

MIL-C-85043B  
 24 March 1987  
 SUPERSEDING  
 MIL-C-85043A  
 30 December 1977

MILITARY SPECIFICATION  
 CLOTHS, CLEANING, LOW-LINT

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

1. SCOPE

1.1 Scope. This specification covers the requirements for a low-lint type cleaning cloth.

1.2 Classification. The low-lint cleaning cloths covered by this specification shall be of the following types, as specified (see 6.2.1):

Type	Description
I	For clean room use
II	For general use

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards, 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.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Systems Engineering and Standardization Department (Code 93), Naval Air Engineering Center, Lakehurst, NJ 08733, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.
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AMSC N4015

FSC 7920

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## SPECIFICATIONS

## FEDERAL

- L-P-378 - Plastic Sheet and Strip, Thin Gauge, Polyolefin.
- PPP-B-566 - Box, Folding, Paperboard.
- PPP-B-636 - Boxes, Shipping, Fiberboard.
- PPP-B-665 - Boxes, Paperboard, Metal Edged and Components.
- PPP-B-676 - Boxes, Setup.

## MILITARY

- MIL-B-117 - Bag, Sleeve and Tubing - Interior Packaging.
- MIL-H-5606 - Hydraulic Fluid, Petroleum Base, Aircraft, Missile, and Ordnance.

## STANDARDS

## FEDERAL

- FED-STD-191 - Textile Test Methods.
- FED-STD-791 - Lubricant, Liquid Fuels and Related Products, Methods of Testing.

## MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection By Attributes.
- MIL-STD-129 - Marking For Shipment and Storage.

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

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 issue of the nongovernment documents which is current on the date of solicitation.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- ASTM D 3951 - Packaging, Commercial.
- ASTM F 51 - Sizing and Counting Particulate Contaminant in and on Clean Room Garments.

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

## AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- ANSI B93.28 - Method for Calibration of Liquid Automatic Particle Counters Using "AC" Fine Test Dust.

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(Application for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018.)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 56A - Inhalation Anesthetics.

(Application for copies should be addressed to the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.)

NATIONAL MOTOR FREIGHT TRAFFIC ASSOCIATION, INC., AGENT

National Motor Freight Classification Rules

(Application for copies should be addressed to the National Motor Freight Traffic Association, Tariff Department, 1616 P Street, N.W., Washington, DC 20036.)

UNIFORM CLASSIFICATION COMMITTEE, AGENT

Uniform Freight Classification Rules

(Application for copies should be addressed to the Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.)

(Industry association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), 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 First article. When specified in the contract or purchase order samples shall be subjected to first article inspection (see 4.3 and 6.3).

3.2 Material. The cloth shall be of a knit construction consisting of virgin stretch-textured continuous filament nylon or polyester yarn. Spun yarns shall not be used.

3.3 Physical properties. The cloths shall conform to the requirements specified in Table I.

3.4 Dimensions. Each wiping cloth shall be between 1300 and 2000 square centimeters (approximately 200 and 310 square inches) except that 10 percent of the lot may be between 1000 and 1300 square centimeters (approximately 155 and 200 square inches) and 10 percent may be between 2000 and 2600 square centimeters (approximately 310 and 400 square inches). Unless otherwise specified, each cloth shall be approximately rectangular with a minimum width

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of 25.4 centimeters (10 inches). The length shall not exceed twice the width of any cloth. (See Table I for details of the aforementioned dimensions.) All dimensions shall be determined without stretching the cloth. The wiping cloths shall not contain any seams or stitching.

3.5 Color. The color of the wiping cloths shall be white, unless otherwise specified by the acquiring activity (see 6.2.1).

3.6 Workmanship. The wiping cloths shall be free from defects that would affect adversely the properties of the end item. The cloths shall be clean and free from grease, oil, spot or stain, lint or other impurities. The cloth shall not contain any cut, tear, mend, patch, abraded area or hole. The wiping cloths shall conform to the quality and grade of product established by this specification. The occurrence of defects shall not exceed the acceptance criteria established herein.

#### 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 the specification 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 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification 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 Classification of inspection. 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 inspection. The first article inspection of the wiping cloths shall consist of tests and examinations for all the requirements of this specification.

4.3.1 First article samples. Unless otherwise specified, as soon as practicable after the award of the contract or order, the contractor shall submit 2.27 kilograms (kg) (5 pounds (lb)) of wiping cloths for each type ordered in the contract. The samples shall be representative of the construction, workmanship and materials to be used during production. When a contractor is in continuous production of these wiping cloths from contract to

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contract, submission of further first article inspection samples, on the new contract, may be waived at the discretion of the acquiring activity (see 6.2.1). Approval of the first article inspection samples or the waiving of the first article inspection does not waive the requirements for performing the quality conformance inspection. The first article inspection samples shall be furnished to the Government as directed by the contracting officer (see 6.2.1). The first article inspection samples shall be identified by securely attached tags or labels durably marked with the following information:

Sample for First Article Inspection  
 CLOTH, CLEANING, LOW-LINT  
 Type I or II, as applicable  
 Name of manufacturer  
 Product designation  
 Date of manufacture  
 Submitted by (name) (date) for first article inspection  
 in accordance with the requirements of MIL-C-85043B

4.4 Quality conformance inspection. The quality conformance inspection shall consist of the visual inspection 4.4.2.1.1 and 4.4.2.1.2 and physical property tests 4.4.2.2.

4.4.1 Inspection lot.

4.4.1.1 Wiping cloths. An inspection lot size shall be expressed in units of 2.27 kg (5 lb) package of wiping cloths of one type made essentially under the same conditions and from the same materials. The sample unit shall be one 2.27 kg (5 lb) package of wiping cloths.

4.4.1.2. Packaging. An inspection lot size shall be expressed in units of fully prepared shipping container, containing packages of wiping cloths, fully prepared for delivery from essentially the same materials and components. The sample unit shall be one shipping container, containing packages of wiping cloths, fully prepared for delivery with the exception that it need not be sealed.

4.4.2 Sampling.

4.4.2.1 Visual examination.

4.4.2.1.1 Wiping cloths. The sample size shall be in accordance with MIL-STD-105, Inspection Level II and Acceptable Quality Level (AQL) of 6.5 defects per 100 units. A minimum of six wiping cloths from each package shall be visually examined to determine conformance to this specification. All defects found shall be counted regardless of their proximity to each other except where two or more defects represent a local condition, in which case only the more serious defect shall be counted. A continuous defect shall be counted as one defect for the individual cloth in which it occurs. Defects found that are clearly noticeable at normal inspection distance (3 feet) shall be enumerated in accordance with the following list of defects:

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## Defects

Hole, cut or tear  
 Mend, snag or seam  
 Size not within limits  
 Spot or stain (any)  
 Dirty, fuzzy or linty

4.4.2.1.2 Packaging. The sample size shall be in accordance with MIL-STD-105, Inspection Level S-2 and an AQL of 2.5 defects per 100 units. Each of the shipping containers selected as a sample unit shall be visually examined to determine that preservation, packing, and marking conform to this specification. The list of defects, Table II, shall be used to enumerate the defects found.

4.4.2.3 Physical properties. The sample size shall be in accordance with MIL-STD-105, Inspection Level S-1 and an AQL of 2.5 defects per 100 units. The physical properties of each wiping cloth package selected as a sample unit shall be tested in accordance with Table III to determine conformance to this specification.

4.5 Test conditions.

4.5.1 Standard conditions. Unless otherwise specified, the test conditions shall be  $50 \pm 5$  percent relative humidity and a temperature of 21 to 24°C (70 to 74°F). Test specimens shall be exposed to this atmosphere for a minimum of 24 hours prior to test.

4.5.2 Reporting of test results. Unless otherwise specified in the applicable test method, test results shall be reported as the average of all values obtained. However, each individual value shall be noted in the test report.

4.6 Test methods.

4.6.1 Weight. The weight shall be determined in accordance with FED-STD-191, Method 5041.

4.6.2 Oil absorption. Weigh the conditioned specimens individually to the nearest 0.01 gram. Three samples shall be tested and the results averaged. Immerse the specimens in hydraulic fluid conforming to MIL-H-5606 in a manner that the fluid completely surrounds the specimens and that no specimen touches any other specimen or the sides of the container. Immediately after one minute, remove the specimens from the fluid and suspend them individually without touching by one corner until no drop forms in 30 seconds. Reweigh each specimen individually to the nearest 0.01 gram and calculate the percent absorption as follows:

$$\text{Percent oil absorption} = \frac{A - B}{B} \times 100$$



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Where:

A = final weight of specimen

B = initial weight of specimen

4.6.3 Antistatic properties. The antistatic properties shall be determined by the surface resistivity method conforming to NFPA 56A.

4.6.4 Particle count. The particle count shall be determined in accordance with FED-STD-791, Method 3009, in a dust free environment. A sample of new hydraulic oil conforming to MIL-H-5606 shall be placed in a 1-liter container. The quantity of oil used shall be such that with the cloth immersed in it, the free space above the oil level shall be not less than 20 percent nor more than 30 percent of the container volume. The container shall be stoppered with a non-shedding plastic film and agitated for 15 minutes by a shaker capable of biaxial motion. Immediately at the conclusion of the 15 minute agitation period, a sample of oil shall be drawn and the particle count determined. If the particle count exceeds that specified in Table IV, filter a second sample of the hydraulic fluid and repeat the process or draw a second sample of hydraulic oil from a different source. The particle count of the hydraulic oil shall not exceed that specified in Table IV. A 15.2 by 15.2 cm (6 by 6 inches) swatch of wiper cloth shall be placed in the container with the hydraulic oil and the operation repeated. The reading shall be normalized per square centimeter of cloth using the following formula:

$$\frac{\text{Number of particles}}{\text{Square centimeter}} = \frac{\text{Number of particles}}{\text{Milliliters}} \times \text{Milliliters of suspension} \times \frac{1}{\text{Area of cloth (cm)}^2}$$

The difference between the final reading and the initial reading shall be calculated. The results shall be expressed as the average per sample unit. The particle count may be determined by using an automatic particle counter, such as the Hiac Model PC 305, or equivalent (see 6.4). When this procedure is used, the instrument shall be calibrated in accordance with ANSI B93.28. When fibers, visible to the naked eye, are found clinging together on the filter, the cut edges of the specimen shall be examined for fraying. If fraying is evident, the fibers clinging together on the filter should not be included in the particle count.

4.6.5 Particulate contaminants. The particulate contaminants, 5 microns and larger, shall be determined as specified in ASTM F 51.

4.6.6 Solubility. A 7.62 by 7.62 cm (3 by 3 inches) swatch of dried to constant weight wiper cloth shall be weighed to the nearest 0.001 gram. Three specimens for each solubility solvent shall be tested and the results averaged. The sample swatch shall be inserted into a dried to constant weight Erlenmeyer flask, weighed to the nearest milligram, and 100 ml of methanol shall be added. One hundred ml of methyl ethyl ketone shall be added to a

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similar prepared swatch and flask. The flasks shall be stoppered with a long evaporation tube. The flasks shall be placed in a hood for 90 hours. Wash the cloths, as they are being removed, with 20 - 25 ml of the applicable solvent into the flasks. Evaporate the solvent from the flask to dryness by use of a steam bath. Dry the flask and residue to constant weight and weigh to the nearest milligram. The amount of residue shall be calculated as follows:

$$\text{Percent solubility} = \frac{A - B}{C} \times 100$$

Where:

A = weight of flask and residue

B = weight of flask

C = weight of swatch

## 5. PACKAGING

5.1 Preservation. Preservation shall be Level A or Commercial, as specified (see 6.2.1).

### 5.1.1 Level A.

5.1.1.1 Type I. Unless otherwise specified, the wiping cloths, in 2.27 kg (5 lb) units, shall be packaged in pre-cleaned, contamination free, hermetically heat sealed polyethylene bags conforming to MIL-B-117, Type I, Class B, Style 2. Excess air shall be expelled from the bags prior to heat sealing. The bags shall be made of polyethylene film having a thickness of  $0.102 \pm 0.005$  mm ( $0.004 \pm 0.0002$  in.) and conforming to L-P-378 Type I.

5.1.1.2 Type II. Unless otherwise specified, the wiping cloths, in 2.27 kg (5 lb) units, shall be packaged in pre-cleaned, contamination free polyethylene bags. The top of the bag shall be folded down three times and held in position by a piece of tape. The bags shall be made of polyethylene film conforming to L-P-378, Type I. The film shall have a minimum thickness of 0.038 mm (0.0015 in.). The seams, as applicable, shall be heat sealed. The heat sealed seams shall be straight, continuous and parallel to the edges of the bag.

5.1.1.3 Intermediate packing. Two 5 lb bags of one type only, packaged in accordance with 5.1.1.1 or 5.1.1.2, as required, shall be packaged in an intermediate container conforming to PPP-B-566, PPP-B-665 or PPP-B-676. The intermediate containers shall be of uniform size and shape and of minimum cube and tare weight.

5.1.2 Commercial. The wiping cloths shall be preserved in accordance with ASTM D 3951.

5.2 Packing. Packing shall be Level B or Commercial, as specified (see 6.2.1).



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5.2.1 Level B. Wiping cloths packaged as specified in 5.1 shall be packed in containers conforming to PPP-B-636, Type CF, Weather Resistant Class, Variety SW, Grade V3c.

5.2.2 Commercial. The packaged wiping cloths shall be packed in accordance with ASTM D 3951.

5.3 Marking. In addition to any special marking required by the contract (see 6.2.1), each unit and intermediate and exterior container shall be marked in accordance with MIL-STD-129. The marking shall include the following:

## CAUTION:

- a. Do not use with solvent having a flash point below 37.8 °C ((100°F).
- b. Do not use for wiping large plastic surfaces such as radomes and canopies.

## 6. NOTES

6.1 Intended use.

6.1.1 Type I. The Type I wiping cloths are intended for use in clean rooms and any other operation where ultra-clean, low-lint wipers are required.

6.1.2 Type II. The Type II wiping cloths are intended for use in cleaning, polishing and wiping operations requiring low-lint, highly absorbent wipers, but not clean room standards.

6.1.3 Caution. These wiping cloths should not be used on plastic surfaces nor with any solvent which has a flash point below 37.8°C (100°F).

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Type required (see 1.2).
- c. Quantity in kilograms (pounds).
- d. Color, if other than white (see 3.5).
- e. Whether first article is waived (see 4.3.1).
- f. Name and address of first article inspection laboratory and Government activity responsible for conducting first article inspection program (see 4.3.1).
- g. Levels of preservation and packing (see 5.1 and 5.2).

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h. Any special markings required (see 5.3).

6.2.2 Data requirements. When this specification is used in an acquisition which incorporates a DD Form 1423, Contract Data Requirements List (CDRL), the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved CDRL incorporated into the contract. When the provisions of DoD FAR Supplement Part 27, Sub-Part 27.410-6 are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this specification is cited in the following paragraph:

Paragraph no.	Data requirement	Applicable DID no.
4.3	First article inspection reports.	DI-T-4902

(Copies of data item descriptions required by contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer.)

6.3 First article. When a first article inspection is required, the wiping cloths will be tested and should be a first production item. The first article should consist of the sample specified in 4.3.1. 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 requirements 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 Automatic particle counter. Information regarding the automatic particle counter, Hiac Model PC 305, may be obtained from the High Accuracy Products Company, Claremont, CA 91711.

6.5 Subject term (key word) listing.

Clean rooms  
 Cleaning  
 Cloths  
 Filament nylon  
 First Article  
 General use  
 Knit  
 Low-lint  
 Polishing  
 Polyester yarn  
 Wiping cloth  
 Ultra-clean

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

Custodians:

Army - GL

Navy - AS

Preparing activity:

Navy - AS

(Project 7920-0259)

User activities:

Navy - MC

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TABLE I. Physical properties.

Characteristic	Requirement		Test paragraph
	Type I	Type II	
Weight, grams/square meter (ounces/square yard):			4.6.2
Minimum	101.7 (3.0)	101.7 (3.0)	
Maximum	305.2 (9.0)	305.2 (9.0)	
Dimensions:			3.4
Square centimeters (square inches):			
Minimum	1,300 (200)	1,300 (200)	
Maximum	2,000 (310)	2,000 (310)	
10 percent below:			
Minimum	1,000 (155)	1,000 (155)	
Maximum	1,300 (200)	1,300 (200)	
10 percent above:			
Minimum	2,000 (310)	2,000 (310)	
Maximum	2,600 (400)	2,600 (400)	
Minimum width	25.4 (10)	25.4 (10)	
Length, not greater than	2 x width	2 x width	
Oil absorption, percent, minimum	120	120	4.6.2
Antistatic properties, maximum:	$1 \times 10^{11}$	$1 \times 10^{11}$	4.6.3
Surface resistivity, ohms/unit square			
Particle count, maximum/square centimeter (size in microns):			4.6.4
5 - 10	1,600	10,000	
11 - 25	160	2,150	
26 - 50	45	225	
51 - 100	30	70	
Over 100	10	25	
Particulate contaminants, 5 microns and over, particles/square meter (particles/square foot), maximum	21,528 (2,000)	-	4.6.5

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TABLE I. Physical properties. - Continued

Characteristic	Requirement		Test paragraph
	Type I	Type II	
Solubility, percent, maximum:			4.6.6
Methanol:			
Polyester	0.16	0.16	
Nylon	0.27	0.27	
Methyl ethyl ketone:			
Polyester	0.21	0.21	
Nylon	0.70	0.70	

TABLE II. List of defects for packaging.

Item	Defect
Exterior and interior markings	Missing, incorrect, incomplete, or illegible; of improper size, location, sequence, or method of application; markings on any interior or exterior container not the same.
Materials	Any nonconforming component; any component or component part missing, damaged or otherwise defective.
Workmanship	Inadequate application of the components, such as incomplete closure of any container, container flap, or loose strapping; bulging or distortion of any container; any polyethylene bag damaged, any open or non-continuous heat sealed seam or air not exhausted.
Exterior and interior weight or content	Gross or net weight exceeds the requirement; number per container more or less than specified; any not individually packaged; any deformed, distorted or bent or any portion of any wiping cloth caught in any heat sealed seam.

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TABLE III. Quality conformance physical property tests.

Characteristic	Paragraph	
	Requirement	Test
Material	3.2	FED-STD-191, Method 1530
Color	3.5	Visual
Weight	3.3	4.6.1
Oil absorption	3.3	4.6.2
Antistatic properties	3.3	4.6.3
Particle count	3.3	4.6.4
Particulate contaminants	3.3	4.6.5
Solubility	3.3	4.6.6

TABLE IV. Maximum hydraulic fluid particle count.

Particle size range in microns	Maximum number of particles per 100 milliliters
5 - 10	2,500
11 - 25	670
26 - 50	93
51 - 100	16
Larger than 100	1



**STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL***(See Instructions - Reverse Side)***1. DOCUMENT NUMBER**

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**2. DOCUMENT TITLE**

CLOTHS, CLEANING, LOW-LINT

**3a. NAME OF SUBMITTING ORGANIZATION****4. TYPE OF ORGANIZATION (Mark one)** VENDOR USER MANUFACTURER OTHER (Specify): \_\_\_\_\_**b. ADDRESS (Street, City, State, ZIP Code)****5. PROBLEM AREAS****a. Paragraph Number and Wording:****b. Recommended Wording:****c. Reason/Rationale for Recommendation:****6. REMARKS****7a. NAME OF SUBMITTER (Last, First, MI) - Optional****b. WORK TELEPHONE NUMBER (Include Area Code) - Optional****c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional****8. DATE OF SUBMISSION (YYMMDD)**