SAE Aerospace
An SAE International Group

AEROSPACE MATERIAL SPECIFICATION

SAE AMS-P-81728 | REV. A

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Superseding AMS-P-81728

Plating, Tin-Lead (Electrodeposited)

RATIONALE

AMS-P-81728A was issued to clarify and standardize hydrogen embrittlement relief requirements and representative test specimen compositions. Precautions for plating on glass and silicon substrates were added. Canceled and superseded government documents were replaced with the current issues. Reference to MIL-F-35081 for reflow adhesion test oil was removed from 4.5.3.3 since the document was cancelled with no superseding document.

NOTICE

The initial SAE publication of this document was taken directly from U.S. Military Standard MIL-P-81728A, Amendment 1. This SAE Standard may retain the same part numbers established by the original military document.

Any requirements associated with Qualified Products Lists (QPL) may continue to be mandatory for DoD contracts. Requirements relating to QPLs have not been adopted by the SAE for this standard and are not part of this SAE document.

1. SCOPE

1.1 Scope

This specification covers the requirements for electrodeposited tin-lead plating intended for use as a coating for corrosion protection and as a base for soldering.

2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

AMS-QQ-N-290 Nickel Plating (Electrodeposited)

AMS2418 Plating, Copper

AS2390 Chemical Process Test Specimen Material

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: http://www.sae.org

SAE values your input. To provide feedback on this Technical Report, please visit
http://www.sae.org/technical/standards/AMSP81728A

2.2 ANSI Publications

Available from American National Standards Institute, 25 West 43rd Street, New York, NY 10036-8002, Tel: 212-642-4900, www.ansi.orgg.

ANSI / ASQC Z1.4 Sampling Procedures and Tables for Inspection by Attributes

2.3 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM A 309 Weight and Composition of Coating on Terne Sheet by the Triple-spot Method

ASTM A 630 Determination of Tin Coating Weights for Electrolytic Tin Plate

ASTM B 487 Measuring Metal and Oxide Coating Thickness by Microscopic Examination of a Cross Section

ASTM B 499 Measurement of Coating Thicknesses by the Magnetic Method: Nonmagnetic Coatings on Magnetic Basis Metal

ASTM B 504 Measuring the Thickness of Metallic Coatings by the Coulometric Method

ASTM B 567 Measuring Coating Thickness by the Beta-Backscatter Principle

ASTM B 568 Measuring Coating Thickness by X-Ray Spectrometry

ASTM F 519 Mechanical Hydrogen Embrittlement Testing of Plating Processes and Service Environments

2.4 U.S. Government Publications

Available from the Document Automation and Production Service (DAPS), Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094, Tel: 215-697-6257, http://assist.daps.dla.mil/quicksearch/.

MIL-S-5002 Surface Treatments and Inorganic Coatings for Metal Surfaces of Weapons Systems

MIL-STD-202 Test Methods for Electronic and Electric Component Parts

2.5 AIA Publication

Available from Aerospace Industries Association of America Inc., 1000 Wilson Boulevard, Suite 1700. Arlington, VA 22209-3928, Tel: 703-358-1000. www.aia-aerospace.org

NASM 1312-12 Thickness Of Metallic Coatings

2.6 IPC-Association Connecting Electronics Industries Publications

Available from IPC, 3000 Lakeside Drive, Bannockburn, IL 60015, Tel: 847-597-2862, www.ipc.org.

J-STD-004 Requirements for Soldering Fluxes

J-STD-005 Requirements for Soldering Pastes

J-STD-006 Requirements for Electronic Grade Solder Alloys and Fluxed and Non-Fluxed Solid Solders for Electronic Soldering Applications

3. REQUIREMENTS

3.1 Materials

The materials used shall be such as to produce electrodeposited tin-lead coatings that meet the requirements of this specification.

3.1.1 Composition

Unless otherwise specified, the coating composition shall be as specified in Table 1. See 6.2 and 6.3.

TABLE 1 - COATING COMPOSITION

Element	Percent by Weight
Tin (Sn)	50 to 70
Other metals and non-metallics	1.0 Maximum
Lead (Pb)	Remainder

3.2 General Requirements

3.2.1 High Tensile Strength Steel Parts

Unless otherwise specified, steel parts having an ultimate tensile strength greater than 240 000 pounds per square inch (psi) shall not be plated without specific approval of the procuring activity. See 6.2.

3.2.2 Stress Relief Treatment

All steel parts having an ultimate tensile strength of 150 000 pounds per square inch (psi) and above, that are machined, ground, cold formed or cold straightened, shall be given a heat treatment at a minimum of 375 °F ± 25 (191 °C ± 14) for 3 hours or more prior to cleaning and plating for the relief of damaging residual tensile stresses.

3.2.3 Cleaning

All steel parts shall be cleaned in accordance with MIL-S-5002. Other basis metals shall be cleaned by methods that shall not damage the substrate and shall not interfere with adhesion of the deposit. See 6.6.

3.2.4 Plating Application

Unless otherwise specified, the plating shall be applied after all basis metal heat treatments and mechanical operations such as machining, brazing, welding, forming and perforating of the article have been completed. See 6.2.

3.2.5 Underplating

Unless otherwise specified (6.2), tin-lead shall be deposited directly on the basis metal without a preliminary plating of other metal. When the basis metal is a copper alloy containing more than 15 percent by weight of zinc (such as Copper Alloy Numbers 268, 270, 752, etc.) or a beryllium copper alloy (such as Copper Alloy Numbers 170, 172, etc.) either a copper underplating, in accordance with AMS2418, or a nickel underplating, in accordance with AMS-QQ-N-290, shall be applied to the basis metal in a thickness of 0.0001 inch (2.5 µm) prior to the tin-lead plating. Nickel underplating shall not be deposited on a copper alloy part that will be flexed or bent during manufacture or use.

3.2.6 Coverage

Unless otherwise specified, the plating shall cover all surfaces including roots of threads, corners and recesses. See 6.2.

3.2.7 Embrittlement Relief

The plating process after baking shall not cause embrittlement in steel parts having a hardness of 40 HRC and over, determined in accordance with 4.5.6. All steel parts having a hardness of 40 HRC and higher shall be baked at 340 °F ± 10 (171 °C ± 6) for 23 hours or more, within 4 hours after plating, to provide hydrogen embrittlement relief. The baked parts, when tested in accordance with 4.5.6, shall not crack or fail by fracture. See 4.4.3.6. Plated springs and other parts subject to flexure shall not be flexed prior to the hydrogen embrittlement relief treatment.

3.2.8 Luster

Unless otherwise specified, either a matte or bright luster shall be acceptable. See 6.2. For printed circuitry parts and electronic components, only parts with a matte or a flow brightened (matte reflowed) finish shall be furnished. Such flow brightened parts shall have a maximum thickness of about 0.0003 inch (8 µm) as thicker platings on flat surfaces tend to reflow more uneven. See 6.4. Flow-brightened (matte reflowed) finish is preferred so as to preclude any undesirable coating characteristics such as bubbles, voids and roughness.

3.3 Detail Requirements

3.3.1 Thickness of Plating

Unless otherwise specified, the thickness of the tin-lead plating, except when applied to electronic components (3.3.1.1), shall be not less than 0.0003 inch (8 µm) and shall not be greater than 0.0005 inch (13 µm) on all visible surfaces that can be touched by a ball 0.75 inch in diameter. All other visible surfaces shall be not less than 0.0002 inch (5 µm) minimum thickness. Unless otherwise specified, holes and other openings and internal threads from which the external environment is completely excluded and where a controlled deposit cannot be normally obtained, shall not be subject to a thickness requirement.

3.3.1.1 Electronic Components

Unless otherwise specified, the thickness of tin-lead plating for electronic components (printed circuit boards, especially those plated-through-hole interconnections, terminals and eyelets) shall be a minimum average of 0.0003 inch (8 µm) thickness when measured at four points at least 0.10 inch apart. Walls of holes such as plated-through-holes in circuit boards shall have a plating with a minimum average of 0.0003 inch (8 µm) thickness. No single measurement shall be less than 0.0002 inch (5 µm) minimum thickness.

3.3.1.2 Underplating

The thickness of any underplate (3.2.5) shall not be used in the determination of the tin-lead plating thickness as specified herein.

3.3.2 Adhesion

3.3.2.1 Shear or Bend

The adhesion of the plating shall be such that when examined at a magnification of approximately 4 diameters, the plating shall not show separation from the basis metal or from any underplate at the interface, nor shall any underplate show separation from the basis metal at the interface, when subjected to the shear or bend test described in 4.5.3.1. The interface between the tin-lead and either the basis metal or the underplate is the surface before plating. The interface between the underplate and the basis metal is the surface before underplating. The formation of cracks in the plate caused by rupture of the basis metal, the underplate or combination of both which does not result in flaking, peeling or blistering of the plate shall not be considered as nonconformance to this requirement.

3.3.2.2 Quench

The adhesion of the plating shall be such that when examined at magnification of approximately 4 diameters, the plating shall show no evidence of flaking, peeling or blistering and shall be free from bubbles, cracks and other defects when subjected to the quench test described in 4.5.3.2.

3.3.2.3 Reflow

The adhesion of the plating shall be such that when examined at a magnification of approximately 4 diameters, the plating shall show no evidence of bubbling, foaming, blistering, flaking, peeling, or uneven flow resulting in voids and roughness when subjected to the reflow test described in 4.5.3.3.

3.3.3 Porosity

Tin-lead plating on ferrous metals shall show no basis metal corrosion products when tested for porosity in accordance with 4.5.4. The appearance of corrosion products, visible to the unaided eye at normal reading distance shall be cause for rejection.

3.3.4 Solderability

Plated specimens or parts shall be easily and completely coated with solder when tested as specified in 4.5.5. The solder shall be deposited uniformly without lumps or peaks and shall be essentially free from evidence of bubbling, foaming, voids and other defects. The solder shall firmly adhere to the plating and the plating shall be firmly adherent to the basis metal or to any underplate. There shall be no separation at the solder-plating interface, the plating-basis metal interface, the plating-underplate interface, or at the undercoat-basis metal interface, so that they cannot be lifted when a sharp-edge instrument is applied.

3.4 Workmanship

3.4.1 Basis Metal

The basis metal shall be free from visible defects that will be detrimental to the appearance or protective value of the plating. The basis metal shall be subjected to such cleaning and plating procedures as necessary to yield deposits as herein specified.

3.4.2 Plating

The tin-lead plating shall be smooth, fine grained, adherent, continuous, free from visible blisters, pits, nodules, indications of burning, excessive build-up, staining and other defects. The size and number of contact marks shall be at a minimum consistent with good practice. The location of contact marks shall be in areas of minimum exposure to service environmental conditions where important to the function of the part. Superficial staining that has been demonstrated as resulting from rinsing, or slight discoloration resulting from baking operations to relieve embrittlement, as specified above (3.2.7), shall not be cause for rejection. Flow brightened or reflowed matte plating shall be free from any material used as the heating media for the treatment and such plating shall be free from untreated areas. All details of workmanship shall conform to the best practice for high quality plating.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Classification of Inspection

The inspection requirements specified herein are classified as follows:

1 - Production control inspection. See 4.3.
2 - Quality conformance inspection. See 4.4.

4.3 Production Control Inspection

4.3.1 Control Records

When specified in the contract or order (6.2), the supplier shall maintain a record of each processing bath, showing all additional chemicals or treatment solutions to the unit, the results of all analyses performed and the quantity of parts plated during operation. Upon request of the procuring activity, such records shall be made available. These records shall be maintained for not less than one year after completion of the contract or purchase order.

4.3.2 Production Control

The equipment, procedures and operations employed by a supplier shall be capable of producing high quality electrodeposited platings as specified in this document. When specified by the procuring activity (See 6.2), the supplier, prior to production, shall demonstrate the capability of the process used to show freedom from hydrogen embrittlement damage as indicated by satisfactory behavior of specimens prepared (6.2.2) and tested in accordance with 4.3.2.1 to comply to the requirements of MIL-S-5002 for preproduction process qualification.

4.3.2.1 Preproduction Control

For preproduction control, four round notched steel specimens shall be prepared in accordance with 4.4.4.2 from four individual heats for a total of 16 specimens, using the specified steel alloy for which preproduction examination of the process is to be demonstrated. Specimens shall be heat treated to the maximum tensile strength representing production usage. The specimens shall be given the same pre-treatments, proposed for production. The specimens shall be subject to test detailed in 4.5.6. The process shall be considered satisfactory if all specimens show no indication of cracks or failure. The test results and production control information shall be submitted to the procuring activity for approval. Until approval has been received, parts shall not be plated.

4.3.3 Frequency of Tests

To assure continuous control of the process as required by MIL-S-5002 and to prevent detrimental hydrogen embrittlement during production, the satisfactory behavior of specimens, prepared and tested in accordance with Table 2, shall be made once each month or more frequently if required by the procuring activity. The results of tests made to determine conformance of electrodeposited platings to all requirements of this specification for definite contracts or purchase order are acceptable as evidence of the properties being obtained with the equipment and procedures employed.

TABLE 2 - PRODUCTION CONTROL TESTS AND SPECIMENS

Test	Requirement Paragraphs	Specimen Preparation Paragraphs	Test Reference Paragraphs
Composition	3.1.1	4.4.4 and 4.4.4.1	4.5.1
Thickness	3.3.1, 3.3.1.1 and 3.3.1.2	4.4.4 and 4.4.4.1	4.5.2
Adhesion Shear or bend Quench Reflow	 3.3.2.1 3.3.2.2 3.3.2.3	4.4.4 and 4.4.4.1	 4.5.3.1 4.5.3.2 4.5.3.3
Porosity	3.3.3	4.4.4 and 4.4.4.1	4.5.4
Solderability	3.3.4	4.4.4 and 4.4.4.1	4.5.5
Hydrogen Embrittlement	3.2.7	4.3.4, 4.4.4 and 4.4.4.2	4.5.6

4.3.4 Production Control Specimens

Test specimens for production control shall be prepared in accordance with 4.4.4 and 4.4.4.1 as applicable for composition, thickness, adhesion, porosity and solderability tests detailed in Table 2. Specimens for the production control embrittlement relief test shall be four round notched steel specimens of alloy steel 4340 conforming to ASTM F 519 Type 1a.1, heat treated to the maximum tensile strength, from one or more heats, and prepared in accordance with 4.4.4.2.

4.4 Quality Conformance Inspection

4.4.1 Lot

A lot shall consist of plated articles of the same material, plated and treated under the same conditions and approximately the same size and shape, submitted for inspection at one time.

4.4.2 Sampling for Visual Examination and Nondestructive Tests

Sampling for visual examination and nondestructive tests shall be conducted as directed by the procuring activity (6.2) in accordance with ANSI Z1.4 or using Table 3. A sample of coated parts or articles shall be drawn by taking at random from each lot the number of articles in accordance with ANSI Z1.4, Level II, Acceptable Quality Level (AQL) 1.5 percent defective, or as indicated in Table 3. The lot shall be accepted or rejected according to the procedures in 4.4.2.1 for visual examination and 4.4.2.2 for plating thickness (nondestructive tests).

4.4.2.1 Visual Examination

Samples selected in accordance with 4.4.2 shall be examined for compliance with the requirements of 3.4.2 after plating. If the number of nonconforming articles exceeds the acceptance number for the sample, the lot represented by the sample shall be rejected.

4.4.2.2 Thickness of Plating (Nondestructive Tests)

Samples selected in accordance with 4.4.2 shall be inspected and the plating thickness measured by the applicable tests detailed in 4.5.2, at several locations on each article as defined in 3.3.1, 3.3.1.1, or 3.3.1.2, as applicable, for compliance with the requirements. Measurements on fastener hardware shall be made at locations defined in NASM 1312, Test 12. The part or article shall be considered nonconforming if one or more measurements fail to meet the specified minimum thickness. If the number of defective items in any sample exceeds the acceptance number for the specified sample, the lot represented by the sample shall be rejected. Separate specimens (4.4.4.1) shall not be used for thickness measurements unless a need has been demonstrated.

4.4.3 Sampling for Destructive Tests

A random sample of four plated parts or articles shall be taken from each lot for each destructive test or separately plated specimens shall be prepared in accordance with 4.4.4, 4.4.4.1 and 4.4.4.2 to represent each lot. If the number of articles in the lot is four or less, the number of articles in the sample shall be specified by the procuring activity. See 6.2.

4.4.3.1 Composition

When specified in the contract or order, compliance with the requirements for composition shall be determined. See 6.2. Samples selected in accordance with 4.4.3 shall be tested in accordance with 4.5.1 to determine compliance with 3.1.1.

4.4.3.2 Thickness of Plating (Destructive Tests)

If sampling and testing for thickness of plating by nondestructive testing is not the option of the supplier, samples selected in accordance with 4.4.3 shall be measured for plating thickness by the applicable tests detailed in 4.5.2 at several locations as defined in 3.3.1, 3.3.1.1, or 3.3.1.2, for compliance with the requirements. Measurements on fastener hardware shall be made at locations defined in NASM 1312, Test 12. If the plating thickness on any place on any article or specimen is less than the specified minimum thickness, the lot shall be rejected. Separate specimens (4.4.4.1) shall not be used for thickness measurements unless a need has been demonstrated.

4.4.3.3 Adhesion (Destructive Tests)

The articles or specimens used for the destructive thickness test (4.4.3.2), if of suitable size and form, may be used as the test pieces for the adhesion tests to determine compliance with the requirements of 3.3.2.1, 3.3.2.2, or 3.3.2.3. Failure of one or more of the test pieces shall constitute failure of the lot.

4.4.3.4 Porosity (Destructive Tests)

When specified in the contract or order, compliance with the requirements for porosity shall be determined. See 6.2. The articles or specimens used for the destructive thickness test (4.4.3.2), if of suitable size and form, may be used as test pieces for the porosity test (4.5.4) to determine compliance with the requirements of 3.3.3. Failure of one or more of the test pieces shall constitute failure of the lot.

4.4.3.5 Solderability (Destructive Tests)

When specified in the contract or order, compliance with the requirements for solderability shall be determined. See 6.2. The articles or specimens used for the destructive thickness test (4.4.3.2), if of suitable size and form, may be used as the specimens for the solderability test (4.5.5) to determine compliance with the requirements of 3.3.4. Failure of one or more of the test specimens shall constitute failure of the lot.

4.4.3.6 Hydrogen Embrittlement Relief (Destructive Tests)

When specified in the contract or order, conformance to the requirements of 3.2.7 for hydrogen embrittlement relief of treated steel parts shall be determined for those parts having a tensile strength of or heat treated to a tensile strength level of 240 000 psi or above and that will be subject to a sustained tensile load in use. See 6.2. Testing shall be in accordance with the requirements of ASTM F 519 Type 1a.1 using round notched specimens, unless a different specimen is specified by the cognizant engineering organization, stressed in tension under constant load. For test purposes, the plating thickness shall be 0.001 to 0.002 inch (25 to 51 µm) measured on the smooth section of the specimen but with visual plating at the root of the notch.

4.4.4 Quality Conformance Specimen Preparation

Representative test specimens may be used in lieu of parts under any one of the following circumstances. The plated parts are of such configuration or size as to be not readily adaptable to specified tests, nondestructive testing is not practical on actual parts, or it is not economically acceptable to perform destructive tests on actual parts. Except as specified below, representative test specimens shall be made of the same generic class of alloy as the parts, established in accordance with AS2390, distributed within the lot, cleaned, plated, and post treated with the parts represented. For example, a cold-rolled steel surface should not be used to represent a hot-rolled steel surface. Due to the impracticality of forging or casting separate test specimens, hot-rolled steel specimens may be used to represent forged and cast-steel articles. The separate specimens may be also cut from scrap castings when ferrous alloy castings are being plated. These separate specimens shall be introduced into a lot at regular intervals prior to the cleaning operations, preliminary to plating, and shall not be separated therefrom until after completion of plating. Conditions affecting the plating of specimens including the spacing, plating media, residual air pressure, temperature, etc. in respect to other objects being plated shall correspond as nearly as possible to those affecting the significant surfaces of the articles represented. Separate specimens shall not be used for thickness measurements, however, unless the necessity for their use has been demonstrated.

4.4.4.1 Specimens for Composition, Thickness, Adhesion, Porosity and Solderability Tests

If separate specimens for composition, thickness, adhesion, porosity and solderability tests are required, they shall be strips approximately 1 inch wide, 4 inches long, and 0.04 inch thick.

4.4.4.2 Specimens for Embrittlement Relief

Separate specimens for embrittlement relief testing shall be in accordance with ASTM F 519 Type 1a.1.

4.5 Tests

4.5.1 Composition

Composition of tin-lead plate shall be determined in accordance with ASTM A 630, ASTM A 309, or ASTM B 568. The plating composition may also be determined by X-ray fluorescence techniques or by atomic absorption spectrophotometry.

4.5.2 Thickness

For nondestructive measuring of plating thickness, procedures in accordance with ASTM B 499 (magnetic test), ASTM B 567 (Beta radiation backscatter) or ASTM B 568 (X-ray spectrometry) may be used. For destructive measuring of plating thickness, procedures in accordance with ASTM B 487 (microscopic) or ASTM B 504 (coulometric) may be used. In addition to the above, the other procedures embodied in NASM 1312, Test 12, may be used for thickness of plated fastener hardware.

4.5.3 Adhesion

4.5.3.1 Shear or Bend

Shear or bend adhesion may be determined by scraping the surface or shearing with a sharp edge, knife or razor through the plating down to the basis metal and parallel to surface of the basis metal and examining at four diameters magnification for evidence of nonadhesion. Alternatively, the article or specimen may be clamped in a vise and the projecting portion bent back and forth until rupture occurs, or specimens shall be given a bend test by bending 180 degrees over a mandrel having a diameter of the thickness of the specimen. If the edge of the ruptured plate can be peeled back or if a separation between the plate and the basis metal can be seen at the point of rupture when examined at four diameters magnification, adhesion is not satisfactory.

4.5.3.2 Quench

Quench adhesion may be determined by heating the plated specimen or article in an oven for a sufficient period of time to reach 300 °F ± 10 (148.9 °C ± 5.5). The specimen or article shall then be quenched in water maintained at room temperature. The deposit shall be examined at four diameters magnification for any evidence of blistering, flaking, or exfoliation to indicate unsatisfactory adhesion

4.5.3.3 Reflow

Reflow adhesion may be determined by totally immersing the article or specimen for 30 to 60 seconds in a bath of suitable oil held at 435 to 460 °F (224 to 238 °C). The article or specimen shall then be removed and quenched by air cooling. The deposit shall be examined at four diameters magnification for any evidence of unsatisfactory adhesion as indicated by beading, voids, roughness, peeling and flaking.

4.5.4 Porosity

Porosity shall be determined when the substrate is a ferrous metal by either the hot water test (4.5.4.1) or by the ferroxyl test (4.5.4.2).

4.5.4.1 Hot Water Test

The article or specimen should be placed in distilled hot water, contained in a beaker or other suitable container, maintained at 205 to 212 °F (96 to 100 °C). The coated article or specimen shall be immersed for 6 hours, after which it should be removed, allowed to dry by evaporation and inspected for red rust spots, that will appear at pores or discontinuities.

4.5.4.2 Ferroxyl Test

A piece of filter paper, saturated by dipping in an aqueous solution of potassium ferricyanide (10 grams per litre), shall be applied to the article or specimen. Dark blue spots will develop on the paper where corrosion of the coating occurs at pores or other defects. Contact may be assured by the use of a soft bristle brush moistened with the ferricyanide reagent. For a permanent record, the paper can then be dried.

4.5.5 Solderability

Solderability shall be determined using flux and solder alloy conforming to J-STD-004, J-STD-005, and J-STD-006 as applicable. The specimen or part shall be coated with a flux conforming to Type W and then partially immersed in a solder conforming to composition Sn 60 for 3 seconds at a solder pot temperature of 450 °F ± 25 (232 °C ±14). The specimen or part shall be preheated prior to immersion. A mechanical dipping device, similar to that detailed in Method 208 of MIL-STD-202, may be used to immerse the part or specimen at the rate of 1 inch per second ± 1/4. Upon removal, the specimen or part shall be shaken lightly to remove excess solder and allowed to cool in air. After examination, the article or the specimen shall be subjected to the bend test detailed in 4.5.3.1.