescribed in **NS 177** for bend test and scratch hardness test respectively.

### **7.2 Criteria for Conformity**

A lot shall be declared as conforming to the requirements of this standard, if the test results of the composite sample satisfy the requirements given in **5**.

## **8 TEST METHODS**

**8.1** Tests shall be conducted as prescribed in **5.1** to **5.8** and **5.10** and the test methods referred in col (5) and col (6) of Table 1.

### **8.2 Quality of Reagents**

Unless specified otherwise, pure chemicals and distilled water (*see NS 177*) shall be employed in tests.

*NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.*

## **9 GENERAL PROVISIONS**

### **9.1 Supply**

Unless otherwise agreed by the purchaser, the paint supplied shall not differ significantly from the registered sample in either composition or performance.

### **9.2 Vendor's Certificate**

9.2.1 When required by the purchaser, the vendor shall certify that each batch of the paint supplied has been manufactured to the same formula as the registered sample and/or that it has been indicated by test to be not inferior to the approved sample. Alternatively, the vendor may give following information and may declare compliance with registered sample:

- a) Description of paint;
- b) Vendor's product reference;
- c) Batch identification;
- d) Quantity in lot; and
- e) Date of manufacture.

9.2.2 A certificate/declaration may relate to more than one batch.

### **9.3 Tests**

9.3.1 The frequency and procedure to establish compliance of the paint material with this specification may vary depending on the agreement between the purchaser and the supplier.

9.3.2 The kind of testing programme as indicated in Annex G, maybe taken for guidance, where thought appropriate.



**ANNEX A**

*(Clause 2)*

**LIST OF REFERRED INDIAN STANDARDS**

1. NS 177:2045      पुर्व मिश्रित पेन्ट तथा इनामेलको परिक्षण विधि

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## **ANNEX B**

*(Clause 5.7)*

### **TEST FOR FREEDOM FROM YELLOWING**

#### **1 PANELS**

Mild steel panel of sizes 150 mm × 150 mm × 1.25 mm shall be prepared as prescribed in **NS\*\*\***.

#### **2 PROCEDURE**

2.1 Apply two normal coats of the material in accordance with **NS\*\*\*** by brushing on the panel as in clauses 1. Allow the first coat to dry for 12 h, slightly rub down the surface and then apply the second coat. Place the panel after 24 h in complete darkness for a period of 7 days.

2.2 Compare with freshly prepared panel and cured, for not less than 24 h and more than 48 h, panel.

## ANNEX C

[Table 1, Sl No. (iii) (a)]

### CONSISTENCY

#### 1 APPARATUS

##### 1.1 Palette Knife or Metal Rod

##### 1.2 Steel Panels

1.2.1 Unless specified otherwise, mild steel panels of size 150 mm × 50 mm × 1.25 mm shall be prepared as prescribed in NS\*\*\*.

#### 2 PROCEDURE

2.1 Insert a clean metal rod or palette knife into the original container and examine the nature of settling.

##### 2.2 Observations

The material shall not cake hard inside the container and shall be in such a condition that stirring easily produces a smooth uniform paint suitable for brushing on steel panels.

## ANNEX D

(Table 1, Note)

### WET OPACITY VALUES, m<sup>2</sup>/10 l, *Min*

S.N.	Value	Colour
i)	350	Black
ii)	250	Azure blue
iii)	290	Dark admiralty grey
iv)	150	Middle brunswick green
v)	90	Signal red
vi)	100	Golden yellow
vii)	80	Pale cream
viii)	200	Light admiralty grey and sea green
ix)	150	Blue sky
x)	110	White

## ANNEX E

[Table 1, Sl No. (ix)]

### TEST FOR RESISTANCE TO WATER

#### 1 GENERAL

##### 1.1 Outline of the Method

This method gives an indication of the results likely to be obtained when painted articles are stored under conditions where prolonged condensation may be produced but not an extremely corrosive atmosphere.

#### 2 MATERIALS

##### 2.1 Test Panels

Glass panel of size 150 mm × 50 mm. Prepare the panel as prescribed in 5 of NS\*\*\*.

#### 3 PROCEDURE

3.1 Apply a coat of material on glass panels as prescribed in NS\*\*\* to give a dry film mass commensurate with the mass per 10 litre as specified in NS 177. Allow the panel to air dry in a horizontal position for 48 h. Then follow the procedure as prescribed in NS\*\*\*. Immerse the panel in the tank at room temperature for 48 h. Remove the panels from water and examine it after 4 h.

#### 4 OBSERVATIONS

The paint shall be deemed to have passed the test, if the painted panel shall be free from blisters, peeling or flaking and undue change in colour. Gloss retention shall not be less than 60 percent of the gloss of un-immersed portion.

## ANNEX F

[Table 1, SI No. (xiii)]

### ACCELERATED STORAGE STABILITY TEST

#### 1 PROCEDURE

1.1 Store 250 ml of the paint sample in a closed 500 ml container having tight lid to avoid leakage of volatile paint thinners. Close the tin properly and keep it at 60 C for 96 h in an electrically heated oven. Take out the sample and allow it to cool for 24 h. The sample is then stirred well and tested for drying time, viscosity and gloss value.

1.2 After the test, paint shall not gel, liver, curdle or increase in viscosity by more than 20 percent of the original value and there shall be no evidence of seeding. The paint shall meet the drying requirements and produce a film that is uniform in appearance and free from streaking, mottling and seeding. Further, for finishing paint, the change in gloss value shall not be more than 5 units from that of original value.

*NOTE — Keep the paint sample in the oven and gradually increase the temperature 60 C.*

## ANNEX G

### *(Foreword and Clause 9.3.2)*

#### TESTING PROGRAMME

1 When a purchaser orders for supply of paint (conforming to this standard) in lots to be delivered, over a period of time, it is assumed that not all of the tests specified shall be carried out on samples representing of each lot or consignment. The extent and frequency of the tests may vary depending on many factors and on choice of purchaser. The following programme of tests is, however, may be useful for the guidance of purchasers, particularly in relation to vendor's certification. It may also provide a useful tool to establish a testing programme when an inspecting agency acting on behalf of a purchaser, is required to examine lots of products for compliance to this standard.

##### **1.1 Programme 1**

Following tests to be made on first lot and on every subsequent lot:

- a) Non-volatile content;
- b) Mass/10 litre;
- c) Condition in container;
- d) Fineness of grind;
- e) Thinning properties;
- f) Drying time;
- g) Colour;
- h) Gloss;
- j) Finish; and
- k) Viscosity.

##### **1.2 Programme 2**

Following tests to be made on first lot and subsequently as and when agreed upon:

- a) Flexibility and adhesion; and
- b) Scratch resistance.

##### **1.3 Programme 3**

Following tests to be made on first lot alone:

- a) Keeping qualities;
- b) Volume solids, percent;
- c) Flash point; and
- d) Resistance