BRITISH STANDARD

BS 6496:1984
Incorporating
Amendment no. 1

Specification for

Powder organic coatings for application and stoving to aluminium alloy extrusions, sheet and preformed sections for external architectural purposes, and for the finish on aluminium alloy extrusions, sheet and preformed sections coated with powder organic coatings

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Pigments, Paints and Varnishes Standards Committee (PVC/-) to Technical Committee PVC/25 upon which the following bodies were represented:

Aluminium Coatings Association
Aluminium Federation
Aluminium Window Association
British Institute of Interior Design
Department of the Environment (Building Research Establishment)
Greater London Council
HEVAC Association
Home Improvement Powder Coatings Association
Oil and Colour Chemists' Association
Paintmakers Association of Great Britain Ltd.
Royal Institute of British Architects
Steel Window Association

This British Standard, having been prepared under the direction of the Pigments, Paints and Varnishes Standards Committee, was published under the authority of the Board of BSI and comes into effect on 31 August 1984

The following BSI references relate to the work on this standard:
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Amendments issued since publication

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Contents

Foreword

This British Standard has been prepared under the direction of the Pigments, Paints and Varnishes Standards Committee at the request of the Aluminium Window Association.

Aluminium alloy windows are frequently located in relatively inaccessible locations and this standard has been prepared as the direct result of the need to ensure that coatings applied to aluminium components (and especially to aluminium windows) have a satisfactory service life with low maintenance requirements. The preparation of the standard was undertaken simultaneously with the revision of BS 4842:1972 and note was taken of comments from industry on that standard. These comments showed that with the development of new coating products a standard corresponding to BS 4842 but applicable to powder organic coatings and finishes should be prepared. Technical considerations indicated that liquid coatings and finishes and powder coatings and finishes required different performance test procedures and therefore separate standards would be required for each. This standard deals with powder organic coatings for and finishes on aluminium alloy components; BS 4842 deals similarly with liquid organic coatings for and finishes on aluminium alloy components. (BS 6497 deals with powder organic coatings for and finishes on galvanized steel sections and preformed sheet.)

This standard relates to two different interfaces (between coating manufacturer and coating applicator and between applicator and, for example, architect) and has therefore been divided into sections in such a way that compliance can be claimed with the appropriate section. In order to assist in identifying these two interfaces, the term “coating” has been used consistently in section 2 to describe the powder organic coating when applied to the test panels, and the term “finish” has been used in section 3 when referring to the powder organic coating as applied by the applicator.

Section 2 of this standard gives the requirements for the organic coatings to be applied to aluminium alloy components and the tests described therein are intended to be carried out by the coating manufacturer. Section 3 gives the requirements for the finish on extrusions, sheet and preformed sections of aluminium alloy and the tests described therein are intended to be carried out by the coating applicator.

Some coatings containing metallic pigments and certain coatings with gloss levels below 50 units may not comply with all the requirements of section 2 of this standard.

It is stressed that preparation and pre-treatment of the metal surface are very important in producing satisfactory finishes on aluminium. Therefore, to ensure optimum adhesion, a preliminary chemical conversion of the aluminium surface has been made a requirement of section three of this standard.

Indeed, preparation and pre-treatment of the surface are so important that the inclusion of a rapid, routine test to detect faulty processing was considered essential, even though none of the tests available could test the pre-treatment processes independently of other parameters. Thus a test to assess the quality of pre-treatment is specified in **10.8**, although failure in this test does not necessarily imply that faulty pre-treatment is the only cause. This test has been specifically introduced as it is an accelerated procedure which reveals when the pre-treatment conditions are becoming unsatisfactory. This same test is also specified in **4.13** as a means of assessing the permeability of the coating.

Attention is drawn to the note in **10.5** explaining that technical difficulties in the coating process can affect the achievement of a specified maximum thickness of finish. Where a purchaser has supplied drawings (or sample sections) indicating where an-excessive thickness of finish on a significant surface would cause problems during fabrication of a product from a coated component, the finish on those surfaces is not to exceed 120 μm. The applicator may need to advise when such drawings (or sections) should be supplied.

It was considered essential to section 2 of this standard that there should be a performance test to assess the resistance to weathering of organic coatings. It was also desirable that this test should include the assessment of permissible loss in gloss. While there were merits in having an accelerated procedure [see **4.10** a)] which allows a coating to be assessed within about 12 weeks, evidence was cited which showed that the loss of gloss after that period could be more severe than that observed under practical conditions. Moreover the converse had also been observed. Thus the decline in gloss could not be considered an exact measure of potential performance and this prevented the property being used in the assessment of a coating.

An alternative procedure [see **4.10** b)] was proposed to overcome this problem, despite the disadvantage of a test period of 1 year. However, while this test was more akin to practical conditions and generally more reliable, again the loss of gloss experienced could not be correlated with performance. It is for this reason that both tests in this specification include an evaluation of coatings for their resistance to chalking to partially resolve the difficulty. Each of the weathering tests is believed to have value but also has disadvantages, and hence the Technical Committee responsible for preparing this standard concluded that both should be included. The artificial weathering test is for use routinely but in the event of a dispute, the product is required to satisfy the appropriate requirements after undergoing both that and the natural weathering test.

It is important that the finish on architectural components should be compatible with sealing compounds used in the building industry. In general, finishes which comply with section 3 of this standard will satisfy this requirement but, in cases of doubt, the user should satisfy himself that the particular sealant he intends to use is compatible with and adheres to the finish by referring the matter to the sealant supplier.

It has been assumed in the drafting of this British Standard that the test methods will be applied by those who are appropriately qualified and experienced.

Certification. Attention is drawn to the certification facilities offered by BSI described on the inside back cover of this standard.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

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 to iv, pages 1 to 10, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

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Section 1. General

1 Scope

Section 2 of BS 6496 specifies requirements for powder organic coatings which are intended for application to aluminium alloy extrusions, sheet and preformed sections that are not to be further formed (except for cutting).

Section 3 of BS 6496 specifies requirements for the finish on aluminium alloy extrusions, sheet and preformed sections when so coated.

The methods of test for these coatings and finishes are described in section 4.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this British Standard, the definitions given in BS 2015 apply together with the following.

2.1
finish[1)]

the final or only coat in a painting process

2.2
conversion coating

a modification to an aluminium surface by chemical treatment with chromate ions or chromate and phosphate ions without the use of an applied electric current

2.3
powder organic coating

a product containing pigments, resins and other additives which is applied in the form of a powder on to a metallic substrate and is fused to form a coherent continuous finish

2.4
test piece

a single item which is representative of the work being processed

2.5
test sample

a group of test pieces

2.6
significant surface

that part of the total surface of the finish on which a particular requirement for the specified finish is to be assessed

2.7
specifier

the person issuing a contract specifying particular properties of a powder organic coating before or after its application to a substrate

Section 2. Performance and other requirements for powder organic coatings

NOTE The tests associated with these requirements are intended to be carried out by or on behalf of the supplier or manufacturer of a powder organic coating.

3 Sampling of powder organic coatings

A representative sample of the powder organic coating shall be taken as described in BS 3900-A1.

The sample shall be examined and prepared for testing by the appropriate methods described in BS 3900-A2.

4 Performance requirements for powder organic coatings

4.1 General. The tests shall be carried out in duplicate. The test panels referred to in this clause shall be prepared as described in clause **13**.

The coating, when applied to a prepared test panel, shall show no scratches through to the substrate. When a coated test panel is illuminated as described in BS 3900-D1 and examined at an oblique angle with normal or corrected vision, no blisters, craters, pinholes or scratches shall be visible from a distance of about 0.5 m.

4.2 Colour. When a coated test panel is examined by the procedure described in BS 3900-D1, the colour of the coating shall match (see BS 2015) the reference colour previously nominated by the specifier.

NOTE Colours should be chosen from BS 4800 but when this is not possible the colour of a reference sample should be agreed.

4.3 Gloss. When a coated test panel is tested by the procedure described in BS 3900-D5, using incident light at 60° to the normal to the surface of the coating, the gloss level of the coating shall be within five units of the value previously nominated by the specifier.

[1)] This definition differs from that given in BS 2015 which is currently being revised.

4.4 Adhesion. When a coated test panel is tested by the procedure described in BS 3900-E6 using a spacing of 2 mm between each of the six parallel cuts, the result shall be in accordance with classification 0 of that standard.

When a piece of adhesive tape[2], approximately 25 mm × 150 mm, is applied firmly to the cut area and then removed rapidly by pulling at right angles to the test panel, no pieces of coating other than debris from the cutting operation shall be removed from the surface of the coating.

4.5 Cupping test. When a coated test panel is tested by the procedure described in BS 3900-E4 using an indentation of 6 mm, there shall be no cracking of the coating nor any detachment from the substrate.

4.6 Scratch resistance. When a coated test panel is tested by the procedure described in BS 3900-E2 using a load of 4 000 g on a tungsten-carbide ball of 1 mm diameter, there shall be no penetration through the coating to the substrate.

4.7 Impact test for cure. When a coated test panel is tested by the procedure described in clause **16**, there shall be no cracking of the coating nor any detachment from the substrate.

4.8 Resistance to mortar. When a coated test panel is tested by the procedure described in clause **14**, the mortar shall be readily dislodged without the use of an implement. There shall be no detachment of the coating and no change in its appearance.

4.9 Resistance to acetic acid/salt spray. When a coated test panel is tested by the procedure described in clause **15** for a period of 1 000 h, there shall be no blistering, softening or detachment of the coating. There shall be not more than 2.0 mm of corrosion creep from the scored line, measured at right angles to the line, and the remainder of the substrate shall show no signs of corrosion.

When, after the panel has been washed with water and allowed to dry for 24 h at 23 ± 2 °C, a piece of adhesive tape[2], approximately 25 mm × 150 mm, is applied firmly to the cut area and then removed rapidly by pulling at right angles to the test panel, no coating shall be removed from the surface of the panel unless it is within 2.0 mm of the scored line.

4.10 Weathering tests. Either the test given in a) or the test given in b) shall be carried out except in the case of a dispute, where the coating shall satisfy the given requirements after undergoing both tests (see foreword and clause **5**).

NOTE Natural weathering tests are generally considered to be more informative than artificial weathering procedures in assessing coating durability but inevitably take longer. Purchasers should satisfy themselves whether **4.10** a) or **4.10** b) has been carried out on a specific product.

a) *Resistance to artificial weathering.* When a coated test panel is tested by the procedure described in BS 3900-F3 for 2 000 h and the coating is examined for signs of chalking in accordance with that standard, the surface of the velvet shall show no chalking in excess of the minimum illustrated in the photographic reference standards of ASTM D 659:1980.

After the coating has been washed with a 1 % aqueous solution of a mild detergent, the coating shall show no checking, cracking or flaking and any change in colour shall not exceed one step in hue, value or chroma in the Munsell atlas[3] from the original colour.

NOTE Although the coating will show some loss of gloss during this test the assessment of other properties should ensure that, in use, the gloss of the coating remains acceptable (see foreword).

b) *Resistance to natural weathering.* When a coated test panel is exposed for a period of 12 months, starting in April in any year, at the direct weathering inland site of the Florida Sub-Tropical Testing Service[4], using method A and with the panel inclined at an angle of 45° and facing south, and the coating is examined for signs of chalking in accordance with BS 3900-F3, the surface of the velvet shall show no chalking in excess of the minimum illustrated in the photographic reference standards of ASTM D 659:1980.

After the coating has been washed with a 1 % aqueous solution of a mild detergent, the coating shall show no checking, cracking or flaking and any change in colour shall not exceed one step in the hue, value or chroma in the Munsell atlas[3] from the original colour [see also the note to **4.10** a)].

NOTE At the Florida Sub-Tropical Testing Service, panels being tested in accordance with method A will be washed with water at three-monthly intervals.

[2] Sellotape type 1101 has been found to be suitable.

[3] The atlas is contained in the "Munsell book of color", published by the Munsell Color Inc., Baltimore, USA.

[4] The Florida Sub-Tropical Testing Service Inc., P O Box 560876, 8290 S. W. 120th Street, Miami, Florida, USA 33156.

4.11 Resistance to humidity. When a coated test panel is tested by the procedure described in BS 3900-F2 for 1 000 h, there shall be no blistering, softening or detachment of the coating nor signs of corrosion of the test panel.

When the coating is tested, after the panel has been dried with absorbent paper and left for 24 h at 23 ± 2 °C, by the procedure described in BS 3900-E6, using a spacing of 2 mm between each of the six parallel cuts, the result shall be in accordance with classification 0 of that standard.

When a piece of adhesive tape[5], approximately 25 mm × 150 mm, is applied firmly to the cut area and then removed rapidly by pulling at right angles to the test panel, no pieces of coating other than debris from the cutting operation shall be removed from the surface of the coating.

4.12 Resistance to sulphur dioxide. When a coated test panel is tested by the procedure described in BS 3900-F8 (but using a smaller cabinet as necessary) for 240 h there shall be no change in colour in comparison with an unexposed coated test panel, no blistering of the coating and no signs of corrosion of the substrate.

4.13 Permeability. When a coated test panel is tested by the procedure described in clause **17** and examined with normal or corrected vision, there shall be no blistering of the coating except within 3 mm of any edge of the panel.

4.14 Storage properties. The powder organic coating, prior to application and after storage at temperatures between 4 °C and 25 °C in unopened containers for 12 months from the date of despatch by the manufacturer, shall still comply with the requirements in **4.1** to **4.13** inclusive.

NOTE If storage conditions are abnormal, the manufacturer of the product should be informed so that any special recommendations can be made.

5 Manufacturer's certificate

The coating manufacturer or supplier shall provide for the issue of a certificate stating that the powder organic coating complies with the requirements specified in **4.1** to **4.13** and, in the case of **4.10**, whether **4.10** a) or **4.10** b) or both had been carried out. This certificate shall relate only to the original coating formulation and a new certificate shall not be required for each batch of material manufactured to this formulation. If changes in the formulation are introduced, the manufacturer shall provide for the issue of a certificate covering the new formulation.

NOTE The certificate will only be provided when specifically requested by the purchaser at the time of order.

6 Identification of powder organic coatings

The documents associated with each consignment of powder organic coatings that claim compliance with section two of this standard shall clearly state the following information:

a) supplier;

b) trade name;

c) colour;

d) type of binder;

e) batch number and reference number;

f) the number, section and date of this British Standard in the form BS 6496/2:1984[6];

g) statement of the weathering test(s) carried out (either **4.10** a) or **4.10** b) or both);

h) the date of despatch;

i) method of application;

j) statutory requirements and information as necessary.

Section 3. Performance and other requirements for the finish on aluminium alloy extrusions, sheet and preformed sections coated with powder organic coatings

NOTE The tests associated with these requirements are intended to be carried out by or on behalf of the applicator of the powder organic coating.

[5] Sellotape type 1101 has been found to be suitable.

[6] Marking BS 6496/2:1984 in relation to a product is a claim by the manufacturer that the product has been manufactured to the requirements of section two of this standard. The accuracy of such a claim is therefore solely the manufacturer's responsibility. Enquiries as to the availability of third party certification to support such claims should be addressed to the Director, Quality Assurance Division, BSI, Maylands Avenue, Hemel Hempstead, Herts HP2 4SQ for certification marks administered by BSI or to the appropriate authority for other certification marks.

7 Coating

The coating to be applied to the aluminium alloy extrusion, sheet or preformed section shall be a powder organic coating complying with section 2 of this standard.

NOTE It will be necessary for the purchaser to indicate the significant surfaces (see **2.6**), if need be by supplying suitably marked specimens or technical drawings of the extrusions or preformed sections.

8 Pre-treatment of aluminium alloy extrusions, sheet or preformed sections

Each aluminium alloy extrusion, sheet or preformed section shall be thoroughly cleaned by treatment with alkaline or acidic solutions under the conditions specified by the conversion coating chemical supplier and then rinsed. A chemical conversion coating shall be applied by treatment with a solution containing essentially chromate ions or chromate and phosphate ions as the active components. The amount of the conversion coating deposited depends on the type used and shall be within the limits specified by the conversion coating chemical supplier. The amount of the coating deposited shall be determined by the method given in **4.5** of BS 5411-14:1982.

The conversion coating shall be thoroughly rinsed either with the solution specified by the conversion coating chemical supplier or with demineralized water and then dried at the temperature and for the time specified by the conversion coating chemical supplier. The conductivity of the demineralized water draining off the rinsed work pieces shall not exceed 100 $\mu S/cm^2$ at 20 °C. The metal surface after the conversion coating pre-treatment and prior to the application of the coating shall be free from dust or powdery deposits.

NOTE The application of the powder organic coating should be carried out as soon as possible after the pre-treatment. Delays in excess of 48 h may result in inferior adhesion and weathering properties.

9 Sampling of coated panels, extrusions, sheet and preformed sections

The frequency of sampling by the applicator is not specified in this standard.

NOTE 1 It is strongly recommended that the testing of coated components [or of coated test panels (see **10.1**)] is carried out on test samples taken sufficiently frequently for the applicator to be satisfied that the finish on all coated components will comply with the requirements of **10.2** to **10.8**.

NOTE 2 Because of wide variations in manufacturing conditions, sampling procedures chosen by applicators will vary appreciably. However, it is recommended that sampling should be carried out at at least four-hourly intervals to minimize process variability and to ensure product acceptance. (For additional information in assessing process variability, see BS 5700, BS 5701 and BS 5703; for additional guidance on acceptance sampling, see BS 6000, BS 6001 and BS 6002.) Tests for appearance (see **10.2**) and colour (see **10.3**) need to be carried out more frequently. It is recommended that continuous monitoring of the thickness of the finish (see **10.5**) should be carried out.

10 Performance requirements for the finish on coated aluminium extrusions, sheet and preformed sections

NOTE It is strongly recommended that coated test pieces should be tested in preference to coated test panels.

10.1 Test panels and test pieces. Where necessary, the applicator shall prepare test panels as described in clause **13**, and shall carry out the pre-treatment described in clause **8** and carry out coating procedures in the same manner as for work pieces by passing the panels (see note) through the same system. The test panels shall be of the same alloy, if possible, as that of the work pieces and the thickness of the finish shall be as specified in **10.5**.

Test pieces shall be of the same material as the work pieces and shall be pre-treated and coated in the same manner as the work pieces by passing them through the same system. The test pieces shall be conditioned at 23 ± 2 °C for at least 1 h before carrying out the tests.

NOTE If a test panel is used it should be strapped to an aluminium alloy base of thickness comparable to that of the thickest part of the work being processed.

10.2 Surface appearance. The finish on significant surfaces shall show no scratches through to the substrate. When the finish on significant surfaces is illuminated as described in BS 3900-D1 and is examined at an oblique angle with normal or corrected vision, no blisters, craters, pinholes or scratches shall be visible from a distance of about 1 m.

NOTE 1 If the coating applicator cannot avoid contact marks on the finish on the significant surfaces, it is essential that the specifier is advised before coating commences and that acceptable limits or alternative positions are agreed.
NOTE 2 The electrostatic deposition of a powder can cause thicker coatings near edges and thinner coatings in recesses.
NOTE 3 A slight degree of "orange peel" may sometimes occur. The maximum extent of "orange peel" allowable should be indicated by the specifier, using suitable reference samples.

10.3 Colour. When the finish on each significant surface of the coated test piece is examined by the procedure described in BS 3900-D1, the finish on each significant surface shall match (see BS 2015) the reference colour previously nominated by the specifier (see **4.2**).

NOTE If the significant surface cannot be placed in the colour-matching booth described in BS 3900-D1, the colour should be compared under natural diffuse daylight.

10.4 Gloss. When the finish on each significant surface of the coated test piece is tested by the procedure described in BS 3900-D5, using incident light at 60° to the normal to the surface, the gloss level of the finish shall be within seven units of the value previously nominated by the specifier (see **4.3**).

NOTE If a significant surface is too small or inaccessible to allow measurements with a glossmeter, the gloss should be assessed visually by comparison with finishes of known gloss.

10.5 Thickness. When the finish on each significant surface of the coated test piece is tested (see note 2 to clause **9**) with a minimum of three determinations, by the procedure specified in **7.3** of BS 3900-C5:1975, the thickness of the finish shall be not less than 40 μm at any point. The thickness, on any significant surfaces that require a limited thickness of finish as indicated on suitably marked specimens or on the technical drawings, shall be not more than 120 μm (see foreword and note to clause **7**).

NOTE The control of the thickness of the finish is technically difficult and is very dependent on the geometry of the sections to be coated. Therefore it may not always be possible to achieve a specified maximum thickness whilst maintaining a minimum thickness of 40 μm.

The substrate shall not be visible at the edge of any significant surface.

10.6 Adhesion. When a coated test piece (or coated test panel) is tested by the procedure described in BS 3900-E6 using a spacing of 2 mm between each of the six parallel cuts, the result shall be in accordance with classification 0 of that standard.

When a piece of adhesive tape[7], approximately 25 mm × 150 mm, is applied firmly to the cut area and then removed rapidly by pulling at right angles to the test area, no pieces of the finish other than debris from the cutting operation shall be removed from the surface of the finish.

10.7 Impact test for cure. When a coating, applied to a test panel at a dry film thickness of 60 ± 20 μm is tested by the procedure described in clause **16**, there shall be no cracking of the finish nor any detachment from the substrate.

NOTE A dry film thickness of greater than 80 μm may give erroneous results in this test which is only included to confirm that the curing of the finish is complete. (See note 2 to **10.2**.)

10.8 Quality of pre-treatment. When a coated test piece (or coated test panel) is tested (see foreword) by the procedure described in clause **17** and examined with normal or corrected vision, there shall be no blistering of the finish except within 3 mm of any edge of the test piece or test panel.

11 Applicator's certificate

The coating applicator shall provide for the issue of a certificate stating that the finish complies with the requirements specified in **10.2** to **10.8**.

NOTE The certificate will only be provided when specifically requested by the specifier at the time of order.

12 Identification, care and maintenance

Each package supplied by the applicator containing a coated component, the finish of which claims compliance with section 3 of this standard, shall be clearly and indelibly identified and the following information shall also be supplied.

a) applicator;

b) type of coating;

c) colour;

d) identification number;

e) the number, section and date of this British Standard in the form BS 6496/3:1984[8];

f) the date of despatch.

NOTE Recommendations for the handling and care of the finish on coated aluminium alloy components are given in appendix A. Recommendations for the maintenance of the finish on installed coated components are given in appendix B.

Section 4. Methods of test for powder organic coatings applied to and finishes on aluminium alloy test panels, extrusions, sheet or preformed sections

13 Preparation of coated test panels

13.1 Test panels. The test panels shall be rectangular, 150 mm × 100 mm in area and nominally 1.0 mm in thickness, and shall be prepared, unless otherwise indicated by the specifier, from aluminium alloy complying with the requirements of alloy designation 1 200, condition H4 of BS 1470 (see also **10.1**).

[7] Sellotape type 1101 has been found to be suitable.

[8] Marking BS 6496/3:1984 in relation to a finish on a coated component is a claim by the applicator that the component has a finish which complies with the requirements of section three of this standard. The accuracy of such a claim is therefore solely the applicator's responsibility. Enquiries as to the availability of third party certification to support such claims should be addressed to the Director, Quality Assurance Division, BSI, Maylands Avenue, Hemel Hempstead, Herts HP2 4SQ for certification marks administered by BSI or to the appropriate authority for other certification marks.

13.2 Pre-treatment. The pre-treatment of the test panels shall be as specified in clause **8**.

13.3 Coating. The test panels shall be coated with the powder organic coating by the method specified by the manufacturer to give a dry film thickness of 60 ± 10 µm, when determined by the procedure described in **7.3** of BS 3900-C5:1975. The coating shall be free from the surface defects specified in **4.1**.

13.4 Conditioning. The panels shall be conditioned at 23 ± 2 °C for at least 1 h before carrying out the specified tests.

14 Resistance to mortar

14.1 Principle. Application of a pat of wet lime mortar to the dry coating and, after allowing the mortar to set and dry, assessment of the effect of the mortar on the surface of the coating.

14.2 Materials

14.2.1 *Sand,* dry, complying with BS 1200.

14.2.2 *Hydrated lime,* complying with clause **2** of BS 890:1972.

14.2.3 *Portland cement,* complying with standard strength class 42.5 as specified in BS 12:1991.

14.3 Procedure. Prepare a mortar by mixing 15 g of the lime (**14.2.2**), 41 g of the cement (**14.2.3**) and 244 g of the sand (**14.2.1**), with sufficient tap water to make a soft paste. Apply four portions of the mortar, about 15 mm diameter and about 6 mm thick, to a test panel which has been prepared and conditioned as described in clause **13**.

Allow the panel to stand for 24 h at 38 ± 3 °C and 95 ± 5 % relative humidity.

At the end of this period, dislodge the mortar by hand from the surface of the coating and remove any residue with a damp cloth. Allow to dry and examine the coating, using normal or corrected vision, for detachment of the coating and for change in appearance due to the effect and removal of the mortar.

15 Resistance to acetic acid/salt spray

15.1 Principle. Subjection of the coating to a prolonged period of exposure to a corrosive atmosphere to evaluate the coating's resistance to attack in aggressive environments and its resistance to lateral corrosion when the coating is penetrated to the substrate.

15.2 Apparatus

NOTE Metal should not be used in the construction of any parts of the apparatus coming into contact with the corrosive medium (**15.3**).

15.2.1 *A room or cabinet,* lined with glass, rubber, glazed ceramic, plastics material or other suitable material resistant to the corrosive medium (**15.3**). The room or cabinet shall have provision for heating and maintaining the temperature at 35 ± 3 °C, baffles to prevent direct impingement of spray on to the test panels and to prevent condensed liquid from the roof of the room or cabinet falling on to the test panels and inert supports from which the test panels may be suspended.

15.2.2 *A supply of clean, compressed air and a suitable means of control.*

15.2.3 *Atomizing nozzles,* one or more.

15.2.4 *Mist collectors,* clean, at least two. 100 mm diameter laboratory funnels in the necks of flasks are suitable.

15.3 Corrosive medium. Dissolve 50 ± 1 g of sodium chloride in water of at least grade 3 purity complying with BS 3978. Add 6 mL of glacial acetic acid and dilute to 1 L with water.

15.4 Procedure. Take a coated test panel prepared as described in clause **13** and score two diagonal intersecting lines through to the metal. Suspend the panel in the room or cabinet (**15.2.1**). Adjust the flow of the corrosive medium (**15.3**) and of the compressed air (**15.2.2**) to the nozzles (**15.2.3**) to give a fine spray. Place the mist collectors (**15.2.4**) in the proximity of the test panel, one near to one of the nozzles and the other away from all nozzles, and both in positions so that no drops of solution are collected from any source other than the spray. Adjust the spray to give a fine continuous mist so that for each 80 cm^2 of horizontal area the volume of solution collected in each mist collector is 1 mL/h to 2 mL/h.

Remove the test panel from the room or cabinet after a period of 1 000 h and rinse it by a single immersion in water. Dry the panel at 50 ± 5 °C and immediately examine it.

16 Impact test

16.1 Apparatus. A suitable apparatus, as shown in Figure 1, allows a steel cylinder of mass 0.908 kg to fall freely through a height of 0.25 m. The impact energy of the falling cylinder is transmitted by a 15.88 mm diameter ground steel hemisphere to the test panel placed over a 16.3 mm diameter die. A vertical guide tube is used to direct the falling cylinder so that the centre lines of the cylinder and of the hemisphere are in line with that of the die.

16.2 Procedure. Place a coated test panel on the die with the test surface downwards. Raise the steel cylinder to a height of 0.25 m and allow it to fall freely onto the test panel.

Examine the direct and reverse surfaces of the indentation.

17 Permeability of coating and quality of pre-treatment of the metal surface

17.1 Apparatus

17.1.1 *Pressure cooker,* complying with the requirements of BS 1746, with a weighted needle valve.

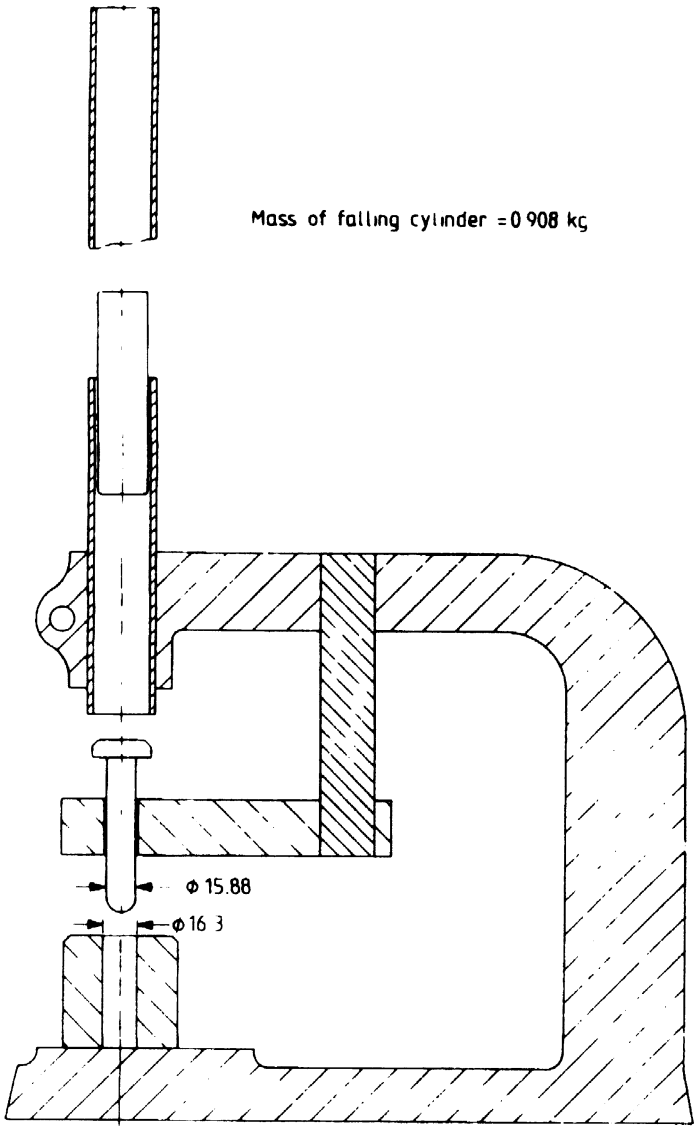
17.2 Procedure. Add demineralized water to the pressure cooker to give a depth of 25 ± 3 mm. Partially immerse a coated test piece or coated test panel in the water so that a minimum length of 25 mm is immersed and secure the lid of the cooker.

Apply heat to the pressure cooker until steam is emitted from the valve, insert a weighted needle valve to give an internal pressure of 100 ± 10 kPa[9] and continue heating for 2 h from when steam is first emitted.

Cool the apparatus with care.

Remove the test piece or test panel, allow it to cool to ambient temperature and immediately examine it.

[9] 100 kPa = 10^5 N/m^2 = 1 bar ≈ 15 lbf/in^2.



All dimensions are in millimetres.

Figure 1 — Falling weight impact test apparatus

Appendix A The care of the finish on coated aluminium alloy components for architectural purposes

A.1 Organic coated aluminium components may be damaged in transit (see **A.2**) or on site (see **A.4**) if carelessly packed or handled. It is recommended that an appropriate note to this effect is affixed to each package containing such components. This note should state that care is to be taken when handling and, particularly, when unloading.

A.2 If self-adhesive tapes are used for packaging organic coated aluminium alloys, care should be taken to prevent direct contact between the tape and the finish. Each component should be separately packaged to prevent damage during transit. As corners of window frames, especially, are susceptible to impact damage, it is recommended that additional corner protection is used.

A.3 Building materials containing alkali (e.g. cement, mortar and plaster) should not adhere firmly to finishes and these finishes are generally resistant to other chemical attack. Although the finishes complying with section 3 of this standard have good resistance to impact damage, sharp instruments may cut them. Damage is also likely to be caused if building components are dragged over them. The only effective method of stopping these forms of damage is by exercising reasonable care on site and imposing strict site discipline.

A.4 It is recommended that neither protective tapes nor clear lacquers should be used directly to minimize damage, as some of these materials can adversely affect the properties of the finish. However, if the use of such tapes for protection on site is required, the tapes should be specifically designed for the protection of the finish. Also if they are to be used, these materials should be approved only by the purchaser with the agreement of the applicator.

A.5 Any repairs of minor damage to the finish should be effected by using only the materials recommended by the manufacturer of the coating. These materials should, however, be confined to the repair of minor scuff marks or small scratches and their general use over large areas is not recommended, principally because such materials have different weathering properties from the original organic coating.

Annex B The maintenance of the finish on coated aluminium alloy components installed externally

Regular cleaning of finishes on aluminium alloy components will maintain the surface in a satisfactory state. Cleaning should be carried out when the appearance has become unsightly or when deposits of atmospheric pollution or matter washed down from building surfaces are apparent. The finishes should be washed with water containing a mild detergent. Harsh scrubbing or the use of abrasive or solvent cleaners, which will damage the finish, should be avoided.

The frequency of cleaning depends in part on the standard of appearance that is required. As a general guide, however, cleaning should be carried out at three-monthly intervals in industrial or marine environments and at six-monthly intervals in rural locations. Cleaning of window sections can be conveniently carried out when the glazing is being cleaned.

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Publications referred to

BS 12, *Specification for Portland cement.*

BS 890, *Building limes.*

BS 1200, *Specification for sands for mortar for plain and reinforced brickwork, blockwalling and masonry (published with BS 1198 and BS 1199 as Specifications for building sands from natural sources).*

BS 1470, *Wrought aluminium and aluminum alloys for general engineering purposes. Plate, sheet and strip.*

BS 1746, *Specification for domestic pressure cookers.*

BS 2015, *Glossary of paint terms.*

BS 3900, *Methods of test for paints.*

BS 3900-A1, *Sampling.*

BS 3900-A2, *Examination and preparation of samples for testing.*

BS 3900-C5, *Determination of film thickness.*

BS 3900-D1, *Visual comparison of the colour of paints.*

BS 3900-D5, *Measurement of specular gloss of non-metallic paint films at 20°, 60° and 85°.*

BS 3900-E2, *Scratch test.*

BS 3900-E4, *Cupping test.*

BS 3900-E6, *Cross-cut test.*

BS 3900-F2, *Determination of resistance to humidity under condensation conditions.*

BS 3900-F3, *Resistance to artificial weathering (enclosed carbon arc).*

BS 3900-F8, *Determination of resistance to humid atmospheres containing sulphur dioxide.*

BS 3978, *Water for laboratory use.*

BS 4800, *Specification for paint colours for building purposes.*

BS 4842, *Specification for liquid organic coatings for application to aluminium alloy extrusions, sheet and preformed sections for external architectural purposes, and for the finish on aluminium alloy extrusions, sheet and preformed sections coated with liquid organic coatings*[10)].

BS 5411, *Methods of test for metallic and related coatings.*

BS 5411-14, *Gravimetric method for determination of coating mass per unit area of conversion coatings on metallic materials.*

BS 5700, *Guide to process control using quality control chart methods and cusum techniques.*

BS 5701, *Guide to number defective charts for quality control.*

BS 5703, *Guide to data analysis and quality control using cusum techniques.*

BS 5703-1, *Introduction to cusum charting.*

BS 5703-2, *Decision rules and statistical tests for cusum charts and tabulations.*

BS 5703-3, *Cusum methods for process/quality control by measurement.*

BS 5703-4, *Cusums for counted/attributes data.*

BS 6000, *Guide to use of BS 6001: Sampling procedures and tables for inspection by attributes.*

BS 6001, *Sampling procedures and tables for inspection by attributes.*

BS 6002, *Specification for sampling procedures and charts for inspection by variables for percent defective.*

BS 6497, *Specification for powder organic coatings for application and stoving to hot-dip galvanized hot-rolled steel sections and preformed steel sheet for windows and associated external architectural purposes, and for the finish on galvanized steel sections and preformed sheet coated with powder organic coatings*[10)].

ASTM D 659, *Standard method of evaluating degree of chalking of exterior paints*[11)].

Munsell book of color[12)].

[10)] Referred to in the foreword only.

[11)] Available from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa 19103, USA.

[12)] Published by the Munsell Color Inc., Baltimore, USA.

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