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Two-Pack Epoxy enamel, glossy paint — Specification

ICS 87.040

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In order to match with technological development and to keep continuous progress in industries, standards are subject to periodic review. Users shall ascertain that they are in possession of the latest edition

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Foreword

Rwanda Standards are prepared by Technical Committees and approved by Rwanda Standards Board (RSB) Board of Directors in accordance with the procedures of RSB, in compliance with Annex 3 of the WTO/TBT agreement on the preparation, adoption and application of standards.

The main task of technical committees is to prepare national standards. Final Draft Rwanda Standards adopted by Technical committees are ratified by members of RSB Board of Directors for publication and gazettment as Rwanda Standards.

DRS 466 was prepared by Technical Committee RSB/TC 056, *Paints, Varnishes, Adhesives and Related Products*.

In the preparation of this standard, reference was made to the following standard:

IS 14209: Epoxy enamel, two components, glossy — Specification

The assistance derived from the above source is hereby acknowledged with thanks.

Committee membership

The following organizations were represented on the Technical Committee on *Paints, Varnishes, Adhesives and Related Products* (RSB/TC 056) in the preparation of this standard.

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Introduction

Epoxy paint is an excellent choice for covering garage, basement and patio floors. Epoxy coating uses a chemical mix of two liquid components, epoxy resin and hardener, to create a tough, solvent-resistant finish that can be applied to floors, countertops and decks. Many types of epoxy are noted for their durability and can be used to seal concrete floors, steel and other industrial materials.

This product is expected to have adhesion on inorganic zinc coating and epoxy-primers, high toughness and abrasion resistance. It is used as a finish coat for the painting of steel plant equipment where protection to salt water, chemicals, mineral oils, solvents and resistance to moisture protection in marine environment.

Two-Pack Epoxy enamel, glossy paint — Specification

1 Scope

This Rwanda Draft Standard prescribes requirements, sampling and test methods for two components epoxy enamel used as a finish coat for the painting of steel plant equipment where protection to salt water, chemicals, mineral oils, solvents and resistance to moisture protection in marine environment.

2 Normative references

The following documents are 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 4618, *Paints and varnishes — Terms and definitions*

ISO 1523, *Determination of flash point — Closed cup equilibrium method*

ISO 9117-1, *Paints and varnishes — Drying tests — Part 1: Determination of through-dry state and through-dry time*

ISO 9117-3, *Paints and varnishes — Drying tests — Part 3: Surface-drying test using ballotoni*

ISO 3251, *Paints, varnishes and plastics — Determination of non-volatile-matter content*

ISO 6503, *Paints and varnishes — Determination of total lead — Flame atomic absorption spectrometric method*

ISO 3856-6, *Paints and varnishes — Determination of "soluble" metal — Part 6: Determination of total chromium content of the liquid portion of the paint — Flame atomic absorption spectrometric method*

ISO 9514, *Paints and varnishes — Determination of the pot life of multicomponent coating systems — Preparation and condition of samples and guidelines for testing.*

ISO 2808, *Paints and varnishes — Determination of film thickness*

ISO 2813, *Paints and varnishes — Determination of gloss value at 20°, 60° and 85°*

ASTM F735-17, *Standard test method for abrasion resistance of transparent plastics and coatings using the oscillating sand method*

RS OIML R 87, *Quantity of product in pre-packages*

ISO 15528, *Paints, varnishes and raw materials for paints and varnishes — Sampling*

3 Terms and definitions

For the purposes of this standard, the terms and definitions given in ISO 4618 and the following apply.

3.1

epoxy paint

a latex acrylic product that may have a small amount of epoxy in the mix and is used for flooring applications.

3.2

enamel

is loosely used to designate a shiny, glossy, decorative topcoat.

3.3

component

a term used to describe each of two parts of the paint, which when mixed together form the pigmented epoxy layer

3.4

epoxy primer

a paint consisting essentially of epoxy resin base, polyamide, amine adduct or other hardeners with appropriate pigments, solvent and additives mixed together in the proportions recommended by the manufacturer

3.5

protective coating system

sum total of coats of paint or related product which are to be applied or which have been applied to a substrate to provide corrosion protection

3.6

pot life

the maximum time during which a coating material supplied as separate components should be used after they have been mixed together

3.7

volatile organic compound (VOC)

fundamentally, any organic liquid and/or solid that evaporates spontaneously at the prevailing temperature and pressure of the atmosphere with which it is in contact

3.8

ready to use

the state of a product when it is mixed in accordance with the manufacturer's instructions in the correct proportions and thinned if required using the correct thinners so that it is ready for application by the approved method.

3.9

marine environment

oceans, seas, bays, estuaries, and other major water bodies, including their surface interface and interaction, with the atmosphere and with the land seaward of the mean high water mark.

3.10

epoxy equivalent weight

equivalent weight of epoxy resin = Molecular weight of epoxy resin. Number of epoxy groups.

4 Requirements

4.1 General requirements

4.1.1 Composition

4.1.1.1 The product shall comprise of epoxy resin as the principal binder. The manufacturer shall specify that the principal type of binder used has epoxy equivalent weight in the range of 350 to 600.

4.1.1.2 The product shall consist essentially of two components base and hardener or catalyst solution to be mixed in a simple ratio by volume as specified by the manufacturer.

4.1.2 Condition in the container

When visually examined, the product shall be free from skins, uncharacteristically coarse particles, foreign matter and lumps. The container shall be free from rust and moulds.

4.1.3 Odour

The odour of the two-pack epoxy primer-marine paint in the container, during and after application shall not be abnormally pungent, offensive or disagreeable.

4.1.4 Settling

The epoxy primer shall be free from settling. Settling if any, shall be easily incorporated by stirring.

4.2 Specific requirements

4.2.1 Specific requirements for wet coat

The product shall meet the specific requirements given in Table 1 when tested in accordance with the test methods specified therein.

Table 1 — Requirements for the wet coat of two-pack epoxy enamel

S/N	Parameters		Requirements	Test methods
i.	Mass, kg/10L, min.		9	Annex A
ii.	Consistency		Smooth and uniform	Annex B
iii.	Flash point		Above 20 °C	ISO 1523
iv.	Drying time, h, max.	Surface dry	3	ISO 9117-3
		Hard dry	24	ISO 9117-1
v.	Solids content, % by volume, min.		40	ISO 3251
vi.	Pot life, h, min.		6	ISO 9514
vii.	Total lead content, mg/Kg, max.		90	ISO 6503
viii.	Total chromium content, mg/kg, max.		5	ISO 3856-6
NOTE – Tests from (i) to (vii) are for mixed paint.				

4.2.2 Specific requirements for dry coat

The product shall meet the specific requirements given in Table 2 when tested in accordance with the test methods specified therein.

Table 2 — Requirements for the dry coat of two-pack epoxy enamel

S/N	Parameters	Requirements	Test methods
i.	Dry film thickness per coat, microns, min.	30	ISO 2808
ii.	Finish	Smooth and glossy	
iii.	Gloss, 60°, min.	61	ISO 2813
iv.	Scratch hardness test (1500 g)	To pass the test	ASTM F735-17
v.	Acid/alkali resistance (10% Nitric acid at 27 ± 2°C – 24h, 20% sulphuric acid at 27 ± 2°C – 16h, 25% caustic soda at 27 ± 2°C – 24h, 10% hydrochloric acid at 27 ± 2°C – 48h)	The film shall not show signs of disintegration or change of colour to a greater extent. The loss of gloss shall not be more than 50% of the original gloss.	-
NOTE – Tests mentioned in (iv) and (v) shall be carried out for the full system that is 1 coat of primer, 1 coat of intermediate and 1 coat of finishing paint or 1 coat of primer and 1 coat of finishing paint supplied by the same firm after 168 hours curing at 30 °C			

5 Packaging and labelling

5.1 Packaging

5.1.1 The product shall be packaged in a suitable container that prevents it from deterioration during storage, transportation and normal handling.

5.1.2 The quantity of product packaged in a container shall be in accordance with the requirements of RS OIML R 87.

5.2 Labelling

5.2.1 Each container shall be marked legibly and indelibly with the following:

a) name of the product as: “Two-pack epoxy enamel”;

b) name and address of the manufacturer and/or registered trader mark;

c) volume of the material, in L;

d) date of manufacture;

e) spreading capacity, in m^2/L;

f) instructions for use and disposal;

g) pot-life at 25 ^{0}C;

h) an indication of flammability.

i) storage condition

5.2.2 Each label of the container shall be marked legibly and indelibly with the following:

a) Date of manufacture;

b) Instructions for use;

c) Pot-life;

d) Shelf life;

e) Colour;

f) Batch number.

6 Sampling

Sampling shall be done in accordance with ISO 15528.

Annex A
(normative)

Determination of mass per 10 litres

A.1 General

Method for determination of mass per 10 litres of liquid paints and related products by pyknometer or a mass per volume cup. It is determined at a specified temperature and is expressed in kg/10 litres or in grams per millilitre.

A.2 Apparatus

A.2.1 **Pyknometer** – Of capacity 20 to 100 ml.

A.2.2 **Thermometer** – Graduated in divisions of 0.1 °C and accurate to 0.2 °C.

A.2.3 **Water-Bath or Constant temperature room** – Capable of being maintained within ± 2 °C.

A.2.4 **Analytical balance** – Accurate to 0.2 mg.

A.3 Procedure

A.3.1 Clean the pyknometer suitably (see note 1). Thoroughly dry the pyknometer. Allow the pyknometer to attain room temperature and weigh it. Fill the pyknometer with distilled water at a temperature not more than 1 °C below the standard temperature (27 ± 2 °C). Stopper or cap the pyknometer leaving the overflow orifice open. Every care shall be taken to prevent the formation of bubbles in the pyknometer. Place the pyknometer in the constant temperature and its contents is constant. Remove the overflow by wiping with absorbent material (see note 2) and thoroughly dry the outside of the pyknometer by wiping with absorbent material. Do not remove any subsequent overflow (see note 3). Immediately weigh the filled apparatus to the nearest 0.001% of its mass (see note 4).

Note 1 – If it is a glass pyknometer, use chromic acid, distilled water and a solvent. If it is a metal pyknometer, use solvent which leaves no residue on evaporation.

Note 2 – A paper tissue is recommended for this purpose.

Note 3 – Handling the pyknometer with bare hands will increase the temperature and cause more overflow from the overflow orifice and will also leave finger prints, hence, handling only with tongs and with hands protected by clean, dry absorbent material is recommended.

Note 4 – Immediate and rapid weighing of the filled pyknometer is recommended in order to minimize loss in mass due to evaporation and overflow subsequent to the first wiping after attainment of temperature.

A.3.2 Repeat the above procedure using the product in place of distilled water. Remove any residues of paints from the outside of pyknometer by wiping with absorbent material moistened with a suitable solvent and thoroughly dry by wiping with a clean absorbent material.

A.3.3 When using glass pyknometer with pigmented products, difficulties may be experienced in removing residual pigments, especially from ground-glass surfaces. Such residues may be removed by ultrasonic vibration in water or solvent bath. To minimize errors, joints shall be firmly seated. For accurate determination, glass pyknometer are preferred. Metal pyknometers are generally used for determination of mass in kg/10 litres for production control purposes. If the sample retains air bubbles, which do not readily disperse on standing, the methods described may be unsuitable.

A.4 Calculations

A.4.1 ***Calculation of volume of the pyknometer*** – Calculate the volume of pyknometer in millilitres as follows:

$$\mathrm{V} = \frac{m1 - m0}{d}$$

Where;

V = volume in ml of pyknometer,

m_1 = mass in g of pyknometer and water,

m_0 = mass in g of the empty pyknometer, and

d = density of water at 27 °C in g/ml (0.9965 g/ml).

A.4.2 ***Calculation of density*** – Calculate the density of the product in g/ml at the test temperature (27 °C) by the following formula:

$$\mathrm{dt} = \frac{m2 - m0}{V}$$

Where;

d_t = density of the product at test temperature (27 °C),

m_2 = mass in g of the pyknometer and product,

m_0 = mass in g of the empty pyknometer, and

d = volume in ml of the pyknometer at 27 °C.

A.4.3 ***Calculation of mass in kg/10 litres of material*** – Calculate mass in kg/10 litres of the material from A.4.2 by multiplying the results by 10.

A.4.4 ***Precision*** – With accurate control of temperature at ± 0.5 °C level, it is possible to achieve the following precision.

A.4.4.1 ***Repeatability*** – The difference between two successive results obtained by the same operator within a short time interval, with the same apparatus under constant operating conditions in identical test material, shall not exceed 0.0006 g/ml at the 95% confidence level.

A.4.4.2 ***Reproducibility*** – The difference between single and independent results obtained by different operators in different laboratories in identical test material shall not exceed 0.0012 g/ml at the 95% confidence level.

A.4.4.3 In case of some liquid paint products, especially those showing structure viscosity or thixotropy, the above precision limits may not be obtainable.

Annex B
(normative)

Determination of consistency

B.1 Scope

It prescribes three methods for determining the dynamic viscosity of paints and related products at a rate of shear not less than 5000 $S^{-1}$and not more than 20000 S^{-1}. The methods are:

a) Flow cup method,
b) Cone and plate or concentric cylinder viscometer method, and
c) Stromer viscometer method.

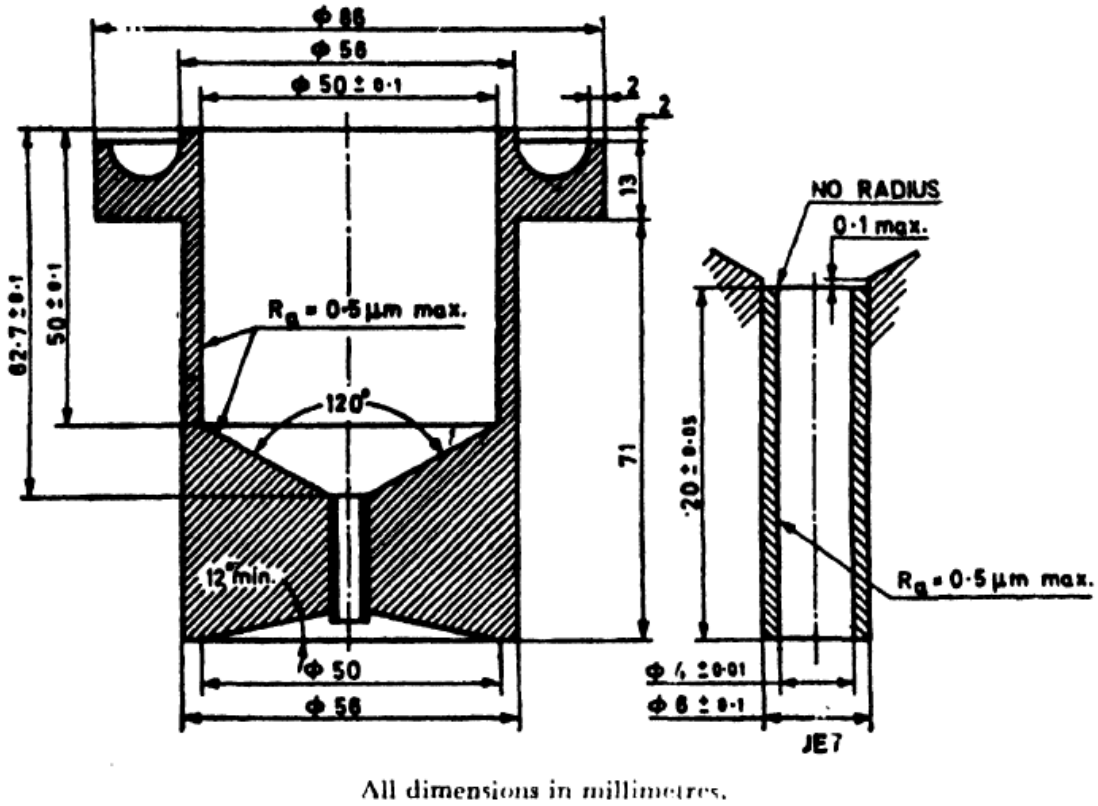
B.2 Flow cup method

B.2.1 Apparatus

B.2.1.1 Flow cup

B.2.1.1.1 Dimensions

The dimensions of the flow cup and the tolerances allowed in manufacture shall be as given figure 1. The most critical tolerance is internal diameter of the jet of the cup since the flow time is inversely proportional to the fourth power of this dimension. The jet of the cup shall be made of stainless steel or sintered carbide, unless specified otherwise, and the body of the cup shall be made of a material which is corrosion resistant and not affected by the products to be tested.



All dimensions in millimetres.

Figure 1 – Flow cup

B.2.1.1.2 Constructions

The dimensions not specified shall be such that no distortion of the cup can occur in use. The external shape shown in figure 1 is recommended, but may be modified for convenience of use or manufacture, provided that the protruding jet of the cup is protected from accidental damage as far as possible by an external protective sleeve, such a protective sleeve shall not be immediately adjacent to the jet so as to cause a capillary action when the material under test flows out.

B.2.1.1.3 Finish

The interior surface of the cup, including the orifice shall be smooth and free from turning marks, crevices, ledges and burrs which may cause random flow or trap some sample or cleaning material. The standard of finish required shall be equivalent to a maximum roughness of not more than 0.5 µm defined as the arithmetic mean deviation Ra from the mean line of the profile.

B.2.1.2 Thermometer, accurate to 0.2 °C and graduated at 0.1 °C intervals.

B.2.1.3 Stand, suitable for holding the flow cup and provided with levelling screws.

B.2.1.4 Spirit level, preferably of the circular type.

B.2.1.5 Flat glass plate of straight edge scraper

B.2.1.6 Stop watch, or other suitable timing device with scale divisions of 0.2 second or finer and accurate to within 0.1 % when tested over a 60-minute period.

B.2.1.7 Temperature controlled room or enclosure for maintaining the cup and sample at a constant temperature.

B.2.2 Procedure

B.2.2.1 Place the flow cup on the stand in a place free from draughts, at ambient temperature. Level by the use of a spirit level placed on the rim.

B.2.2.2 Strain the sample into a clean container and adjust the temperature to meet the requirement. A 150 micro sieve or finer, is suitable. This and the following operations shall be carried out with minimum delay to avoid loss of solvent.

Bibliography

[1] IS 101-1-7, *Methods of sampling and test for paints, varnishes and related products — Part 1: Test on liquid paints (general and physical) — Section 7: Mass per 10 litres.*

[2] IS 101-1-5, *Methods of sampling and test for paints, varnishes and related products — Part 1: Test on liquid paints (general and physical) — Section 5: Consistency.*

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