BS 2X 32 : 1998

# Specification for pretreatment etch 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

This British Standard, having been prepared under the direction of the Engineering Sector Board, was published under the authority of the Standards Board and comes into effect on
15 April 1998



First published 28 June 1991
Second edition April 1998

The following BSI references relate to the work on this standard:
Committee reference ACE/44
Draft for comment 96/705058 DC

**ISBN 0 580 27977 4**

**Amendments issued since publication**

| Amd. No. | Date | Text affected |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

# 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 specifies requirements for a two pack pretreatment etch primer that may be used with British Standard X series primer and/or finishing schemes. It supersedes BS X 32 : 1991 which has been withdrawn.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 a water resistant, two pack pretreatment etch primer for aerospace applications.

The pretreatment etch primer is for use on metallic substrates to provide adhesion for an anti-corrosive primer and finishing scheme.

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

## 2 References

### 2.1 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.

### 2.2 Informative references

This British Standard refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on the inside back cover, but reference should be made to the latest editions.

## 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 pretreatment etch primer shall consist of a pigmented phenolic/polyvinyl acetal resin base and an activator containing an appropriate quantity of orthophosphoric acid in a suitable solvent. The base and activator 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 pretreatment etch primer shall consist essentially of zinc tetroxychromate, opacifying pigments and extenders.

**4.1.3** The zinc tetroxychromate (see **4.1.2**) shall conform to zinc chrome type 3 of BS 282, 389 : 1963.

### 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** to **4.2.4**.

#### 4.2.2 *Pretreatment etch primer*

Pretreatment etch primer shall conform to this British Standard.

#### 4.2.3 *Primer*

Primer shall conform to type A of BS X 33 unless otherwise specified.

#### 4.2.4 *Finish*

Finish shall conform to type A 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** 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

Pretreatment etch 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 and 2 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.

## 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 32 : 1998;

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

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

e) the batch number;

f) the date of manufacture;

g) 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 0 °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 200 ml sample 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** | a) 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. |
| | **B.1.1**, **B.1.3** and **B.2** | b) ≤ 5 min after spraying, force drying at (125 ± 5) °C for 15 min and allowing to cool for 1 h | 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 ≤ 1 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).

**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.2** | 24 h after application, under diffuse daylight | BS 3900 : Part D1 | Shall be yellow.[1)] |
| 2) Specular gloss | **B.1.1**,**B.1.3** and **B.2** | 24 h after application, using a 60° glossmeter | BS 3900 : Part D5 | Shall be less than or equal to 20 units.[1)] |
| 3) Water resistance | **B.1.1**, **B.1.2** and **B.4** | Immerse for 168 h at (23 ± 2) °C in water conforming to at least grade 3 of BS EN ISO 3696 | Method 1, procedure A of BS 3900 : Part G5 | ≤ 2 min after removal shall show no blistering or other film defects. |
| | | | BS 3900 : Part E6, 1 mm spacing | ≤ 2 min after removal shall be ≤ class 2. |
| 4) Flexibility (cupping test) | **B.1.1**, **B.1.2** and **B.3** | After 7 d air drying | BS EN ISO 1520 (× 10 magnification) | There shall be no cracking at an indentation depth of 4 mm. |
| 5) Corrosion resistance (filiform) | **B.1.1**, **B.1.2** and **B.4** | Cut paint film through to substrate, penetrating the cladding, using a sharp blade; test for 1000 h | BS EN 3665 | There shall be no blistering or other film defect.[2)] Corrosion shall not spread more than 2 mm from cut. |
| 6) Natural weathering | **B.1.1**, **B.1.3** and **B.4** | Cut paint film through to substrate, penetrating the cladding, using a sharp blade; test for 2 years at a rural site | ISO 2810 | There shall be no blistering, flaking or cracking.[2)] Corrosion shall not spread more than 2 mm from cut. |

[1)] Unless otherwise specified by the purchaser.
[2)] BS 3900 : Parts H2, H4 and H5 may prove useful when evaluating conformity.

## Annex A (normative)
## Type approval

**A.1** If 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), acid chromate 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 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 Pretreatment etch primer application

**B.2.1** Prepare the pretreatment etch primer by mixing the base and activator in the proportions specified and thin as necessary with the appropriate thinners as recommended by the manufacturer.

**B.2.2** Spray the pretreatment etch primer on the test panels (see **B.1**), within 24 h of preparation, at a spreading rate sufficient to produce a single dry coat with a film thickness of $(8 \pm 2)$ μm, unless otherwise specified, and allow to dry vertically, with free air access, for 16 h to 24 h, unless otherwise specified.

### B.3 Primer application

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

**B.3.2** Spray the primer 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 $(20 \pm 5)$ μm, unless otherwise specified, and allow to dry vertically, with free air access, for 16 h to 24 h, unless otherwise specified.

### B.4 Finish application

**B.4.1** Prepare the finish by mixing the base and curing agent in the proportions specified by the manufacturer and thin as necessary with the appropriate thinners.

**B.4.2** Spray the finish to the test panels primed in accordance with **B.3**, at a spreading rate sufficient to produce a single dry coat with a film thickness of $(40 \pm 5)$ μm, unless otherwise specified, and allow to dry vertically, with free air access, for 7 d, unless otherwise specified.

*blank*

# List of references (see clause 2)

## Normative references

### BSI publications

BRITISH STANDARDS INSTITUTION, London

| | |
|---|---|
| BS 282, 389 : 1963 | *Specification for lead chromes and zinc chromes for paints* |
| BS 2015 : 1992 | *Glossary of paint and related terms* |
| BS 3900 : | *Methods of test for paints* |
| BS 3900 : Group A : | *Tests on liquid paints (excluding chemical tests)* |
| BS 3900 : Part A2 : 1993 | *Examination and preparation of samples for testing* |
| 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 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 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 21512 : 1994 | *Methods of test for paints — Sampling* |
| 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* |

### ISO publications

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO), Geneva. (All publications are available from Customer Services, BSI.)

| | |
|---|---|
| ISO 2810 : 1974 | *Paints and varnishes — Notes for guidance on the conduct of natural weathering tests* |

[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.

## Informative references

### BSI publications

BRITISH STANDARDS INSTITUTION, London

| | |
|---|---|
| BS 3900 : | |
| BS 3900 : Group H : | *Evaluation of paint and varnish defects* |
| BS 3900 : Part H2 : 1982 | *Designation of degree of blistering* |
| BS 3900 : Part H4 : 1983 | *Designation of degree of cracking* |
| BS 3900 : Part H5 : 1983 | *Designation of degree of flaking* |

# BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

**Revisions**

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: 020 8996 9000. Fax: 020 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

**Buying standards**

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: 020 8996 9001. Fax: 020 8996 7001.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

**Information on standards**

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: 020 8996 7111. Fax: 020 8996 7048.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: 020 8996 7002. Fax: 020 8996 7001.

**Copyright**



BSI
389 Chiswick High Road
London
W4 4AL