

**AEROSPACE
MATERIAL
SPECIFICATION**

AMS 2525A
Superseding AMS 2525

Issued 5-17-72
Revised 1-1-83

**COATING, THIN LUBRICATING FILM, GRAPHITE
Impingement Applied**

1. SCOPE:

1.1 Form: This specification covers a thin lubricating coating consisting of finely powdered graphite in a heat-resistant inorganic binder.

1.2 Application: Primarily for use on metal parts and selected nonmetallic materials requiring a coating less than 0.0001 in. (2.5 μ m) thick for reducing wear or minimizing galling.

1.2.1 This lubricating film may be applied to thoroughly cleaned surfaces of ferrous and nonferrous metals and alloys, cured thermoplastic and thermosetting polymers, and rubber (O-rings, seals, etc). Aluminum, magnesium, and ferrous alloys, other than corrosion-resistant types, either coated or in contact with other parts having this coating, may be susceptible to corrosion.

1.2.2 This lubricating film is compatible with such fluids as distilled water, MIL-H-5606 hydraulic fluid, SAE Phosphate Ester Test Fluid #1, silicone fluid, UDMH-compatible grease, IFRNA-compatible grease, solid rocket propellants, nitrogen tetroxide, and liquid oxygen.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

REAFFIRMED
10/31

SAE Technical Board rules provide that: "All technical reports, including standards approved and practices recommended, are advisory only. Their use by anyone engaged in industry or trade or their use by governmental agencies is entirely voluntary. There is no agreement to adhere to any SAE standard or recommended practice, and no commitment to conform to or be guided by any technical report. In formulating and approving technical reports, the Board and its Committees will not investigate or consider patents which may apply to the subject matter. Prospective users of the report are responsible for protecting themselves against liability for infringement of patents."

AMS 2525A

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM D1186 - Measurement of Dry Film Thickness of Nonmagnetic Organic Coatings Applied on a Magnetic Base

ASTM D2510 - Adhesion of Solid Film Lubricants

ASTM D2625 - Endurance (Wear) Life and Load-Carrying Capacity of Solid Film Lubricants (Falex Method)

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Federal Specifications:

PPP-T-60 - Tape, Pressure-Sensitive, Adhesive, Waterproof

2.3.2 Military Standards:

MIL-STD-794 - Parts and Equipment, Procedures for Packaging and Packing of

3. TECHNICAL REQUIREMENTS:

3.1 Coating Material: Shall consist of finely powdered graphite in a heat-resistant inorganic binder; the material, properly applied, will form a lubricating film conforming to the requirements of 3.3.

3.2 Procedure:

3.2.1 Cleaning: Before applying the coating, surfaces of the basis material shall be thoroughly cleaned with minimum abrasion or erosion. The cleaned surfaces shall be free from oxides and from foreign materials detrimental to coating adhesion.

3.2.2 Surface Finishing: Surfaces of parts to be coated shall be honed with aluminum oxide powder of 240 - 400 mesh to prepare the basis material for coating.

3.2.2.1 During honing, it is essential, in order to provide the proper surface for bearing applications, to remove all residual metallic particles, whether mechanically or electrostatically held.

3.2.3 Coating: The coating material shall be applied by spraying at high velocity (impinging) under controlled conditions to all surfaces on which it is specified.

3.2.4 Curing: The coating shall be cured as specified on the part drawing (See 8.3).

3.2.4.1 Curing conditions may vary from 7 days at room temperature to 120 min. ± 15 at $300^{\circ}\text{F} \pm 10$ ($150^{\circ}\text{C} \pm 5$). The time-temperature cycle should be selected so as not to deleteriously affect the basis material.

3.2.5 Preservation: A supplementary preservative treatment, such as light machine oil, shall be applied after curing, unless otherwise specified. Prior to using coated parts, the preservative treatment may be removed by vapor degreasing and drying in warm, dry air.

3.3 Properties: The coating shall conform to the following requirements:

3.3.1 Adhesion: Pressure-sensitive tape conforming to PPP-T-60, Type III, Class 1, shall be applied to a flat surface of a coated specimen, rolled in place, and then rapidly removed, in accordance with ASTM D2510, Procedure B. The lifting of flakes or particles of the coating from the specimen, exposing the basis metal, is not acceptable, but a uniform deposit of powdery material clinging to the tape will be permitted.

3.3.2 Thickness: Shall be not greater than 0.0001 in. (2.5 μm), unless otherwise specified, determined in accordance with ASTM D1186.

3.3.3 Wear Rate: The time to failure shall be as agreed upon by purchaser and vendor, determined in accordance with ASTM D2625, Procedure A.

3.3.4 Thermal Stability: No evidence of damage to the coating shall be visible on specimens of a corrosion-resistant steel heated to $2000^{\circ}\text{F} \pm 25$ ($1095^{\circ}\text{C} \pm 15$), held at heat for 5 min. ± 0.5 , air cooled to room temperature, held at room temperature for 60 min. ± 5 immersed in liquid nitrogen for 60 min. ± 5 removed, warmed to room temperature, and examined.

3.4 Quality: The coating shall be uniform in color, smooth, and free from surface imperfections detrimental to its intended function. Any evidence of porosity or other conditions detrimental to functional life of the coating is not acceptable.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The coating vendor shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.5. 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 to determine conformance to requirements for adhesion (3.3.1) are classified as acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Tests to determine conformance to requirements for thickness (3.3.2), wear rate (3.3.3), and thermal stability (3.3.4) are classified as periodic tests and shall be performed at a frequency selected by the coating vendor unless frequency of testing is specified by purchaser.

4.2.3 Preproduction Tests: Tests to determine conformance to all technical requirements of this specification are classified as preproduction tests and shall be performed prior to or on the initial shipment of a coated part to a purchaser, when a change in material and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to 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, the contracting officer, or the request for procurement.

4.3 Sampling: Shall be in accordance with the following: a lot shall be all parts of the same material, size, and shape coated in a continuous series of operations in not more than 8 consecutive hours and presented for vendor's inspection at one time:

4.3.1 For Acceptance Tests: Two specimens processed with each lot.

4.3.2 For Periodic Tests and Preproduction Tests: As agreed upon by purchaser and vendor.

4.3.3 Specimens for adhesion (3.3.1) and thickness (3.3.2) shall be panels approximately 4 in. (100 mm) long x 1 in. (25 mm) wide x 0.200 in. (5 mm) thick of the same material, condition, and surface finish as the parts they represent and which are cleaned, coated, and cured with the parts.

4.4 Approval:

4.4.1 Sample coated parts shall be approved by purchaser before parts for production use are supplied unless such approval be waived by purchaser. Results of tests on production coated parts shall be essentially equivalent to those on the approved sample parts.