AEROSPACE
MATERIAL SPECIFICATIONS

SOCIETY OF AUTOMOTIVE ENGINEERS, Inc. 485 Lexington Ave., New York, N.Y. 10017

AMS 2402E
Superseding AMS 2402D
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# ZINC PLATING

1. ACKNOWLEDGMENT: A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

2. APPLICATIONS: Primarily for use on metal parts to protect against corrosion.

3. PREPARATION:

3.1 Ground case hardened parts shall be stress relieved at a temperature not lower than 275 F (135 C) before cleaning.

3.2 All brazing or welding shall be completed before parts or assemblies are plated.

3.3 Before placing parts in plating solution, they shall have chemically clean surfaces, prepared with minimum abrasion, erosion, or pitting.

3.4 Unless otherwise specified, parts shall be within drawing limits before plating.

3.5 Parts having hardness of Rockwell C 33 or over and parts roll threaded after heat treatment shall not be cleaned with inorganic acids (hydrochloric or sulfuric) unless specifically approved; cleaning of other parts with inorganic acids is not prohibited but permission to use that method on a particular part shall first be obtained from purchaser. In either case a momentary dip in acid after alkaline cleaning is permissible.

4. PROCEDURE:

4.1 The plating process consists of electrodeposition of zinc from a zinc cyanide solution. The zinc shall be deposited directly on the metal part, without a flash coating of other metal, such as copper or nickel, underneath, except in the case of parts, assemblies, and weldments made wholly or in part of corrosion resistant steel, on which a preliminary flash of nickel or other suitable metal is permissible.

4.2 After plating, washing, and drying, steel parts shall be treated as follows, unless otherwise permitted, to remove hydrogen embrittlement due to cleaning and plating; heating shall be in air, preferably in a circulating air furnace.

4.2.1 Springs and all other parts having hardness of Rockwell C 45 or over shall be heated to 450 F ± 10 (232.2 C ± 5.6) and held at heat for not less than 2 hr, except as specified in 4.2.2.

4.2.2 Parts, including roll threaded parts, cold worked after being heat treated by hardening and tempering; all other parts having hardness of Rockwell C 33 or higher but less than Rockwell C 45; and springs and all other parts having hardness of Rockwell C 45 or higher which will decrease in hardness or be otherwise deleteriously affected by heating to 450 F (232.2 C) shall be heated to 375 F ± 10 (190.6 C ± 5.6) and held at heat for not less than 3 hr, except as specified in 4.2.3.

4.2.3 Parts and assemblies, including carburized parts, which will decrease in hardness or be otherwise deleteriously affected if heated to 375 F (190.6 C) shall be heated to 275 F ± 10 (135 C ± 5.6) and held at heat for not less than 5 hr, except parts requiring special handling which shall be treated as agreed upon by purchaser and vendor.







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4.3 Unless otherwise specified, zinc plated parts, after the embrittlement relief treatment, shall be treated by a process which has been demonstrated to be capable of preventing the formation of white corrosion products after 100 hr salt spray test in accordance with the procedure referred to in 7.2.

5. THICKNESS: Thickness of zinc plate shall be as specified in Table I except as specified in 5.1 and 5.2. When plate thickness is specified by AMS 2402 and a suffix number, the suffix number will normally designate the minimum thickness in ten-thousandths of an inch; the maximum thickness shall be 0.0002 in. greater than the minimum unless otherwise specified. Thus, AMS 2402-1 designates a thickness of 0.0001 - 0.0003 in., AMS 2402-6 designates a thickness of 0.0006 - 0.0008 in., etc.

5.1 No requirements are established for minimum thickness of plate for holes, recesses, and other areas where a controlled deposit cannot be obtained under normal plating conditions, but such areas shall not be masked to prevent plating. Except as specified in Table I for externally threaded sections, the resulting thickness shall be considered only when such surfaces of parts can be touched by a sphere 0.75 in. in diameter unless otherwise noted on drawings.

5.1.1 If internal surfaces as defined in 5.1 are required to be plated to a specified thickness, notes on the drawing will so specify.

5.2 Where zinc flash is specified, the thickness of zinc shall be approximately 0.0001 inch.

6. THICKNESS DETERMINATION: Thickness of plate shall be determined on representative parts, or on separate specimens representing parts and plated simultaneously with them, by one of the following methods as applicable.

6.1 When possible, thickness shall be determined on plated parts by the drop test method. The drop test method consists of allowing an aqueous solution containing 200 g of chromic acid and 27 ml of sulfuric acid (sp gr 1.84) per liter at a temperature of 70 - 80 F (21.1 - 26.7 C) to drop at a uniform rate of 100 drops ± 5 per min. directly upon properly cleaned surfaces of plated parts until the basis metal is exposed. The dropping apparatus may be a 250 ml laboratory separatory funnel equipped with a stopcock to regulate the solution flow and having the discharge orifice of the outlet tube constricted to deliver drops approximately 0.05 ml each. Plated parts shall be supported so that the surface to be tested is at an angle of 45 deg from the horizontal and about 7/8 in. below the discharge orifice. Plating which meets specified thickness requirements shall not be perforated in less than the time specified in Table I.

6.2 When plated parts are of such form that they are not adaptable to determination of plate thickness by the drop test method, thickness may be determined, by drop test or micrometer measurement, on steel strip specimens approximately 0.032 x 1 x 4 in. in the case of still plating, or on cylindrical specimens with cross-sectional areas approximately equal to those of the parts in the case of barrel plating, which are processed simultaneously with the parts through the complete cleaning and plating cycle.

6.3 Magnetic methods or other methods may be used for determining plate thickness if the results are dependably accurate.

7. QUALITY:

7.1 Plated zinc shall be smooth, continuous, adherent, uniform in appearance, and not coarsely crystalline, and shall be free from pin holes, porosity, blisters, nodules, pits, and other harmful imperfections. Slight staining or discoloration will not be cause for rejection.

7.2 The salt spray corrosion resistance of the plate may be determined by subjecting representative plated parts or test panels representing parts to continuous salt spray corrosion test conducted in accordance with the issue of ASTM B117 specified in the latest issue of AMS 2350. Plate shall be capable of withstanding salt spray for the minimum time specified in Table I for the respective thicknesses or thickness designations, without definite rusting, pitting, or other visible damage to the basis metal. Slight stain or discoloration which readily washes off without damage to the plate, when scrubbed with a cloth or bristle brush, is permissible. Salt spray corrosion test shall be applicable only to zinc plated ferrous metal parts and when thickness is specified as other than "flash."

7.3 Steel strip specimens approximately 1/32 x 1 x 4 in., when cleaned and plated simultaneously with parts, shall withstand rapid bending at room temperature through an angle of 180 deg around a diameter equal to the thickness of specimen, without showing separation from the basis metal at the interface when examined at approximately 4 diameters magnification. Bend tests shall be performed on specimens with a plate thickness of 0.0006 - 0.0008 in. where the thickness of the plating on actual parts exceeds 0.001 inch. The formation of cracks which do not result in flaking or blistering of the plate shall not be considered as non-conformance to this requirement. Specimens may be the same ones used for determination of thickness.

8. REJECTIONS: Parts on which plating does not conform to this specification or to authorized modifications will be subject to rejection.

NOTE. SIMILAR SPECIFICATIONS: (a) This specification exceeds the minimum requirements of Federal QQ-Z-325a, Type II, Class 2, Amendment 1, dated April 8, 1960.

(b) Federal QQ-Z-325, Type II, Class 2 is listed for information only and shall not be construed as an acceptable alternate unless all requirements of this AMS are met.