BS 2X 34 : 1998

Specification for two component polyurethane finish 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 polyurethane finish. This British Standard supersedes BS X 34 : 1991 which has been withdrawn.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 7, and a back cover.

1 Scope

This British Standard specifies requirements for the materials and performance of two types of two pack polyurethane finish, for air-drying at ambient temperature, in a range of gloss levels, for aerospace applications.

Type A materials are intended for interior and exterior use where maximum resistance to fluid attack is required.

Type B materials are intended for exterior surfaces, and offer increased tolerance to flexing compared with type A materials.

The polyurethane finish, as part of a paint scheme including a primer, is intended for application to metallic and non-metallic surfaces to give protection against corrosion and resistance to aircraft fluids and to offer surface appearance in terms of colour and level of gloss as specified by the purchaser.

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 the inside back cover. 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

The paint shall consist of a pigmented base and an aliphatic isocyanate 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.

4.2 Scheme components

4.2.1 *General*

Components used in tests on the paint 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 type B of BS X 33 unless otherwise specified.

4.2.3 *Finish*

The finish shall conform to this British Standard.

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 described 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 finish shall conform to table 1.

5.3 Tests on the dry film

The dry film of the paint system comprising primer and finish, 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 6 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.

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.3.1**	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.3.1**	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.3** (without primer)	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.3** (without primer)	After application	BS EN 29117	Paint film shall be through-dry at ≤ 6 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)] During 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.1.3** and **B.3**	24 h after application, under diffuse daylight	BS 3900 : Part D1	Shall match the colour specified by the purchaser.
2) Specular gloss	**B.1.1**, **B.1.3** and **B.3**	24 h after application, using a 60° glossmeter	BS 3900 : Part D5	Shall be as follows: – high gloss: 85 units or above; – semi matt: (15 ± 3) units – matt: less than or equal to 5 units.
3) Flexibility (cupping test)	**B.1.1**, **B.1.3** and **B.3**	—	BS EN ISO 1520 (×10 magnification)	Type B: there shall be no cracking at an indentation depth of 4 mm
4) Flexibility (impact)	**B.1.1**, **B.1.2** and **B.3**	—	BS EN ISO 6272 (coating downwards)	Type B: there shall be no cracking at an indentation depth of 3.8 mm
5) Adhesion (cross hatch)	**B.1.1**, **B.1.3** and **B.3**	—	BS 3900 : Part E6, 1 mm spacing	≤ class 1
6) Hardness (scratch)	**B.1.1**, **B.1.3** and **B.3**	—	BS 3900 : Part E2	There shall be no penetration of the needle to the primer under a load of 1500 g.
7) Water resistance	**B.1.1**, **B.1.3** and **B.3**	Immerse for 168 h at (40 ± 2) °C in water conforming to at least grade 3 of BS EN ISO 3696	a) Method 1, procedure A of BS 3900 : Part G5	≤ 2 min after removal shall show no blistering or other film defects.
			b) BS 3900 : Part E6, 1 mm spacing	≤ 2 min after removal, adhesion shall be ≤ class 1.
			c) BS 3900 : Part E2	≤ 2 min after removal shall show no penetration of the needle to the primer under a load of 1500 g.
8) Hydraulic fluid resistance	**B.1.1**, **B.1.2** and **B.3**	Cut paint film through to substrate down middle of panel; immerse at (70 ± 2) °C in tri-*n*-butylphosphate; type A: 1000 h; type B: 168 h	a) Method 1, procedure A of BS 3900 : Part G5	1 h after removal shall show no blistering or other film defects.
			b) BS 3900 : Part E2; scratch (10 ± 2) mm parallel to the cut	1 h after removal shall show no penetration of the needle to the primer under the following load: – type A: 1200 g; – type B: 1000 g.

Table 2. Tests on the dry film *(continued)*				
Test	**Test panel, preparation and paint system**	**Conditions**	**Test method**	**Requirement**
9) Artificial weathering	**B.1.1**, **B.1.3** and **B.3**	BS 3900 : Part F16, method A. Lamps: UV-B (313); total duration 500 h	a) BS EN ISO 1520	Type B: there shall be no cracking at an indentation depth of 4 mm
			b) BS 3900 : Part D5	High gloss and semi matt: gloss reduction shall be $\leq$ 20 % of initial value.
			c) BS 3900 : Parts D8, D9 and D10	$\Delta E^*_{ab} \leq 2.0$

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 34 : 1998;

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

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

e) the gloss category;

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

g) the batch number;

h) the date of manufacture;

i) mixing and thining instructions.

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 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), pickle the panels in accordance with BS EN 2334.

B.1.3 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 ISO 1514. Allow to dry and immerse in a 10 % aqueous solution of aircraft cleaning detergent conforming to DEF STAN 79-17 [3] 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 4 h to 16 h, 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 to 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 at least 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 : Part D8 : 1986	*Determination of colour and colour difference — Principles*
BS 3900 : Part D9 : 1986	*Determination of colour and colour difference — Measurement*
BS 3900 : Part D10 : 1986	*Determination of colour and colour difference — Calculation*
BS 3900 : Group E :	*Mechanical tests on paint films*
BS 3900 : Part E2 : 1992	*Scratch 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 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 33 : 1998	*Specification for two component epoxy primer for aerospace purposes*
BS EN 2334[1)]	*Specification for acid chromate pickle for aluminum alloys*
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 1514 : 1997	*Paints and varnishes — Standard panels 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*
BS EN ISO 6272 : 1994	*Paints and varnishes — Falling weight test*

[1)] In preparation.

Other publications

[1] ASTM-D 3960 *Standard practice for determining volatile organic compound (VOC) content of paints and related coatings*, ASTM, 100 Barr Harbor Drive, West Conshohoken, PA 19428.

[2] ASTM G53 *Standard practice for operating light-and-water-exposure apparatus (fluorescent UV-condensation type) for exposure of non-metallic materials*, ASTM, 100 Barr Harbor Drive, West Conshohoken, PA 19428.

[3] 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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