The Engineering Society For Advancing Mobility Land Sea Air and Space®
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS 2436C

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Superseding AMS 2436B

Submitted for recognition as an American National Standard

COATING, ALUMINUM OXIDE
Detonation Deposition

1. SCOPE:

1.1 Form:

This specification covers the engineering requirements for applying aluminum oxide to metal parts by detonation deposition and the properties of such coatings.

1.2 Application:

This process has been used typically to provide a hard, wear-resistant surface on metal parts, particularly those used under corrosive or elevated-temperature oxidizing conditions, but usage is not limited to such applications. This coating is not recommended for surfaces with deep vee-shaped grooves, blind cavities, narrow holes, or sharp corners, or where deformation of the basis metal may be expected.

1.3 Safety - Hazardous Materials:

While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The applicable issue of referenced publications shall be the issue in effect on the date of the purchase order.

2.1 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM C 633 Adhesion or Cohesive Strength of Flame-Sprayed Coatings
ASTM E 384 Microhardness of Materials

2.2 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-STD-2073-1 DOD Materiel, Procedures for Development and Application of Packaging Requirements

3. TECHNICAL REQUIREMENTS:

3.1 Equipment:

Shall consist of a specially constructed machine in which the particles of coating compound are fed into the tube of a gun, suspended in a mixture of oxygen, acetylene, and nitrogen, and detonated, heating the particles to plasticity and propelling them at high velocity out of the gun barrel onto the part.

3.2 Coating Compound:

Shall consist of not less than 99% aluminum oxide.

3.3 Preparation:

3.3.1 Surfaces to be coated shall be machined to allow for the finished thickness of the coating.

3.3.2 Parts requiring heat treatment or shot peening shall be so processed prior to coating.

3.3.3 Parts shall be cleaned to remove water, oil, grease, dirt, scale, paint, and other foreign materials detrimental to adhesion of the coating.

3.3.4 Parts shall be suitably masked to protect surfaces not required to be coated.

3.3.5 Surfaces to be coated shall be grit blasted to produce a uniform matte finish sufficient to provide good adhesion of the coating.

3.4 Procedure:

The coating compound shall be deposited onto the designated surfaces to a sufficient thickness to permit finishing to specified dimensions. The temperature of the parts during deposition shall be controlled so as not to exceed 300 °F (149 °C).

3.5 Properties:

The coating on parts or representative test specimens shall conform to the following requirements.

3.5.1 (R) Representative Test Specimens: Shall be coated in the same manner and under the same conditions as the actual hardware.

3.5.1.1 (R) Hardness: Shall be 950 to 1300 HV300, or equivalent, determined in accordance with ASTM E 384 as the average of not less than 10 microhardness readings taken on a cross-section of specimens as in 4.3.1.1 with a minimum coating thickness of 0.007 inch (0.18 mm).

3.5.1.2 (R) Bond Strength: Shall be not less than 6000 psi (41.4 MPa), determined in accordance with ASTM C 633 or other procedure acceptable to purchaser on solid cylinders 1.0 inch (25 mm) in diameter coated at 90 degrees on one flat face and tested at a thickness of 0.008 to 0.012 inch (0.20 to 0.30 mm).

3.5.1.3 Inclusions and Apparent Porosity: Foreign particle inclusions and apparent porosity shall be not more than 2.0% of the coating cross-section, determined by microscopic examination at 200X magnification.

3.5.1.4 (R) Cracks and Interface Bond Separation: Shall not be present, determined by microscopic examination at 200X magnification.

3.5.2 Finished Parts:

3.5.2.1 Hardness: Shall be 950 to 1250 HV300, or equivalent, determined in accordance with ASTM E 384 as the average of not less than 10 microhardness readings taken on a cross-section of a part.

3.6 Quality:

The coating on parts, as received by purchaser, shall be adherent to the basis metal and shall have a uniform, continuous surface free from spalling, chipping, flaking, and other imperfections detrimental to usage of the coating.

3.7 Tolerances:

A maximum tolerance of +0.125 inch (+3.18 mm) is permissible on the boundaries of areas designated to be coated.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:
(R)

The processor of coated parts shall supply all samples for processor's tests and shall be responsible for performing all required tests. When tests are required on actual parts, such parts shall be supplied by purchaser. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the coating conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests for **thickness (3.4.1), hardness (3.5.1.1)** and bond
(R) strength of test specimens (3.5.1.2), inclusion and apparent porosity of coated specimens (5.3.1.3), quality (3.6), and tolerances (3.7) are acceptance tests and shall be performed to represent each lot.

4.2.2 Periodic Tests: Tests for composition for coating compound (3.2) and
(R) hardness (3.5.2.1) of finished parts are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

4.2.3 Preproduction Tests: Tests for all technical requirements are
(R) preproduction tests and shall be performed prior to or on the initial shipment of coated parts to a purchaser, when a change in material and/or processing requires approval by the cognizant engineering organization (see 4.4.2), and when purchaser deems confirmatory testing be required.

4.2.3.1 For direct U.S. Military procurement, substantiating test data and, when requested, preproduction test material shall be submitted to the cognizant agency as directed by the procuring activity, contracting officer, or request for procurement.

4.3 Sampling and Testing:
(R)

Shall be not less than the following; a lot shall be all parts of essentially the same configuration, processed in a continuous operation, to the same range of thickness, with powder from the same batch, and presented for processor's inspection at one time:

4.3.1 Test Specimens: Two sets of specimens, one coated at the beginning and one coated at the end of each lot.

4.3.1.1 Test specimens shall be 3/8 inch (9.5 mm) cubes fabricated from the same
(R) material as the parts they represent, coated on one face to a thickness of 0.005 to 0.010 inch (0.13 to 0.25 mm).

4.3.1.2 (R) For parts of a complex geometry or which requires that the coating be applied at other than a nominal 90 degrees, the purchaser and coating vendor may agree on a sampling technique to determine acceptable coating properties. Where no such agreement exists, test results shall be based on samples coated at 90 degrees.

4.3.1.3 (R) When a statistical sampling plan has been agreed upon by purchaser and vendor, sampling shall be in accordance with such plan in lieu of sampling in accordance with 4.3.1 and the report of 4.5 shall state that such plan was used.

4.4 Approval:

4.4.1 (R) The process and control procedures, a preproduction sample part, or both, whichever is specified, shall be approved by the cognizant engineering organization before production parts are supplied.

4.4.2 (R) The processor of coated parts shall make no significant change to materials, processes, or controls from those on which the approval was based, unless the change is approved by the cognizant engineering organization. A significant change is one which, in the judgment of the cognizant engineering organization, could affect the properties or performance of the parts.

4.4.3 Control factors shall include, but not be limited to, the following:

a. Surface preparation
b. Coating compound and mesh size distribution
c. Gun-to-work distance
d. Fuel gasses
e. Frequency of periodic tests

4.5 Reports:

(R) The vendor of coated parts shall furnish with each shipment a report showing the results of tests to determine that the coating conforms to the acceptance test requirements and, when performed, to the periodic test requirements. The report shall include the purchase order number, lot number, AMS 2436C, contractor or other direct supplier of part and coating materials, part number, and quantity.

4.6 Resampling and Retesting:

(R) If any specimen used in the above tests fails to meet the specified requirements, disposition of the coated parts may be based on the results of testing three additional specimens from the same coating lot for each original nonconforming specimen. Except as specified in 4.6.1 and 4.6.2, failure of any retest specimen to meet the specified requirements shall be cause for rejection of the parts represented. Results of all tests shall be reported.