

NOT MEASUREMENT
SENSITIVE

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12 December 1990
SUPERSEDING
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MILITARY SPECIFICATION

PLATING, NICKEL-TUNGSTEN, ELECTRODEPOSIT ON ALUMINUM
ALLOYS, BY SELECTIVE (BRUSH) METHOD

This specification is approved for use by the U.S. Army Missile Command, Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification establishes the materials, method, and requirements for the plating of a nickel-tungsten alloy on aluminum as applied by the brush method.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, U.S. Army Missile Command, ATTN: AMSMI-RD-SE-TD-ST, Redstone Arsenal, AL 35898-5270 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

AREA-MFFP

DISTRIBUTION STATEMENT A.
unlimited.

Approved for public release; distribution is

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SPECIFICATIONS

FEDERAL

A-A-113 - Tape, Pressure-sensitive Adhesive

STANDARDS

FEDERAL

FED-STD-151 - Metals, Test Methods

MILITARY

MIL-STD-810 - Environmental Test Methods and Engineering Guidelines

(Unless otherwise indicated, copies of the federal and military specifications, standards, and handbooks are available from the Naval Publications and Forms Center, Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Ave., Philadelphia, PA 19111-5094.)

2.2 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR TESTING MATERIALS

ASTM D 740 - Standard Specification for Methyl Ethyl Ketone
 ASTM E 70 - Determination of pH of Aqueous Solutions with Glass Electrode

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection (see 6.3) in accordance with 4.3.

3.2 Materials. All materials or solutions used shall be acceptable to the procuring agency and entirely suitable for the intended use. The parts to be plated shall be in accordance with the applicable design drawings. The plating and surface preparation solutions shall be a proprietary material supplied by a qualified manufacturer, with manufacturer's instructions. The materials used shall be such as to produce plating which will meet the requirements of this specification.

3.3 Equipment. The plating equipment shall consist of Dalic Plating Process Equipment, Brooktron Plating Process Equipment, or equivalent.

3.4 Base metal. The base metal shall be free from visible defects detrimental to the appearance or performance of the plating.

3.4.1 Base metal condition. The plating shall be applied after all base metal treatment and mechanical operations, such as machining, forming, or anodizing of the article have been completed.

3.5 Procedure. The following procedure shall be used:

3.5.1 Surface preparation. The areas to be plated shall be prepared as follows:

3.5.1.1 Cleaning. Solvent clean the surface to be plated using methyl ethyl ketone in accordance with ASTM D 740, or equivalent degreasing solvent.

WARNING

All safety regulations regarding the handling of flammable and toxic materials shall be observed.

3.5.1.2 Masking. Areas not to be plated shall be adequately masked prior to application of the plating.

3.5.1.3 Scaling. Remove heavy scale or oxides by chemical or mechanical means.

3.5.1.4 Preparing. Prepare the surface for plating, using the equipment specified in 3.3, and the appropriate activating solutions conforming to manufacturer's instructions for the base metal being treated.

3.5.2 Plating. Deposit the metals, as required, from the proprietary nickel-tungsten plating solution in accordance with chemical and plating

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requirements supplied by the solution manufacturer. The pH of the plating solution shall be checked prior to plating in accordance with ASTM E 70 [the plating article described in 3.4.1 need not be baked after plating if the pretreatment, plating solutions and processes have been demonstrated not to have harmfully affected the performance of the plating article (see 4.8.1)].

3.6 Thickness of plating. The thickness and other dimensions of the plating shall be as specified on the applicable engineering document (see 4.8.1).

3.7 Adhesion. The adhesion of the final plating, and any undercoat shall be such that separation of the plate or any electrodeposited undercoat from the base metal or from each other at their common interfaces cannot be detected when subjected to the test specified in 4.8.2 and examined at a magnification of four diameters. The adhesion shall result in no flaking, peeling, or blistering of the plate.

3.8 Hardness. Unless otherwise specified, the hardness of the electroplated nickel-tungsten layer shall be 61-65 Rockwell "C" (see 4.8.3).

3.9 Environmental. The plating shall be such that corrosion or flaking cannot be detected when subjected to the tests as specified in 4.8.4 and 4.8.5 and examined at a magnification of four diameters.

3.10 Workmanship. The plating shall be smooth, fine grained, adherent, and free from blisters, nodules, indications of burning, and other defects. Superficial staining shall not be cause for rejection.

3.10.1 Boundaries. Boundaries of the plating that cover only a portion of the surface shall be free from beads, nodules, jagged edges and other irregularities, and shall blend smoothly into the unplated surface.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor 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 this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection

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system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.3)
- b. Quality conformance inspection (see 4.4).

4.3 First article. First article inspection shall consist of all those tests performed for the purpose of qualifying a product to the requirements of this specification. First article test samples shall be representative of the manufacturer's normal production.

4.4 Quality conformance. Quality conformance inspection shall consist of those tests performed on individual lots to determine conformance of the lots with the specified requirements prior to their acceptance. Certified test reports of the tests shall be submitted with each lot shipment.

4.5 Lot. A lot shall consist of all plated articles of the same base alloy material, size, shape and conditions, plated with the same thickness of plating, under the same conditions, and submitted for inspection at the same time.

4.6 Sampling. Sampling shall be according to the contract or order (see 6.2). When the plated articles are not readily adaptable to tests specified herein, the acceptance tests may be performed on separate specimens plated concurrently with the articles represented. The separate specimens shall be of the same nominal chemical composition, heat treat condition and surface finish as the articles represented. Conditions affecting the plating of the specimens shall correspond as nearly as possible to those affecting the significant surfaces of the articles represented. Any failure shall cause the entire lot to be rejected.

4.7 Examination. Samples shall be visually examined for compliance with workmanship requirements cited in 3.10 and 3.10.1.

4.8 Test methods.

4.8.1 Thickness of plating. Unless otherwise specified, the plating thickness shall be determined in accordance with Method 521 or 522 of FED-STD-151 (see 3.6) with an accuracy of ± 10 percent.

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4.8.2 Adhesion of plating. Pressure sensitive cellophane tape in accordance with A-A-113 (see 3.7) shall be applied firmly to the plating and then peeled from the plating suddenly at a 90° angle. The plating shall not separate from the base metal when so tested.

4.8.3 Hardness of plating. Hardness of electrodeposited nickel-tungsten shall be determined in accordance with FED-STD-151 (see 3.8).

4.8.4 Humidity. Unless otherwise specified, the plating shall be capable of withstanding humidity cycling in accordance with Method 507.3 of MIL-STD-810 (see 3.9).

4.8.5 Thermal. Unless otherwise specified, the plating shall be capable of withstanding temperature cycling in accordance with Method 503.3 of MIL-STD-810 (see 3.9).

5. PACKAGING

This section is not applicable to this specification.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. This specification indicates the requirements and materials necessary for the plating of a nickel-tungsten alloy on aluminum as applied by the brush method.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of the specification
- b. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1 and 2.1.1)
- c. When first article is required (see 3.1 and 4.3)
- d. Quality conformance inspection requirement
(see 4.4)
- e. Lot formation (see 4.5)
- f. First article sample size (see 4.6)

6.3 First article. When first article inspection is required, the contracting officer should provide specific guidance to offerers whether the

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item(s) should be a first article sample, a first production item, or a number of items to be tested as specified in 4.3. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results and disposition of first articles. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract.

6.4 Metrication. Metric equivalents in accordance with FED-STD-376 are acceptable for use in this specification.

6.5 Subject term (keyword) listing.

Coating, metal
Metals, annealed
Metals, married

6.6 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodian:
Army-MI

Preparing Activity:
Army-MI

Project No. MFFP-A462

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

1. DOCUMENT NUMBER MIL-P-47184A (MI)		2. DOCUMENT DATE (YYMMDD) 12 December 1990	
I RECOMMEND A CHANGE:			
3. DOCUMENT TITLE PLATING, NICKEL-TUNGSTEN, ELECTRODEPOSIT ON ALUMINUM ALLOYS, BY SELECTIVE (BRUSH) METHOD			
4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)			
5. REASON FOR RECOMMENDATION			
6. SUBMITTER			
a. NAME (Last, First, Middle Initial)		b. ORGANIZATION	
c. ADDRESS (Include Zip Code)		d. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON (If applicable)	e. DATE SUBMITTED (YYMMDD)
8. PREPARING ACTIVITY			
a. NAME COMMANDER U.S. ARMY MISSILE COMMAND		b. TELEPHONE (Include Area Code) (1) Commercial (205) 876-6980	(2) AUTOVON 746-6980
c. ADDRESS (Include Zip Code) ATTN: AMSMI-RD-SE-TD-ST REDSTONE ARSENAL, AL 35898-5270		IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340	

