BS 2X 33 : 1998

Specification for two component epoxy primer for aerospace purposes

ICS 49.040

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee ACE/44, Protective treatments and aircraft finishes, upon which the following bodies were represented:

British Coatings Federation Ltd.
Metal Finishing Association
Ministry of Defence
National Centre of Tribology
Oil and Colour Chemists' Association
Society of British Aerospace Companies

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Contents

Foreword

This British Standard has been prepared by Technical Committee ACE/44 and is one of a series for paints and varnishes suitable for aerospace purposes. It covers two types of cold curing epoxy primer. This British Standard supersedes BS X 33 : 1991 which has been withdrawn. During its preparation the layout has been aligned with other BS X series standards and all references have been revised.

It has been assumed in the drafting of this British Standard that execution of its provisions is entrusted to appropriately qualified and experienced people.

The quality assurance authority and approving authority referred to in this British Standard are as stated in the contract or order, or the accredited representative of the authority stated, as instructed by the purchaser.

WARNING. This British Standard calls for the use of substances and/or procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 6, an inside back cover and a back cover.

1 Scope

This British Standard specifies requirements for the materials and performance of two types of strontium chromate pigmented two pack epoxy resin based primer, for air-drying at ambient temperature, for aerospace applications.

Type A materials are intended for application to chemically pretreated substrates (e.g. by a chromate conversion process) suitable for general applications.

Type B materials are similar to type A but with improved tolerance to the standard of surface preparation, and with increased chemical resistance.

The primers are for use on metallic substrates as an anti-corrosive coating on interior surfaces, or, when overcoated with a compatible finish, as a protective and decorative finishing scheme for exterior surfaces.

Information on application for type approval is provided in annex A.

2 Normative references

This British Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are made at the appropriate places in the text and the cited publications are listed on page 6. For dated references, only the edition cited applies; any subsequent amendments to or revisions of the cited publication apply to this British Standard only when incorporated in the reference by amendment or revision. For undated references, the latest edition of the cited publication applies, together with any amendments.

3 Definitions

For the purposes of this British Standard the definitions given in BS 2015 apply.

4 Materials

4.1 Composition

4.1.1 The primer shall consist of a pigmented epoxy resin base and an amino functional curing agent. The base and curing agent shall be mixed in simple proportions by volume and thinned as necessary with the appropriate thinners as recommended by the manufacturer.

4.1.2 The pigment of the primer shall consist essentially of strontium chromate, opacifying pigments and extenders.

4.1.3 The strontium chromate shall conform to BS 4313 and shall comprise not less than 15 % (*m/m*) of dried film.

4.2 Scheme components

4.2.1 *General*

Components used in tests on the primer as part of a paint scheme shall conform to **4.2.2** and **4.2.3**.

4.2.2 *Primer*

The primer shall conform to this British Standard.

4.2.3 *Finish*

The finish shall conform to type A or type B of BS X 34 unless otherwise specified.

NOTE. The performance of a scheme including components otherwise specified may be suitable but should be separately assessed.

5 Performance

5.1 General

5.1.1 The test panels shall be prepared and coated as specified in annex B.

5.1.2 Unless otherwise specified, all tests shall be carried out in temperature and relative humidity conditions conforming to BS EN 23270.

5.2 Tests on liquid paint

The primer shall conform to table 1.

5.3 Tests on the dry film

The dry paint film, prepared in accordance with annex B, shall conform to table 2.

6 Batch inspection

Before despatch, a representative sample of each batch of material, taken in accordance with BS EN 21512, shall be tested to confirm conformity to tests 1, 4, 5 and 6 of table 1, and, when prepared in accordance with annex B, the scheme shall conform to tests 1, 2, 4 and 5 of table 2.

NOTE. Samples of material and material ingredients may be inspected at any stage of manufacture, and from any portion of the batch, by the quality assurance authority.

7 Marking

In addition to any statutory requirements each container shall be legibly and durably marked with at least the following:

a) a description of the material;

b) the number and date of this British Standard, i.e. BS 2X 33 : 1998;

c) the type of material, i.e. type A or type B;

d) the colour (with the colour standard if appropriate);

e) the manufacturer's name and recognized trade mark;

f) the batch number;

g) the date of manufacture;

h) mixing and thinning instructions.

Table 1. Tests on liquid paint

Test	Test panel, preparation and paint system	Conditions	Test method	Requirement
1) Condition	—	Components in their original or laboratory containers	BS EN ISO 1513	Shall be free from extraneous matter and shall show no skinning, gelling, hard settlement or other defect that may prevent satisfactory application of a defect-free film.
2) Volatile organic compound (VOC) content	—	When prepared for application as specified in **B.2.1**	ASTM-D 3960 [1]	Shall be less than or equal to the reference value.[1)]
3) Shelf life	—	After 12 months at 5 °C to 35 °C, components in their original containers	Tests 1), 5) and 6) of this table	Shall conform to the requirements.
4) Pot life	—	4 h after preparation of a 1000 ml sample[2)] as specified in **B.2.1**	BS EN ISO 2431	Viscosity shall not increase by more than a factor of two from the initial value, unless otherwise specified by the purchaser.
5) Application	**B.1.1**, **B.1.3** and **B.2**	24 h after application	Visual examination with normal corrected vision	Paint film shall show an opaque even finish, free from runs, sags, wrinkling, pin-holing or other defect.
6) Drying time	**B.1.1**, **B.1.3** and **B.2**	After application	BS EN 29117	Paint film shall be through-dry at $\leq$ 4 h from application, unless otherwise specified by the purchaser.

[1)] The reference value shall be established during type approval unless agreed otherwise between manufacturer and purchaser (see annex A).
[2)] For batch inspections, a sample size of 200 ml shall be tested.

Table 2. Tests on the dry film				
Test	**Test panel, preparation and paint system**	**Conditions**	**Test method**	**Requirement**
1) Colour	**B.1.1**, **B.1.4** and **B.2**	24 h after application, under diffuse daylight	BS 3900 : Part D1	Shall be yellow.[1)]
2) Specular gloss	**B.1.1**, **B.1.4** and **B.2**	24 h after application, using a 60° glossmeter	BS 3900 : Part D5	Shall be $\leq$ 20 units.[1)]
3) Water resistance	**B.1.1**, **B.1.3** and **B.2**	a) Type A: After 7 d air drying, immerse for 24 h at (40 $\pm$ 2) °C in water conforming to at least grade 3 of BS EN ISO 3696	Method 1, procedure A of BS 3900 : Part G5	$\leq$ 2 min after removal shall show no blistering or other film defects.
			BS 3900 : Part E2	$\leq$ 2 min after removal shall show no penetration of the needle to the substrate under a load of 1200 g.
	B.1.1, **B.1.4** and **B.2**	b) Type B: After 7 d air drying, immerse for 24 h at (40 $\pm$ 2) °C in water conforming to at least grade 3 of BS EN ISO 3696	Method 1, procedure A of BS 3900 : Part G5	$\leq$ 2 min after removal shall show no blistering or other film defects.
			BS 3900 : Part E2	$\leq$ 2 min after removal shall show no penetration of the needle to the substrate under a load of 1200 g.
4) Flexibility (cupping test)	**B.1.1**, **B.1.3** and **B.2**	After 7 d air drying	BS EN ISO 1520 ($\times$ 10 magnification)	There shall be no cracking at an indentation depth of 4 mm
5) Adhesion (cross hatch)	**B.1.1**, **B.1.3** and **B.2**	Type A: After 7 d air drying	BS 3900 : Part E6, 1 mm spacing	Shall conform to class 0.
	B.1.1, **B.1.4** and **B.2**	Type B: After 7 d air drying	BS 3900 : Part E6, 1 mm spacing	Shall conform to class 0.

Table 2. Tests on the dry film (*continued*)

Test	Test panel, preparation and paint system	Conditions	Test method	Requirement
6) Hydraulic fluid resistance	**B.1.1**, **B.1.3** and **B.2**	After 7 d air drying, cut paint film through to substrate down middle of panel; immerse for 168 h at (70 ± 2) °C in tri-*n*-butylphosphate	Method 1, procedure A of BS 3900 : Part G5	1 h after removal, shall show no blistering or other film defects.
			BS 3900 : Part E2; scratch (10 ± 2) mm parallel to cut	1 h after removal shall show no penetration of the needle through to substrate under a load of: – type A: 1000 g; – type B: 2000 g.
7) Corrosion resistance (alternate immersion)	**B.1.2**, **B.1.3** and **B.3**	a) Type A: Test for 1500 h at (35 ± 2) °C	BS EN 3212	There shall be no blistering or other film defect. Corrosion shall not spread more than 1 mm from cut.
	B.1.2, **B.1.4** and **B.3**	b) Type B: Test for 1500 h at (35 ± 2) °C		

[1] Unless otherwise specified by the purchaser.

Annex A (normative)
Type approval

A.1 When the manufacturer is required to prove product conformity to this British Standard, the following shall be provided:

a) test results conforming to this British Standard;

b) wet samples of all materials;

c) a declaration of composition, including the percentage and nature of all ingredients;

d) reference values if required, e.g. VOC content.

A.2 After type approval has been granted, there shall be no change in the product formulation unless this is approved by the approving authority.

Annex B (normative)
Preparation of test panels

B.1 Preparation of substrate

B.1.1 Where specified (see tables 1 and 2), use test panels made from unabraded aluminium sheet conforming to BS L 163 : 1978, and measuring approximately 150 mm × 100 mm and 0.8 mm thick.

B.1.2 Where specified (see tables 1 and 2), use test panels made of unabraded aluminium sheet conforming to BS EN 2395, measuring approximately 100 mm × 40 mm × 1.2 mm, and heat treated in accordance with BS EN 3212.

B.1.3 Where specified (see tables 1 and 2), acid chromate pickle the panels in accordance with BS EN 2334.

B.1.4 Where specified (see tables 1 and 2), detergent degrease the panels as follows. Remove protective oil or grease either by vapour degreasing or solvent washing in accordance with BS EN 605. Allow to dry and immerse in a 10 % aqueous solution of aircraft cleaning detergent conforming to DEF STAN 79-17 [2] for 15 min. Remove and wash with running tap water for 1 min. Check that a water break-free surface is obtained. Rinse with water conforming to at least grade 3 of BS EN ISO 3696, and allow to dry.

B.2 Primer application

B.2.1 Prepare the primer by mixing the base and curing agent in the proportions specified and thin as necessary with the appropriate thinners as recommended by the manufacturer.

B.2.2 Spray the primer on the test panels prepared in accordance with **B.1**, within 24 h of preparation, at a spreading rate sufficient to produce a single dry coat with a film thickness of (20 ± 5) μm, unless otherwise specified, and allow to dry vertically, with free air access, for the time specified for the tests in tables 1 and 2, unless otherwise specified.

B.3 Finish application

B.3.1 Prepare the finish by mixing the base and curing agent in the proportions specified and thin as necessary with the appropriate thinners as recommended by the manufacturer.

B.3.2 Spray the finish on the test panels primed in accordance with **B.2**, at a spreading rate sufficient to produce a single dry coat with a film thickness of (40 ± 5) μm, unless otherwise specified, and allow to dry vertically with free air access for 7 d, unless otherwise specified.

List of references (see clause 2)

Normative references

BSI publications

BRITISH STANDARDS INSTITUTION, London

BS 2015 : 1992	*Glossary of paint and related terms*
BS 3900 :	*Methods of test for paints*
BS 3900 : Group D :	*Optical tests on paint films*
BS 3900 : Part D1 : 1978	*Visual comparison of the colour of paints*
BS 3900 : Part D5 : 1995	*Measurement of specular gloss of non-metallic paint films at 20°, 60°and 85°*
BS 3900 : Group E :	*Mechanical tests on paint films*
BS 3900 : Part E2 : 1992	*Scratch test*
BS 3900 : Part E4 : 1995	*Cupping test*
BS 3900 : Part E6 : 1992	*Cross cut test*
BS 3900 : Group G :	*Environmental tests on paint films (including tests for resistance to corrosion and chemicals)*
BS 3900 : Part G5 : 1993	*Determination of resistance to liquids — General methods*
BS 4313 : 1988	*Specification for strontium chromate pigments for paints*
BS L 163 : 1978	*Specification for sheet and strip of aluminum-coated aluminum–copper–magnesium–silicon–manganese alloy (solution treated, cold-worked for flattening and aged at room temperature) (Cu 4.4, Mg 0.5, Si 0.8, Mn 0.8)*
BS 2X 34 : 1998	*Specification for two component polyurethane finish for aerospace purposes*
BS EN 605 : 1992	*Paints and varnishes — Standard panels for testing*
BS EN 2334[1)]	*Specification for acid chromate pickle for aluminum alloys*
BS EN 3665[1)]	*Filiform corrosion resistance test for paints on aluminum alloys*
BS EN 2395 : 1994	*Specification for sheet and strip of aluminum–copper–magnesium–silicon–manganese alloy (solution treated and aged at room temperature) (Cu 4.4, Mg 0.5, Si 0.8, Mn 0.8)*
BS EN 3212 : 1995	*Paints and varnishes — Corrosion test by alternate immersion in buffered sodium chloride solution*
BS EN 23270 : 1991	*Specification for temperatures and humidities for conditioning and testing paints, varnishes and their raw materials*
BS EN 29117 : 1992	*Paints and varnishes — Determination of through-dry state and through-dry time — Method of test*
BS EN ISO 1513 : 1995	*Paints and varnishes — Examination and preparation of samples for testing*
BS EN ISO 1520 : 1995	*Paints and varnishes — Cupping test*
BS EN ISO 2431 : 1996	*Paints and varnishes — Method for determination of flow time by use of flow cups*
BS EN ISO 3696 : 1995	*Water for analytical laboratory use — Specification and test methods*

[1)] In preparation.

Other publications

[1] ASTM-D 3960 *Standard practice for determining VOC content of paints and related coatings*, ASTM, 100 Barr Harbor Drive, West Conshohoken, PA 19428.
[2] DEF STAN 79-17 *Aircraft cleaning detergent solution*, Ministry of Defence, Directorate of Standardization, Kentigern House, 65 Brown Street, Glasgow G2 8EX.

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