MIL-P-83953A(USAF)
April 7 1980
SUPERSEDES
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13 February 1970

MILITARY SPECIFICATION

PENCIL, AIRCRAFT MARKING

This specification is approved for use by Warner Robins ALC, Department of the Air Force, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE.

1.1 Scope. This specification covers requirements for wood cased, thick lead, non-mechanical pencils that will be used for marking aircraft surfaces.

1.2 Term definition. The term "lead" is used in this specification to designate the marking medium.

1.3 Item Identity. The identity of the item required by this purchase order is further explained in 6.4 (see 6.2).

2. APPLICABLE DOCUMENTS.

2.1 Issues of documents. The following documents of the issue in effect on date of invitation for bids or request for proposal form a part of this specification to the extent specified herein.

SPECIFICATIONS

Federal

GG-S-236	Sharpeners, Pencil
QQ-A-250/12	Aluminum Alloy 7075, Plate and Sheet
SS-P-186	Pencil, Mechanical (Including Leads and Erasers)
TT-P-1757	Primer Coating, Zinc Chromate, Low Moisture Sensitivity

Beneficial comments (recommendations, additions, deletions) and any pertinent data wich may be of use in improving this document should be addressed to AFLC CASO/LODS, Federal Center, Battle Ceek, MI 49016 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FSC 7520

UU-P-121	Paper, Bond and Writing, White and Colored

Military

MIL-P-7962	Primer Coating, Cellulose-nitrate, Modified Alkyd Type, Corrosion-inhibiting, Fast-drying
MIL-C-8514	Coating Compound, Metal Pretreatment, Resin-Acid
MIL-L-19537	Lacquer, Acrylic-nitrocellulose, Gloss (For Aircraft Use)
MIL-P-23377	Primer Coating, Epoxy-Polyamide, Chemical and Solvent Resistant
MIL-C-83286	Coating Urethane, Aliphatic Isocyanate, For Aerosapce Applications

STANDARDS

Federal

FED-STD-102	Preservation, Packaging, and Packing Levels
FED-STD-191	Textile Test Methods
FED-STD-595	Color Requirements for Individual Color Chips

Military

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring 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 indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

ASTM B117	Method of Salt Spray (Fog) Testing

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

3. REQUIREMENTS.

3.1 Reclaimed materials. Recycled and recovered raw materials should be used to the maximum extent possible in lieu of virgin raw materials as long as these materials do not jeopardize the intended use and fully comply with all contract requirements.

3.2 Component materials.

3.2.1 Lead. Each lead shall be furnished in one piece, and shall be of such materials as to produce smooth, even, and uniform writing when tested as described in 4.2.1.

3.2.1.1 Lead compositions. Lead compositions shall be left to the discretion of the supplier; however, the lead formulation shall not include graphite or unalloyed or uncompounded powdered metals. The lead shall be soft enough to mark all grades of aluminum alloy without scratching the metal surface but shall have sufficient strength to withstand tests of 4.2.3. Other requirements of this specification shall be complied with.

3.2.2 Casing. The wood casing of the pencil shall be seasoned, straight grained cedar.

3.2.3 Eraser. The pencil shall not be equipped with an eraser.

3.3 Construction. The casing shall enclose the leads in a neat, secure manner. Both halves of the wood casing shall be of uniform construction and securely glued together throughout their entire lengths. Leads shall be centered consistent with commercial practice. When sharpened as specified in 4.2.1, the casing shall have a smooth even finish, and shall show no evidence of splitting or tearing of the wood grain.

3.4 Color. The pencil lead color shall be as specified (see 6.2), and shall possess brilliance, vividness and smoothness inherent in the color specified. The pencil casing shall either have the lead color stamped on it or its color shall be a close approximation of the color of the lead.

3.5 Identification marking. The casing shall be imprinted with the manufacturer's name or trade mark, and unless otherwise specified (see 6.2) it shall be imprinted with the wording "AIRCRAFT MARKING."

3.6 Resistivity of lead. The pencil leads of the color required shall show resistivities of not less than 100,000 ohms per inch of length when measured as described in 4.2.6.

3.7 Corrosiveness of lead. Markings of pencils shall not cause accelerated corrosion of bare or coated metal panels or show reactions with coatings of coated panels when tested as described in 4.3.10.

3.8 Pencil mark removability. Markings of pencils shall be easily removable from all test panels marked as described in 4.3.11.

3.9 Light fastness. All colors shall be fast to light and shall show no immediately noticeable fading when subjected to 20 hours exposure as described in 4.2.5.1.

3.10 Water fastness. The color shall be fast to water at 60 to 70 degrees F (15 to 21 degrees C) and shall not smear when tested as specified in 4.2.5.2.

3.11 Configuration details.

3.11.1 Length. The pencil shall be 7 inches (178mm) long plus or minus 1/4 inch (6.4 mm).

3.11.2 Outside shape. Unless otherwise specified (see 6.2) the outside surface of the pencil shall be hexagonal with distances across flats not more than 0.315 inches (8 mm).

3.11.3 Lead.

3.11.3.1 Lead diameter. Lead diameter shall be not less than 0.140 inch (3.56 mm) nor more than 0.165 inch (4.19mm).

3.11.3.2. Lead coloring. Lead coloring shall consist essentially of pigment with or without dye as required, subject to the limitations of 3.2.1.1.

3.11.3.3 Lead breaking strength. Lead breaking strength shall be not less than 850 grams when tested according to 4.2.3.

3.12 Performance. All pencils shall mark legibly on bare metal and coated test panels when applied according to 4.3.8.

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 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 when such action is deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Sampling and inspection for acceptance. Sampling and inspection shall be performed in accordance with provisions set forth in MIL-STD-105, except where otherwise specified herein. For purposes of sampling, an inspection lot for acceptance and tests shall consist of all pencils of the same type, class and color resulting from a single uninterrupted production run, packed in the same type container and submitted for inspection at one time.

4.1.2 Examination of the end item. Examination of the end item shall be in accordance with the classification of defects set forth in Table I.

4.1.3 Sampling for tests. The sample unit for all tests shall consist of four pencils randomly selected from the lot.

4.2 Tests. Samples of pencils selected in accordance with 4.1.3 shall be subjected to all tests required herein.

4.2.1 Performance. Sample pencil shall be sharpened to points at three different positions on the pencil in a pencil sharpener conforming to Type II of Federal Specification GG-S-236. Pencils shall be tested at each point by drawing a line equivalent to 24 inches (609mm) under ordinary writing pressure on Type IV bond paper conforming to Federal Specification UU-P-121.

4.2.2 Casings. Casings shall be examined after the pencils have been sharpened as described in 4.2.1 to determine conformance with 3.2.2 and 3.3.

4.2.3 Lead breaking strength. After the pencils are sharpened to points having diameters between 0.070 and 0.080 inches (1.78 and 2.03 mm) the pencil shall be placed in a rigid holder set to maintain a constant angle of 45 degrees ($\pi/4$ radians) between pencil and platform (see figure 1). The pencil shall extend beyond the underside of the block 1-1/4 to 1-1/2 inches (32 to 38mm) measured along the pencil to the point. The scale platform shall be smooth and offer practically no resistance to the point moving across its surface. Pressure shall be applied by pushing the rod down gradually and uniformly in order to avoid variations and shock. Readings shall be taken at the instant of breaking, provided the breaking point is definite and does not develop into a general crumbling. Not less than four pencils shall be used and each pencil shall be subjected to not less than four tests. The breaking strength of the leads shall be the average of all determinants. This average breaking strength shall equal or exceed the strength requirements of 3.11.3.3.

TABLE I - CLASSIFICATION OF DEFECTS

CATEGORIES	DEFECTS
101 Major	None Defined
101	Shape and design not as specified
102	Casing not straight-grain Cedar
103	Casing does not enclose the lead in a neat secured manner
104	Both halves of the casing not of uniform construction
105	Casing and lead not securely glued throught the entire length of the pencil
106	Lead not centered
107	Casing not of the same color as lead, or lead color not stamped on pencil
108	Finish damaged or blemished, clearly noticeable
109	Lead does not correspond to the color specified
110	Not smoothly finished, splits splinters, blisters or other imperfection which would affect appearance or impair serviceability
111	Marking of manufacturer's name, trade name, or other identification is incorrect

112	Pencil is warped, cracked or fractured
113	Pencil length not as specified
114	Pencil diameter not as specified
115	Lead diameter not as specified

Minor

201	Quantity of package less than specified or indicated
202	Marking of shipping containers and intermediate packages incorrect
203	Use of any nonconforming materials or components damaged or otherwise defective affecting serviceability
204	Incomplete closure of case liner, container flaps, loose strapping, bulging, or distortion of container
205	Any unfilled areas of shipping containers not properly filled with adequate cushioning material
206	Number of items per shipped containers more or less than specified as indicated quantity. Packing lists (see MIL-STD-129) are incomplete or incorrect.

Numerals listed adjacent to description of defects are for use of inspection in recording of defects.

4.2.4 Continuity of lead. During the strength test in 4.2.3, the lead shall be examined to determine its continuity. More than two breaks in each pencil lead, resulting from strength test, will not be acceptable.

4.2.5 Color fastness.

4.2.5.1 Light fastness. The color fastness of the lead to light shall be determined as described in FED-STD-191, Test Method 5660 with the following exceptions:

a. A colored area 2 inches (50mm) by 4 inches (100mm) on test material (see 4.2.1) shall be placed in the apparatus so that one-half of the colored area is exposed to the radiation.

b. The time of exposure shall be 20 hours.

4.2.5.2 Water fastness. The color fastness of the lead to water shall be determined by inscribing a line 6 inches (152mm) long on test paper, immersing the marked portion in clean water that is at 60 to 70 degrees F. (15 to 21 degrees C.) for a period of 2 minutes. After the immersion period, remove the test paper from the water, allow to dry, and observe the marked area for compliance with 3.10.

4.2.6 Resistivity of lead. Suitable samples of the pencil lead shall be removed from their casing and the resistance shall be measured by an

ohm-meter. The average of four successive readings on 1 inch (25.4mm) length of lead shall not be less than 100,000 ohms.

4.2.7 Lead Analysis. A sufficient amount of marking lead shall be crushed and analyzed for traces of graphite, and for uncompounded or unalloyed powdered metals. Detectable traces of any of these substances shall be cause for rejection of the lot. The method used in the analysis of graphite and uncompounded or unalloyed powdered metals shall be left to the discretion of the manufacturer. Some analysis methods that may be used include various types of spectrographic analyses, infrared analyses, gas chromatograph analyses, and nuclear magnetic reasonance (NMR) analyses.

4.3 Test panels. All panels for test purposes shall be of aluminum alloy in accordance with QQ-A-250/12 with cleaned, unclad, non-anodized, uncoated, and unscratched test surfaces.

4.3.1 Size and number of panels. Twenty-four panels shall be prepared for a single sample lot of 4 pencils. Where more than one sample lot of pencils is to be tested, the same 24 panels can be used up to a limit of 6 test lots. The size of the panels shall be 3" x 6" x 0.020 thick (76 x 152 x 0.51 mm thick)

4.3.2 Identification of panels. Each lot of 24 panels shall be divided into 4 groups of 6 panels each. Within each group, panels shall be scribed with identification numbers "1" through "6". All panels of a given group shall be further identified by a scribed letter "A" through "D" so that all 24 panels are uniquely identified by symbols "1A" through "6D".

4.3.3 Uncoated panels. The number "1" panel of each group shall be set aside as an uncoated sample.

4.3.4 Application of pretreatment. The remaining 20 panels (numbers "2" through "6" in groups "A" through "D") shall be coated on one face to dry film thickness of 0.0002 to 0.0003 inches (0.005 to 0.008mm) with coating compound, Metal Pretreatment, Resin-Acid MIL-C-8514. The sample of each group numbered "2" shall be air dried at least 24 hours before marking as indicated in 4.3.8 without further treatment. Samples "3" through "6" of each group (16 samples) shall be air dried at least 30 minutes before further coating in accordance with 4.3.5 through 4.3.7.

4.3.5 Application of zinc chromate primer. The sample panels of each group marked "3" shall be coated on one face with 2 coats of zinc chromate primer, low water sensitivity conforming to TT-P-1757. Each coat shall have a dry thickness of 0.0003 to 0.0004 inch (0.008 to 0.010 mm). These four samples shall be air dried at least one hour between coats and 24 hours after the second coat before marking as indicated in 4.3.8.

4.3.6 Application of Acrylic Nitrocellulose Lacquer MIL-L-19537. The four panels number "4" will be coated on one face to dry film thickness of 0.0002 to 0.0003 inch (0.005 to 0.008 mm) with one coat of primer conforming to MIL-P-7962 and air dried 30 minutes. They shall then be top-coated with two coats of Acrylic Nitrocellulose Lacquer MIL-L-19537

color insignia Blue #15044 of FED-STD-595 with a 45 minute air-drying period between coats. The total dry film thickness of the two coats of lacquer shall be 0.001 inch ± .0002 (0.025 ± 0.005 mm). The finished panels shall be air dried for 24 hours before marking as specified in 4.3.8.

4.3.7 Application of urethane coating MIL-C-83286. The four panels numbered "5" shall be coated on one face with primer-epoxy, polyamide MIL-P-23377 to a dry film thickness of 0.0006 to 0.0009 inch (0.015 to 0.023 mm), air dried 1 hour, then topcoat with 2 coats of urethane coating MIL-C-83286 to a dry film of 0.0014 to 0.0015 inch (0.035 to 0.038 mm) per coat, air-drying at least 3 hours between coats. The urethane coated panels shall be air dried 168 hours before marking as specified in 4.3.8.

4.3.8 Marking test panels. After all 24 panels are processed as specified in 4.3.3 through 4.3.7 they shall be marked with the pencil to be tested as follows: At least one checkered area 3/4 inch (19 mm) x 1/4 inch (6.4 mm) composed of alternate solid and open 1/4 inch (6.4 mm) squares shall be marked on each of the six panels of one set employing the same pencil of the test lot. Each of the other 3 pencils of the test lot shall be used to similarly mark one set of the test lot until all 24 panels have been marked. By spacing the checkered areas as shown in Figure 2, up to six test lots of four pencils each can be tested using 20 panels and still have sufficient unmarked area to serve as control in corrosion test 4.3.10.

4.3.9 Judging markings. A given pencil shall be judged to have successfully passed the performance requirement 4.2.1 if it legibly marks the test panels as follows: The pencil must legibly mark all panels #1 through #5. Lack of color contrast shall not be considered to indicate illegibility as it is intended that yellow pencils shall be used on dark surfaces and red pencils on light surfaces.

4.3.10 Corrosiveness of lead. After coating and marking, all panels should be exposed to salt spray corrosion for a period of 500 hours in accordance with ASTM Test Method B117. At the end of this period of exposure no panel shall show evidence of accelerated corrosion due to pencil markings. Judgement shall be made on a visual basis by comparing the condition of the panels in areas marked by the test pencils and unmarked areas at the top of the panel. Where marking by any pencil shows evidence of increased corrosion, the test shall be repeated with four panels similarly coated and marked by the test pencil in question. If all four panels pass the repeat test, the pencil shall be considered acceptable; a second failure shall be cause for disqualification.

4.3.11 Pencil mark removability. Following the corrosion tests outlined in 4.3.10, all panels shall be washed in tap water with the aid of rubbing with soft cloth or sponge. If the grid markings are removed from all test panels, the pencils tested shall qualify. Where one or more panels show a slight residual marking after cleaning, it shall be demonstrated that such panels can be successfully recoated employing authorized touch up procedures for the coatings in question. The pencil shall be considered acceptable when the test has been successfully completed.

5. PACKAGING

5.1 Packaging requirements. Pencils shall be packaged level A, B, or C as specified in the solicitation (see 6.2).

(Definitions and applications of various levels of packaging and packing protection for civil agencies, shall be as defined in FED-STD-102.)

6. NOTES.

6.1 Intended use. These pencils are for marking on bare and coated surfaces of aircraft components without leaving a residue that could cause corrosion.

6.2 Ordering data. Purchasers should exercise any desired options offered herein, and should specify the following:

a. Title, number, and date of this specification along with any applicable amendment.

b. Identity of item required (see 1.3 and 6.4).

c. Color required (see 3.4).

d. If "AIRCRAFT MARKING" is not to be stamped on the pencil (see 3.5).

e. If the required shape is other than hexagon (see 3.11.2).

f. Levels of preservation, packaging, packing, and marking required (see section 5).

6.3 Omitted items. This specification covers requirements for non-mechanical, thick lead (Type I, Class B) pencils of the basic issue of this specification. Thin lead, non-mechanical pencils (Type I, Class A) and mechanical pencils (Type II) with lead refills are omitted because of the lack of requirements for these items by the military services. Mechanical pencils are covered by SS-P-186 and are available from the GSA stock system.

6.3.1 Black lead pencils. Requirements of black lead pencils (cancelled NSN 7510-00-537-6928) have been dropped from this specification because of the inability of black lead's compliance with electrical resistance requirements as specified herein.

6.4 Item identification. A solicitation for the item required should identify one of the part numbers with its applicable lead color and NSN as follows:

PART NUMBER	LEAD COLOR	NSN
M83953-1	Yellow	7510-00-537-6930
M83953-2	Red	7510-00-537-6935

6.5 Asterisks are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

Custodian:
Air Force - 99

Preparing Activity:
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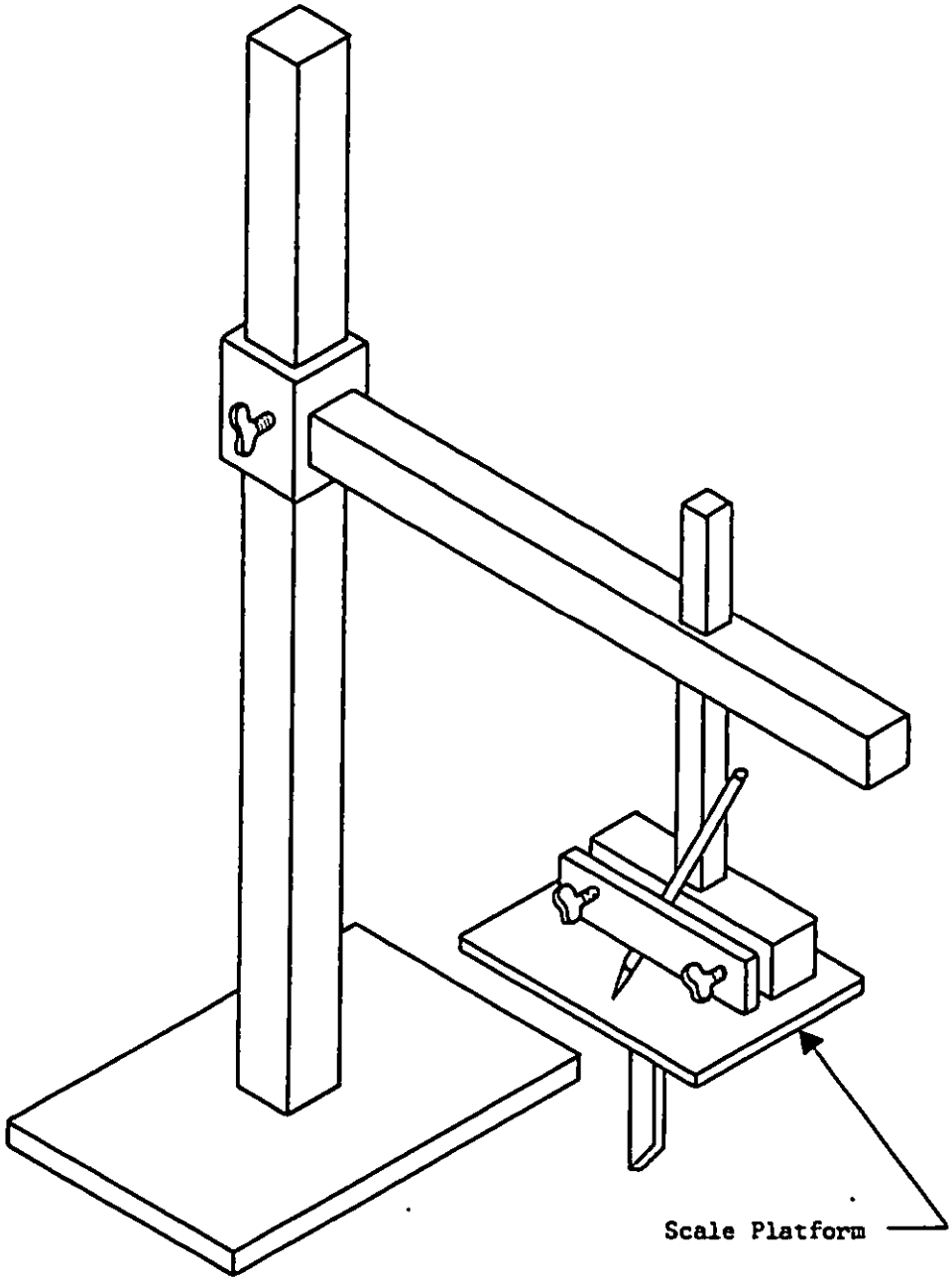
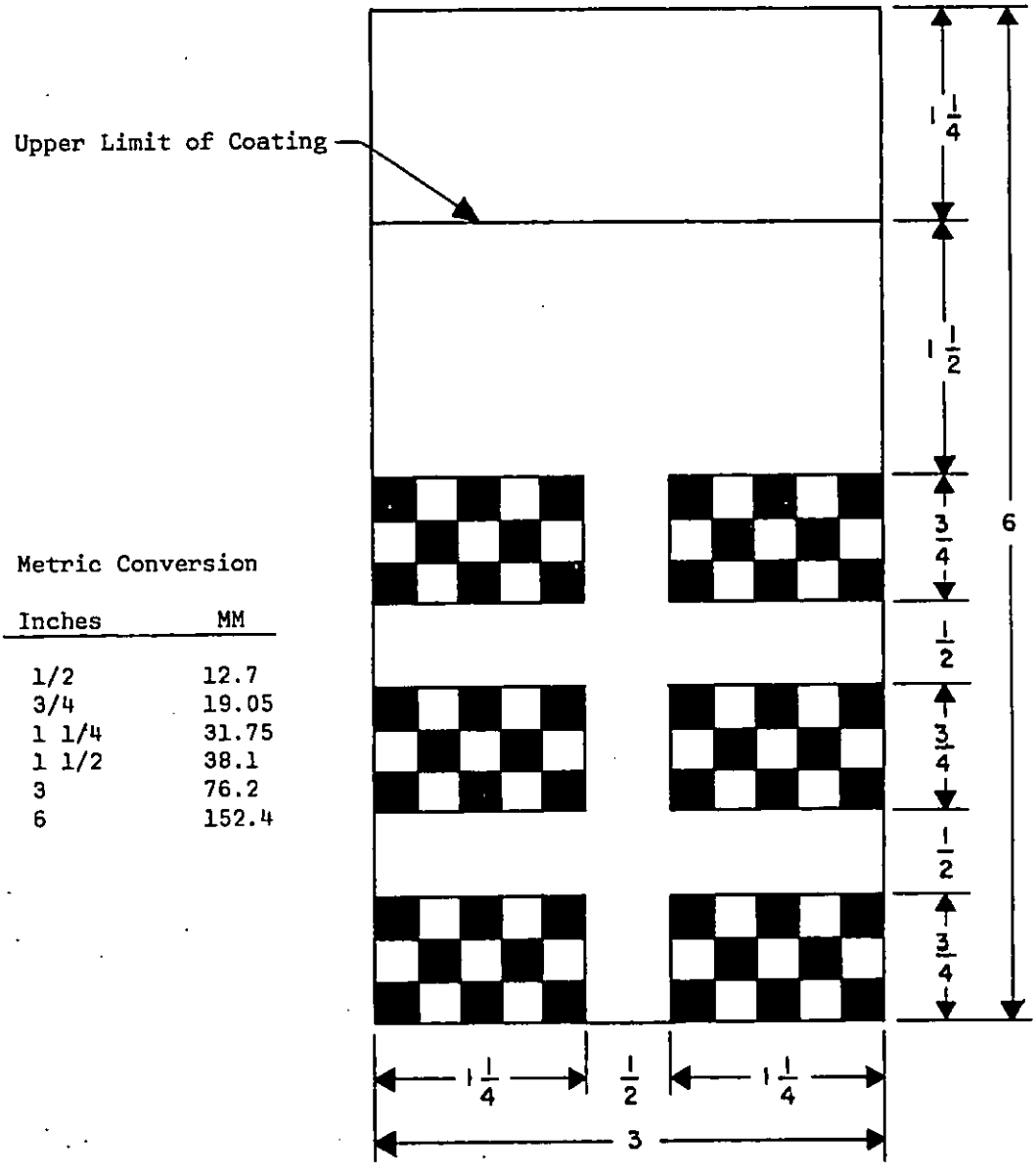


Figure 1. Holder



Metric Conversion

Inches	MM
1/2	12.7
3/4	19.05
1 1/4	31.75
1 1/2	38.1
3	76.2
6	152.4

Figure 2
Method of Marking Test Panels

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