

MIL-T-9906B
19 September 1983

SUPERSEDES
MIL-T-9906A
8 April 1964

MILITARY SPECIFICATION

TAPE, IDENTIFICATION, AEROSPACE VEHICLE TUBING MARKER

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

1. SCOPE

1.1. Coverage. This specification for identification tape used for tubing markers covers the requirements for one type of printed, pressure-sensitive, non-corrosive identification tape, which shows different designs and used for identifying tubing lines on vehicles and aircraft. This tape shall withstand temperatures between the range from plus 325 to minus 290°F. (plus 163 to minus 179°C) and shall be resistant to fuels, lubricating oils and hydraulic fluids.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1. Specifications, standards, and handbooks. Unless otherwise specified the following specifications, standards, and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications & Standards (DODISS) specified in the solicitation form a part of this specification to the extent specified herein.

SPECIFICATIONS

Federal

QO-A- 250/5	Aluminum Alloy Alclad 2024, Plate and Sheet
PPP-T-680	Tape, Pressure Sensitive Adhesive, Packaging and Packing of.

Military

MIL-H-5606	Hydraulic Fluid Petroleum Base, Aircraft, Missile, and Ordnance.
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Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: WR-ALC/MMEDO, Robins AFB, GA 31098, by using the self-addressed Standardization Document Proposal (DD Form 1426) appearing at the end of this document or by letter.

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MIL-T-5624	Turbine Fuel, Aviation, Grades JP-4 and JP-5
MIL-L-7808	Lubricating Oil, Aircraft Turbine Engine, Synthetic
MIL-T-8504	Tubing, Steel, Corrosion-Resistant (304) Aerospace Vehicle Hydraulic Systems, Annealed Seamless and Welded
MIL-P-25576	Propellant, Kerosene

STANDARDS

Military

MIL-STD-1247	Marking, Functions and Hazard Designations of Hose, Pipe, and Tube Lines for Aircraft, Missiles and Space Systems
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(Copies of specifications, standards, handbooks, drawings, and publications required by manufacturers 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 document(s) form a part of this specification to the extent specified herein. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3330	Peel Adhesion of Pressure-Sensitive Tape at 180 degree Angle, Test for
ASTM D 3652	Thickness of Pressure-Sensitive and Gummed Tapes, Test for
ASTM D 3715	Quality Assurance of Pressure-Sensitive Tapes, Practice for
ASTM D 3759	Tensile Strength and Elongation of Pressure-Sensitive Tapes, Test for
ASTM D 3815	Accelerated Aging of Pressure-Sensitive Tapes by Carbon-Arc Exposure Apparatus, Practice for

(Copies of ASTM publications may be obtained from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

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

3. REQUIREMENTS

3.1 Recovered materials. The manufacturer shall utilize recovered materials to the maximum extent practicable.

3.2 First Article Testing and Inspection. This specification provides for first article testing and inspection that can be implemented by a tape producer prior to receipt of a solicitation (see 4.2 and 6.2).

3.3 Construction and materials.

3.3.1 Construction. The identification tape shall consist of an integral unit of printed pressure-sensitive tape. The printed side of the printed pressure-sensitive tape shall be subsurface or shall have laminated to it a transparent pressure-sensitive tape, to insure fluid, and abrasion resistance of the printing. If laminated, the lamination shall not contain any air bubbles or other defects which would affect the legibility of the markings. If laminated, the lamination shall not separate when tested for any requirements of Table 1. The adhering side of the printed tape shall be coated with a pressure-sensitive adhesive.

3.3.2 Materials. The materials used shall contain no halogenated compounds.

3.3.2.1 Backing. The backing of the printed and transparent tape shall be a polyester film.

3.3.2.2 Adhesive. Unless otherwise specified that heat-applicable tape is required (see 6.2), the adhesive shall be pressure-sensitive, withstand heat and cold, resistant to hydrocarbon fuels, lubricating oils and hydraulic fluids; and shall require no heat, moisture or other preparations prior to or after application. When properly applied, the adhesive shall be such that the identification tape shall adhere immediately and firmly to a clean dry surface without curling, buckling, or wrinkling. Tape that will be applied by heat shall withstand the heat applied during testing, without failure.

3.4 Physical characteristics. Test values of identification tape shall comply with the requirements of Table 1.

TABLE 1

Characteristics	Value	Test Para.
Tensile strength lb/in width, min.	17 (2977Nm)	4.2.4
Elongation, %	50	4.2.4

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TABLE I (continued)

Thickness, inch, max.	0.0065 (0.165mm)	4.2.4
Adhesion, oz./in., width, min.		
Initial	50 (547 N/M)	4.2.4
After accelerated weathering	50 (547 N/M)	4.2.4.4
After 24 hour immersion in water	30 (328 N/M)	4.2.4.1
After 72 hour immersion Turbine Fuel (MIL-T-5624, Grade JP4)	30 (328 N/M)	4.2.4.1
After 24 hour immersion in Lubricating Oil (MIL-L-7808) at 200°F	30 (328 N/M)	4.2.4.1
After 72 hour immersion in Propellant (MIL-P-25576)	30 (328 N/M)	4.2.4.1
After 72 hour immersion in Aircraft Hydraulic Oil (MIL-H-5606)	30 (328 N/M)	4.2.4.1
After Adhesive Stability Test	15 (164 N/M)	4.2.4.1

3.5 Form. Tapes for fluid line identification shall be supplied (without liner) in rolls, evenly and uniformly wound, adhesive side in, on cores of paper or plastic. Unless otherwise specified (see 6.2) the cores shall have an inside diameter of 3 inches, minus 0 plus one sixteenth inches (76mm, minus 0 plus 1.6mm). Width of fluid line identification tapes shall be the minimum width or larger as specified in MIL-STD-1247, and the length shall be 72 yards (65M) unless otherwise specified (see 6.2). For serialization marking, the form and size of the markings shall be as specified in Appendix I of this specification. The size of other designs and legends shall be as specified in the contract or order. A width and size tolerance of plus or minus 1/32 inch (0.8mm) shall be permissible.

3.6 Design and color. Unless otherwise specified (see 6.2), the basic design, color and printed legend for fluid line identification shall conform to MIL-STD-1247. The color of the background behind the geometric symbols shall be either white or silver. For serialization, the design, color and legend shall conform to Appendix I. Other designs and legends shall be as specified in the contract or order.

3.7 Performance.

3.7.1 Low temperature. After testing as described in 4.2.4.8, the tape shall show no evidence of loosening or change that would indicate loss of adhesion to the LOX tubes.

3.7.2 Fluid resistance. The applied material, when immersed in test fluids as specified in 4.2.4.1 shall show no visible deterioration of color, printing, or general film appearance such as to affect serviceability. On removal from the fluids, the identification tape shall meet the adhesion requirements of Table I. After immersion for the specific time in water.

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fuels, lubricants, and hydraulic fluids, edge attack no greater than 1/8 inch (3.2mm) shall be allowed.

3.7.3 Heat resistance. The identification tape, when applied to test panels and subjected to 325 deg F (163 degrees C.) for 100 hours shall show no deterioration such as cracking, wrinkling or other defects that affect the serviceability. Slight discoloration that does not affect the serviceability shall be permissible (4.2.4.2).

3.7.4 Corrosive properties. The identification tape shall not cause surface corrosion or stress corrosion cracking of the materials to which it is applied (4.2.4.3).

3.7.5 Weathering resistance. When tested as specified in 4.2.4.4, the identification tape shall show no visible deterioration such as cracking, peeling, chalking or blistering, and shall meet the adhesion requirements of Table I. The colors shall show no appreciable fading or loss of legibility such as to make the markings unserviceable.

3.7.6 Storage stability. After twelve (12) months storage at a temperature of 70° to 90° F (21 to 32°C.), the identification tape shall exhibit no adhesive flow on sides and no telescoping. It shall also be capable of meeting the tensile, elongation and initial adhesion requirements of Table I (4.2.4.5).

3.7.7 Delamination. Identification tape of laminated construction shall unwind from the roll with no loosening or separation of the overlaid transparent film when tested as specified in 4.2.4.6.

3.7.8 Adhesive stability. The identification tape shall meet the adhesion requirements of Table I after exposures as specified (4.2.4.7).

3.8 Workmanship. The identification tape shall be manufactured in accordance with high grade commercial practice. The material shall be free from blisters, cracks, foreign material and the edges shall be straight, true and unbroken within the limits of the best commercial practice.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, 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.

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4.2 First Article testing and inspection. These first article test and inspection procedures gives allowance for compliance with these procedures prior to receipt of requirements for these items so that supplies of items required can be made in an expeditious manner. A certificate of conformance must be made available to the procuring agency showing compliance to tests and inspections required herein. Repetition of these tests does not apply for changes in designs shown on tapes or changes in physical dimensions, but these tests shall apply to the first production run on items produced if any of the following conditions exist:

a. The manufacturer that desires to supply this item have not had his product subjected to the tests and inspections as required herein.

b. The manufacturer is a new producer of tapes in accordance with this specification.

c. There is a change in the material compositions of either the tapes or in the adhesives used.

d. There is a change in production procedures on tapes other than a change in design shown.

4.2.1 Lot size. Lot size shall be as specified for applicable inspection (4.2.2).

4.2.2. Sampling and inspections procedures.

4.2.2.1 Visual. The lot size, sampling and inspection procedures for this inspection shall be as specified in the end item examination, paragraph 6.2, of ASTM D 3715. Sample unit shall be one roll of tape.

4.2.2.2 Physical properties. Lot size and sampling for physical property testing shall be as specified in end item testing, paragraph 6.3 of ASTM D 3715. Each unit of product shall be tested to the applicable requirements of Table II. The AQL shall be 4.0 percent.

4.2.2.3 Packaging. Lot size, sampling, inspection and AQL shall be in accordance with Section 5 and PPP-T-680.

4.2.3 Test panels and tubing.

4.2.3.1 Panels. Bare metal panels of aluminum alloy conforming to QQ-A-250/5 in rectangular sizes of 2 by 5 by 0.020 inches thick (51 by 127 by 0.51mm) shall be used for test purposes.

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4.2.3.2 Tubing. Bend a 10 inch (254mm) long section of stainless steel tubing to the radius shown in Figure 1 on a tube bender to form a "U" shaped test specimen. The original dimension between the legs of the unstressed "U" specimen shall be 2-1/4 inches + 1/32 inch (57mm + 0.79mm). The tubing, conforming to MIL-T-8504, shall be 3/8 inch (9.5mm) O.D. and have 0.035 inch (0.89mm) walls. Drill 3/16 inch (4.76mm) holes through the tube and pass a #8-32, 304 stainless steel machine screw through the holes. Draw the open end of the tube to the dimensions of Figure 1.

4.2.3.3 Cleaning. Panels and tubing used for testing shall be thoroughly cleaned in a detergent solution and rinsed in acetone. After cleaning, the panels and tubing shall only be handled when wearing rubber gloves.

4.2.3.4 Tape application. Tape application on the tubing shall consist of a 3/8 inch (9.5mm) wide strip of identification tape wound spirally around the entire bend, without overlapping, and extending one inch (25mm) down the legs. Tape application onto the panels shall be in compliance with the applicable test methods required. Finger pressure shall be used to obtain adhesion of the test tape and the tubing and panels with test tape applied shall be allowed to condition for 72 hours prior to conducting tests.

4.2.4 Tests. The following tests shall be conducted in accordance with the ASTM methods as specified:

<u>TEST</u>	<u>METHOD</u>
Tensile	ASTM D 3759
Elongation	ASTM D 3759
Thickness	ASTM D 3652
Adhesion	ASTM D 3330 (See 4.2.3.1 for test panel)

4.2.4.1 Fluid resistance. Specimens prepared as described in 4.2.3.1 shall be immersed in the fluids listed in 4.2.4.1.1 through 4.2.4.1.5. Remove the specimens after the required immersion time, allow to drain, examine for conformance to 3.7.2 and test for adhesion within 15 minutes after removal of the panel from the fluid. The adhesion values shall conform to Table 1.

4.2.4.1.1 Water. Immerse specimens in distilled water for 24 hours.

4.2.4.1.2 Turbine engine fuel. Immerse specimens in jet engine fuel conforming to MIL-T-5624, Grade JP-4, for 72 hours.

4.2.4.1.3 Lubricating oil. Immerse specimens in lubricating oil, MIL-L-7808 at 200 degrees F (93 degrees C) for 24 hours.

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4.2.4.1.4 Rocket fuel. Immerse specimens in rocket fuel conforming to MIL-P-25576 for 72 hours.

4.2.4.1.5 Hydraulic oil. Immerse specimens in aircraft hydraulic oil conforming to MIL-H-5606 for 72 hours.

4.2.4.2 Heat resistance. Identification tape on bare panels shall be exposed to 325°F (163°C) dry heat for 100 hours. Cool and examine for conformance to 3.7.3.

4.2.4.3 Corrosion test. Suspend three specimens (see Fig. 1 and 4.2.3.1) open ends up under a glass shield in a 2 liter Parr vessel equipped with a pressure gauge and thermowell or a similar 2 liter vessel constructed to withstand a minimum internal pressure of 300 psi, (20.4 atmospheres) (see 6.3). The specimens shall be suspended above the water phase with stainless steel or nichrome wire wound around the steel bolt. The wire and side of the vessel shall not make direct contact with the "U" tube walls. All interior surfaces of the pressure vessel including thermowell, pressure gauge outlet, and tubing leading to the pressure gauge shall be of stainless steel or glass, as applicable. Dissimilar metal contact shall be avoided wherever practicable. Add 20cc of distilled water to the vessel and close. Heat to an internal temperature of 325°F \pm 10° F. (163°C \pm 5°C). Check vessel after 1 hour to determine if internal pressure is increasing, which indicates no leak in system. Maintain a temperature of 325°F (163°C) for 144 hours. Cool vessel and remove specimens. Following solvent cleaning, examine for cracking under 10 power magnification. If no cracking is observed, draw open ends together from original dimension of 1-7/8 (47.6mm) to a 1-1/2 inch (38.1mm) separation. Re-examine for cracking. If no cracks are observed, the material is considered acceptable (3.7.4).

4.2.4.4 Weathering. A set of specimens on bare panels, prepared for adhesion testing as described in 4.2.3.1 shall be exposed in a weathering device conforming to ASTM D 3815 for 96 hours. The water spray shall be used. Remove, examine for conformance to 3.7.5 and test for adhesion according to Table I.

4.2.4.5 Storage stability. The supplier of the identification tape shall furnish the contracting officer certification that the tape supplied meets the storage stability requirements of 3.7.6.

4.2.4.6 Delamination. Unwind approximately three feet (0.91m) of identification tape from a freely rotating roll at a rate of 15 to 20 inches per second (380-510mm/second). Examine for conformance to 3.7.7. Repeat at three different levels within the roll. This test is not required if tape is not of laminated construction.

4.2.4.7 Adhesive stability. A specimen of the identification tape at least 6 inches long (152mm) shall be placed adhesive side out on a bare panel. It shall be so mounted to the panel that at least 4 inches (101mm)

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of the adhesive is exposed. Mount the panel, adhesive exposed to the light source, in a weathering device described in ASTM D 3815 and expose for 20 hours. Water spray shall not be used. Remove and test for adhesion as described in 3.7.8. Only the adhesion of the 4 inch (101mm) exposed area shall be reported.

4.2.4.8 Low temperature.

4.2.4.8.1 Apparatus. The apparatus needed shall consist of a tube capable of carrying LOX. The outside diameter shall not be less than 1/2 inch (12.7mm).

4.2.4.8.2 Preparation. The tube line shall be cleaned with a solution compatible with LOX. The specimen length shall exceed the circumference of the tube by at least 2 inches (51mm). Apply the center portion of the tape to the tube, holding each end of the tape. Firmly apply the tape around the balance of the tube and bring the excess tape together, adhesive to adhesive. With a sharp instrument, cut off the excess tape. Press the ends of the tape firmly in place.

4.2.4.8.3 Procedure. Allow the tape to remain adhered to the LOX line at room temperature for at least 72 hours after application. LOX at -290°F (-179°C) shall be passed through the line to which the tape is applied for at least 10 of the following cycles:

- a. 2 hours LOX on.
- b. 1/2 hour LOX off.
- c. 2 hours LOX on.
- d. 1/2 hour LOX off.
- e. 2 hours LOX on.
- f. 17 hours LOX off.

During and at the end of the exposure period examine the specimen for conformance to 3.7.1.

4.2.5 Retesting. In the event of failure of any of these tests, corrective action must be taken and all parts of the tests shall be repeated.

4.3 Inspection of packaging. The packaging, packing and marking of the tape shall be examined for the applicable classification of defects specified in PPP-T-680.

5. PACKAGING

5.1 Packaging requirements. Preservation, packaging, packing, and marking of this material shall be in accordance with the requirements of PPP-T-680 or as otherwise specified in the solicitation (see 6.2).

6. NOTES

6.1 Intended use. The identification tape conforming to this specification is designed especially for identifying fluid lines, aircraft and missile spare parts, and similar applications, where a noncorrosive, heat, cold, and solvent resistant tape is required.

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6.2 Ordering data. Procurement documents should specify the following:

- (a). Title, number, and date of this specification and identity of any applicable amendment.
- (b). If a certificate of compliance is required that testing as specified herein has been complied with or conditions that would preclude requirements for this certificate of conformance (see 3.2 and 4.2).
- (c). If tape required is of the type that requires heat for application (see 3.3.2.2).
- (d). Inside diameter of core, if different (see 3.5).
- (e). Length of tape on roll, if different (see 3.5).
- (f). Design required and color (if different) (see 3.6, and Appendix I or MIL-STD-1247).
- (g). Selection of applicable levels of packaging, packing, and marking (see 5.1 and solicitation).

6.3 The Parr vessel required for corrosion testing in 4.2.4.3 is sold by the Parr Instrument Company. It is type 316 stainless steel, Series 4500 Pressure Apparatus rated at 1000 psig (70kg/sq cm gage) at 250°C. The body is a standard item but the heads are custom made. The head for this test should include a thermowell and hooks for suspending the specimens and the glass shield. It is heated by being placed in an oil bath to a depth of 8 inches (20.3cm). The oil bath is usually maintained at a temperature between 5 and 10 degrees above the temperature desired in the test vessel.

6.4 Changes. Changed paragraphs in this revision are not identified due to the extent of changes made.

6.5 Item availabilities. This specification is not compatible for change over to a Commercial Item Description (CID) because of specified designs and harsh environment for use which prevents these tapes from being stocked.

6.6 Item identification. Items applicable to this specification involves use of various designs applicable to MIL-STD-1247 and other specific printing design details; therefore, part number (other than M9906) for these required items are not applicable.

Custodians:

Army -GI
Navy -AS
Air Force - 99

Preparing Activity:

Air Force - 84

DOD Project:
7690-0062

Users:

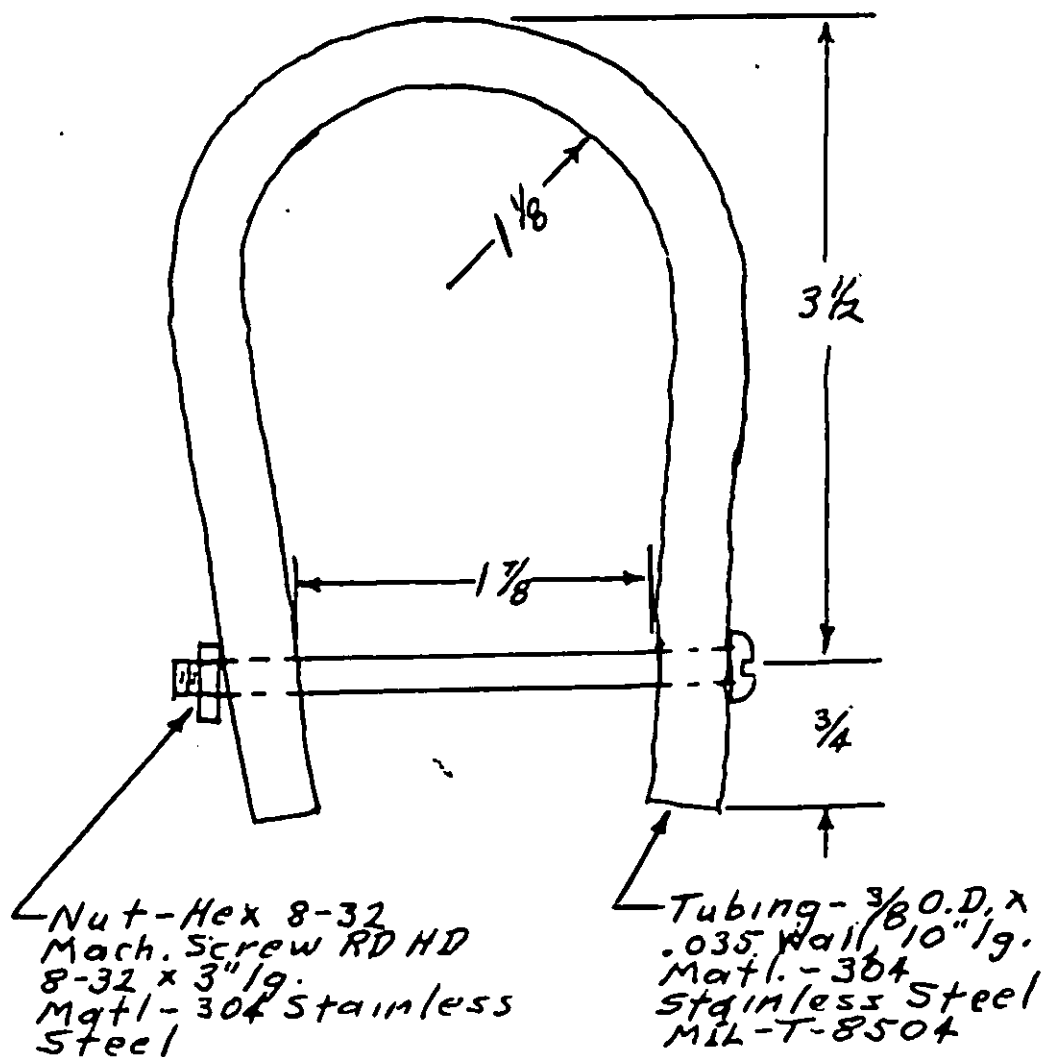
Army - ME, AT, AV, FA, MI, AR, ER, AL
Navy - MC

Reviewers:

Navy - MI
Civilian Agencies - GSA

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Figure 1
Corrosion Test Specimen



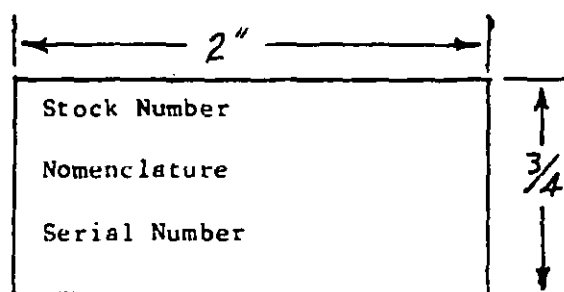
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APPENDIX I

USE OF PRESSURE-SENSITIVE ADHESIVE IDENTIFICATION TAPE
FOR
SERIALIZATION MARKINGS

10. General. The following requirements cover the use of identification tape for serialization marking or labeling.

20. Design and size. The following drawing states the size of the label and the location of the printing:



The letters and numbers for the stock number and nomenclature shall be 1/8 inch (3.18mm) high. The numbers and letters of the serial number shall be 3/16 inch (4.76mm) high. There shall be 1/16 inch (1.6mm) space above the stock number and between the stock number and the nomenclature. There shall be a 3/32 inch (2.4mm) space between the nomenclature and the serial number and a 3/32 inch (2.4mm) margin below the serial number.

30. Color. The background or basic color of the tape on which is printed the legend shall be silver. The lettering shall be black. The tape on which the legend is printed shall be covered with a transparent pressure-sensitive adhesive polyester tape.

40. Form. The tape shall be supplied in rolls or applied to cards. When supplied in rolls, the adhesive shall be covered with a liner. The liner shall be skip-split or otherwise prepared for easy removal of one label at a time. When supplied on a card, provisions shall be made for easy removal of one label at a time from the card. The rolls or cards shall contain labels having the same stock number and nomenclature only.

50. Ordering data. Requisitions, orders or contracts shall state the stock number, nomenclature, beginning and ending serial number.

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

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

(TO DETACH THIS FORM, CUT ALONG THIS LINE.)