

MIL-F-495E  
30 September 1988  
SUPERSEDING  
MIL-F-495D  
26 August 1975

MILITARY SPECIFICATION

FINISH, CHEMICAL, BLACK, FOR COPPER ALLOYS

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This document covers a black chemical finish for copper alloys.

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 specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

SPECIFICATION

FEDERAL

P-S-1792 - Soap, Laundry (Neutral and Built)

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: U.S. Army Natick Research, Development, and Engineering Center, Natick, MA 01760-5014 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC MFFP

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

MIL-F-495E

STANDARD

MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection  
by Attributes

(Copies of specifications, standards, and handbooks required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

- \* 2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of the DODISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS shall be the issues of the nongovernment documents which are current on the date of the solicitation.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- D 523 - Gloss, Specular
- D 822 - Light and Water Exposure Apparatus (Carbon ARC Type) for testing paint, varnish, lacquer, and related products
- G 23 - Operating Light Exposure Apparatus (Carbon ARC Type) With and Without Water, for Exposure of Nonmetallic Materials

(Copies should be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103-1187.)

(Nongovernment standards and other publications are normally available from the organizations which prepare or which 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 specification and the references cited herein, the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Materials. Manufacturers are given latitude in the selection of raw materials provided the finish meets the requirements of this document.

3.2 Preparation of surface prior to application of black finish. Surfaces to be finished shall be thoroughly cleaned to remove all grease, oil, scale, and foreign matter. If desired, surfaces may be given additional preparatory treatments to assist in meeting the requirements of this document.

3.3 Black chemical finish. The black chemical finish shall be produced by chemical or electrochemical treatment of the copper-alloy surface.

3.3.1 Stress-corrosion prevention. When specified (see 6.2), copper alloys with high residual stresses shall be finished by a process excluding ammonia.

3.4 Rinsing. Black finish surfaces shall be thoroughly rinsed free of treatment chemicals and shall be dried. Care shall be exercised to effect thorough rinsing and drying in crevices and recesses of the articles being finished.

3.4.1 Base. Where the black chemical finish is to be used as a base of lacquer or other paint coating (see 6.2), the rinsing shall be followed by a 30-second dip in a 1/2 ounce of chromic acid per gallon of water solution. The acid dip shall be followed by rinsing with water and drying.

### 3.5 Performance.

3.5.1 Resistance to hot soap solution. The finish shall show no more than a slight change in color and appearance and shall not loosen, be removed, or flaked when tested as specified in 4.3.2.2.

3.5.2 Resistance to accelerated weathering. The finish shall show no more than a slight change in color and appearance and shall not have any finish loosening, removal, or flaking when tested as specified in 4.3.2.3.

3.5.3 Flexibility. Where the article is to be clinched or bent subsequent to the finishing operation (see 6.2), the finish shall withstand clinching and bending stresses without cracking, except at those points where cracking in the metal itself is permissible when tested as specified in 4.3.2.4.

3.6 Color and gloss. The finish shall be black and shall completely hide the color of the underlying material. Gloss shall be 25 maximum when tested as specified in 4.3.2.1. The gloss requirement shall not apply when the chemical finish is to be coated with oil, wax, lacquer, or other film (see 6.2).

3.7 Workmanship. The finish shall be uniform and, unless otherwise specified, small variations in appearance will be permitted on surfaces not significantly exposed to view. The finish shall be continuous, clean, and free from flaking, breaks, or scratches.

\* 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 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 document where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items must meet all requirements of section 3. The inspection set forth in this document shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirement in the document shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.2 Quality conformance inspection. Unless otherwise specified, sampling for inspection shall be performed in accordance with MIL-STD-105.

4.2.1 Component and material inspection. In accordance with 4.1, components and materials shall be inspected in accordance with all the requirements of referenced documents unless otherwise excluded, amended, modified, or qualified in this document or applicable purchase document.

4.2.2 In-process inspection. When stress-corrosion prevention is specified (see 3.3.1), the finishing operation shall be examined for conformance with the requirements of 3.3.1. Whenever nonconformance is noted, correction shall be made to the operation and all affected items shall be rejected.

4.2.3 End item visual examination. The end item shall be examined for conformance to the workmanship requirements of 3.7. The lot size shall be expressed in units of black chemical finished items. The sample unit shall be one finished item. The inspection level shall be I and the acceptable quality level (AQL), expressed in terms of defects per hundred units, shall be 4.0.

\* 4.2.4 End item testing. The end items shall be tested as specified in 4.3.2.1 through 4.3.2.4. The lot size shall be expressed in units of black chemical finished items. The inspection level shall be S-1. Any test failure shall be cause for rejection of the lot.

### 4.3 Methods of inspection.

4.3.1 Test specimens. When the size, shape or cost of the finished item is such that tests cannot be performed on the item, sample test specimens may be used for tests 4.3.2.1 through 4.3.2.4. Such test specimens shall be cut from scrap items or made from the same copper alloy and finished by the same process as the end item. The test specimens shall have a minimum external surface of 4 square inches. Specimens shall be randomly distributed throughout the processed lot and finished concurrently with the items. Test specimens shall be used only once.

### 4.3.2 Procedures.

- \* 4.3.2.1 Gloss. Gloss shall be measured in accordance with ASTM D 523. On articles which are too small for proper measurement by glossmeter and on articles with curved surfaces, the gloss shall be estimated visually against a black panel having a gloss of 25. In this visual determination, the high-light effect due to sharp curvatures shall be ignored. Any nonconformance to the requirements in 3.6 shall constitute a test failure.
- \* 4.3.2.2 Resistance to hot soap solution. The surface to be tested shall be immersed in a 5 percent soap solution at 195°F for 2 hours, then rinsed and examined. The soap used shall conform to type I, class 1 or 2, of P-S-1792. Where the black finish is intended as a base for other coatings, the test shall be conducted on uncoated black finished surfaces. Any nonconformance to the requirements in 3.5.1 shall constitute a test failure.
- \* 4.3.2.3 Resistance to accelerated weathering. The surface to be tested shall be exposed for 200 hours in accordance with ASTM D 822 and G 23. The test sample shall be rinsed using the water supply, spray nozzles, and pressure as prescribed in the standard test method. The sample shall be lightly washed under the spray using a thoroughly degreased lambs wool or absorbent cotton pad. The excess water shall be wiped off with a clean lint free cloth, and the sample dried for at least two hours and examined for conformance to the requirements in 3.5.2. Any nonconformance shall constitute a test failure. Where the black finish is intended as a base for other coatings, the test shall be conducted on uncoated black finished surfaces.
- \* 4.3.2.4 Flexibility. When specified (see 6.2), the sample item shall be flexibly tested by bending as in the assembled condition. When a test specimen is used, it shall be bent 180 degrees over a 1/2 inch diameter rod. Any nonconformance to the requirements in 3.5.3 shall constitute a test failure.

MIL-F-495E

5. PACKAGING

This section is not applicable to this document.

6. NOTES

6.1 Intended use. The black chemical finish is intended to be used to impart a black color to and for gloss reduction purposes on copper-alloy surfaces other than food service and water supply items. It is also used as a base for subsequent coatings such as lacquer, varnish, oil, and wax.

6.2 Ordering data. Acquisition documents should specify the following:

- a. Title, number, and date of this document.
- b. When ammonia is to be excluded from finished process (see 3.3.1).
- c. When the finish is to be used as a base for another coating (see 3.4.1).
- d. When the item is to be clinched or bent after finishing (see 3.5.3).
- e. When the finished item is to be coated with oil, wax, lacquer, or other film (see 3.6).

\* 6.3 Subject term (key word) listing.

Coating base  
Copper alloys  
Finish

6.4 Changes from previous issue. The margins of this document are marked with an asterisk (\*) to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only, and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content, as written, irrespective of the marginal notations and relationship to the last previous issue.

Custodians:

Army - GL  
Air Force - 11

Preparing activity:

Army - GL

Project No. MFFP-0402

Review activities:

Army - AR, ME, EA, AT  
Navy - SA  
Air Force - 15

User activities:

Army - ER  
Navy - MC, OS

# STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

<b>1 DOCUMENT NUMBER</b> MIL-F-495E	<b>2 DOCUMENT TITLE</b> Finish, Chemical, Black, For Copper Alloys		
<b>3a. NAME OF SUBMITTING ORGANIZATION</b>		<b>4 TYPE OF ORGANIZATION (Mark one)</b> <input type="checkbox"/> VENDOR <input type="checkbox"/> USER <input type="checkbox"/> MANUFACTURER <input type="checkbox"/> OTHER (Specify) _____	
<b>b ADDRESS (Street City State ZIP Code)</b>			
<b>5 PROBLEM AREAS</b> <b>a. Paragraph Number and Wording</b>          <b>b. Recommended Wording</b>          <b>c. Reason/Rationale for Recommendation</b>			
<b>6 REMARKS</b>			
<b>7a. NAME OF SUBMITTER (Last, First, MI) - Optional</b>		<b>b. WORK TELEPHONE NUMBER (Include Area Code) - Optional</b>	
<b>c. MAILING ADDRESS (Street, City, State ZIP Code) - Optional</b>		<b>8. DATE OF SUBMISSION (YYMMDD)</b>	



instructions. In a continuing effort to make our standardization documents better, the DoD provides this form for use in submitting comments and suggestions for improvements. All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge (DO NOT STAPLE), and mailed. In block 5, be as specific as possible about particular problem areas such as wording which required interpretation, was too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 6 any remarks not related to a specific paragraph of the document. If block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered.

**NOTE** This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification 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.

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